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International Conference Proceedings

DIGITAL CULTURE & AUDIOVISUAL CHALLENGES
Interdisciplinary Creativity in Arts and Technology

Editors: Michail Panagopoulos, Agnes Papadopoulou, Andreas Giannakouloupoulos



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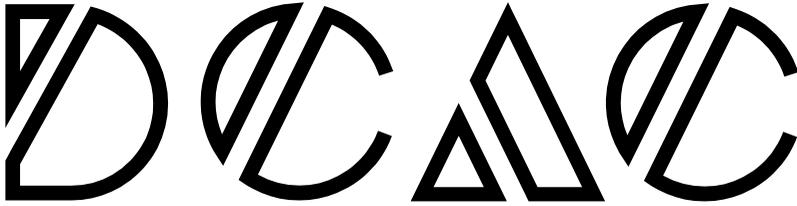
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Preface

Welcome to the community of DCAC 2018, the first International Conference on Digital Culture and AudioVisual Challenges, Interdisciplinary Creativity in Arts and Technology.

The conference was organized by the Department of Audio Visual Arts - Ionian University, on June 1- 2, 2018, in Corfu, Greece. The conference successful organization served as a strong indication that the Department of Audio Visual Arts, after almost fifteen years, continues to play a pioneering role in the field of digital arts. The DCAC conference continuously evolves as a dynamic platform through which new possibilities perpetually emerge, offering a wide range of possibilities for digital exploitation, and constantly opening the doors to new and as yet unexplored synergies.

In particular, the DCAC conference aims to function as a forum in which progress-oriented individuals, researchers, professionals, technicians, technartists, practitioners in the area of arts and information technologies, as well as industries and institutions find a place to present results, debating and sharing ideas, best practices, and find a wealth of opportunities for networking. All the talks presented during the 2018 conference confirmed our belief that an interdisciplinary approach to the questions of art, technology and media, technoculture and critical theory, is both challenging and necessary.

DCAC 2018 received 50 submissions. We thank all authors for submitting their work. The standards for the submissions had been high. The international Scientific Committee was composed of 32 members from 10 countries. We would like to express our gratitude to these 32 experts from the United Kingdom, Turkey, Malta, Denmark, Spain, Russia, Israel, USA, Austria, and Greece for reviewing and recommending papers for the conference.

We want to especially thank our keynote speaker, Maurice Benayoun and our invited speakers: Elif Ayiter, Adnan Hadzi, Antonios Liapis, Robertina Šebjanic.

We greatly acknowledge all those who enriched the DCAC 2018 Conference through their contribution, and who made the conference possible through their dedication and work.

We thank, in particular, Nikolaos Kanellopoulos (Head of the Department of Audio Visual Arts) and Andreas Floros (Dean of the Faculty of Music and Audiovisual Arts) for their active involvement and especially for their continuous assistance.

The Organizing Committee hope is that the DCAC Conference will further promote the academic dialog between specialists in the involved different fields, spark fruitful future collaborations, and continue to grow steadily in strength and quality.

Agnes Papadopoulou

NEW AESTHETICS - NEW DIMENSIONS

SMOOTH/STRIATED, PLACE/NON-PLACE: SPACES FOR METAVERSE AVATARS

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Abstract

This paper will attempt to connect Gilles Deleuze and Felix Guattari's conceptions of 'smooth/striated space' and Marc Augé's definitions of 'place/non-place' to the space/place usages of the avatars of online three dimensional virtual builders' worlds, also known as the metaverse. The premise is that a particular type of virtual space inhabited by avatars, the art ecologies of the metaverse, show usage and navigational attributes which dovetail with these two separate physical space related conceptions since characteristics such as the absence of hierarchies, the confusion brought about through repetitive architectural / spatial elements, as well as an absence of essential navigational aids such as floors in some virtual art spaces, and the intrinsically transitional nature of them appear to be a combination of an inclination toward spatial 'smoothness' and 'non-place.' In order to further examine the subject, Brian Eno's concept of the 'unfinished artifact' will also be dwelled upon.

Keywords: *Smooth/Striated, Space, Place, Non-Place, Unfinished Artifact, Metaverse, Avatar, Virtual Architecture, Second Life.*

Smooth and Striated



Figure 1: "Arid Dawn" by Pixabay. Creative Commons License. Source: <https://www.pexels.com/photo/adventure-arid-dawn-desert-274035/>

The topic will first be examined under Gilles Deleuze and Felix Guattari's definitions regarding the smooth and striated characteristics of space – the transformation that occurs towards striation upon the entry of the nomad to previously smooth locations; that is

pre-agricultural spaces devoid of clearly defined entry and exit points and navigational direction which are characterized through shifting intensities and events rather than static relational markers. These distinctions reside between the nomadic and the sedentary, the latter manifesting inclinations that eventually culminate towards creating spaces which befit the needs of the State apparatus, and its appended 'War Machine' that depends on striation for order, hierarchy as well as defence and attack procedures.

Deleuze and Guattari state that completely smooth space can only exist in natural environments that have not yet been infiltrated by humans, whose "*primary determination is to occupy and hold a smooth space ... [] ... creating an extended confrontation between the smooth and the striated in which the striated progressively takes hold.*" (Deleuze and Guattari, 1987, 410)

'Smooth space' finds its counterpoint in 'striated space,' which is man-made, post-agricultural space (which has actually transitioned to a 'place' state) that comes about when the nomad is settled, is bounded to a specific locus that is defined by boundaries, walls, hierarchies, and easily identifiable entry/exit points.

'Smooth space' is occupied by intensities and events. The characteristic experience of it is short term, up close, with no visual points of reference or invariant distances. Instead of the metrical forms of striated space, smooth space is made up of a constantly changing orientation provided by a population of nomads who are actively entertaining tactile relations among themselves.

While Deleuze and Guattari note upon the fundamental oppositions of these two types of spaces, they nevertheless acknowledge the distinctly separate existence of 'smooth space' only in nature, claiming that when it comes to man-made spaces 'smooth' and 'striated' can exist only in a hybrid state. Although such an opposition does exist, nevertheless these "*two spaces in fact exist only in mixture: smooth space is constantly being translated, into striated space; striated space is constantly being reversed to smooth space. In the first case, one organizes even the desert; in the second, the desert gains and grows; and the two can happen simultaneously.*" (Deleuze and Guattari, 1987, 474-475)

'Place' and 'Non-place'

It is at this transitional point that Marc Augé's deliberations on 'place' and 'non-place' can be brought forward since it appears that a transition from smooth to striated inevitably brings about 'place' as an anthropological manifestation that can be defined as relational, historical and concerned with identity. Augé contends that supermodernity has also brought about a very specific type of space that has no relational or historical contexts and manifests no concern whatsoever for identity. These are 'non-places' which can be seen to be transitional 'places of memory' that are assigned to specific positions: 'Non-places' are spaces that we do not live in but that we only pass through, that we have memories of without actually having dwelled in them.



Figure 2: “Airport Escalators” by Gratisography at Pixabay. Creative Commons License. Source: <https://www.pexels.com/photo/stairs-people-airport-escalators-4610/>

Here we are talking about a world where transit points and temporary abodes proliferate under luxurious or inhuman conditions, of a dense network of inhabited transitional spaces wherein the habitués of supermarkets and credit cards communicate wordlessly with an abstract, unmediated commerce; a world thus surrendered to solitary individuality, to the fleeting, the temporary and the ephemeral. While ‘place’ and ‘non-place’ appear to be opposed polarities, nevertheless the first is never completely erased, the second never totally completed. Instead they are like palimpsests on which the scrambled game of identity and relations is ceaselessly rewritten.

But, that said, according to Augé, non-places still appear to be the real measure of our times – one that also includes the complex skein of cable and wireless networks which mobilize extra-terrestrial space for the purposes of a communication so peculiar that it often puts the individual in contact only with another image of himself. (Augé, 1995)

The Unfinished Artifact

Up until this point what we have pondered upon relates to the physical world. As we now transition into virtuality it may be useful to bring one other concept into the equation – namely the unfinished artifact, since this may help provide a clue to the riddle as to why virtual architectures will so often be uninhabitable, why they tend to prefer to remain as hybrids, as ‘non-places’ rather than ‘places.’ One of the most compelling points of virtual building is that such output is often bound in a continuous process of transformation as Brian Eno defines it in his famous *Wired* magazine interview of 2005:

“Think of cultural products, or art works, or the people who use them even, as being unfinished. Permanently unfinished. We come from a cultural heritage that says things have a ‘nature,’ and that this nature is fixed and describable. We find more and more that this idea is insupportable - the ‘nature’ of something is not by any means singular, and depends on where and when you find it, and what you want it for. The functional identity of things is a product of our interaction with them.” (Eno, 2005)

While the physical world which is comprised of atoms is not conducive to the approach that Eno describes, the electronic environment with its building blocks of bits

provides ground for the existence of creations whose inherent nature is to remain in a perpetual state of being worked upon, copied and proliferated. The outcomes tend to be creative systems which, unlike their physical counterparts, can be endlessly improvised upon, altered, re-worked and played with; and as such they appear to provide the constitutional material of all metaverse building.

Virtual Spaces, Virtual Places

Looking back on many years of building in Second Life I am always astounded by the fact that the only ‘place’ that I have ever built, that I actually lived in, and that has been used as a ‘home’ by others as well, is the tent (shown below in Figure 3), a construct that is clearly recognizable for what it is; and furthermore this is a personal dwelling, i.e., a ‘place.’ Almost everything else that I have built has been hybrid and transitional in nature. In other words, I have built ‘non-places’ instead of ‘places’ that also carry a contradiction in that – unlike physical ‘non-places’ that are public spaces where ease of navigation through signage and visual markers is a priority – these spaces are unclear, are devoid of demarcations. They are tough to understand and to navigate since they have no clear visual points of reference, and no clear entry and exit points or any type of signage. While these spaces have walls, these walls are usually placed in such a way that they do not serve hierarchies by being layered into maze-like constructions, oftentimes also further complicated through transparencies: If anything the walls are there to confuse the transient avatar populations that visit the space rather than to create boundaries which delineate intimacies and seclusion, thereby setting up personal connections to the visited space.



Figure 3: “The Angry Monkey Tent” by Elif Ayiter. 2009. Second Life.

Thus, although these environments are ultimately striated since – virtual or not – they are human-made, they share some of the attributes of smooth space – you never really know where you are, how to get in, how to get out, and where to go next. Even more importantly, through their confusing spatial attributes, these localities also do not aim to ease a sense of personal belonging.



Figure 4: “From here on there be dragons,” a virtual architecture that is built out of exact replicas of one architectural module which are repeated and mirrored not only horizontally but also vertically, creating a considerable sense of navigational confusion for visiting avatars. Elif Ayiter. 2017. Second Life.

One important factor that brings about this hybridity between smooth and striated is repetition, which brings us back to the bit-based nature of the electronic building medium in which things can endlessly be replicated through identical copies which make for loss of hierarchy, a loss of direction, and ultimately a loss of sense. When you place scores of exactly identical, as well as sometimes mirrored building elements on a transparent floor it becomes quite difficult to know where you are (Figure 4). However, it isn't just the replicated or mirrored elements. There are further visual clues (or absences thereof) of quasi ‘smoothing’ that make it difficult to identify with such a space as a ‘place’ that you belong to, thus aiding in the creation of a ‘non-place’ that you just wander through: In a world where you can fly, do you really need floors? After all, how striated can a floorless space really be? Would you ever make a ‘place’ out of a floorless space, or would you just fly through it? (Figure 5)

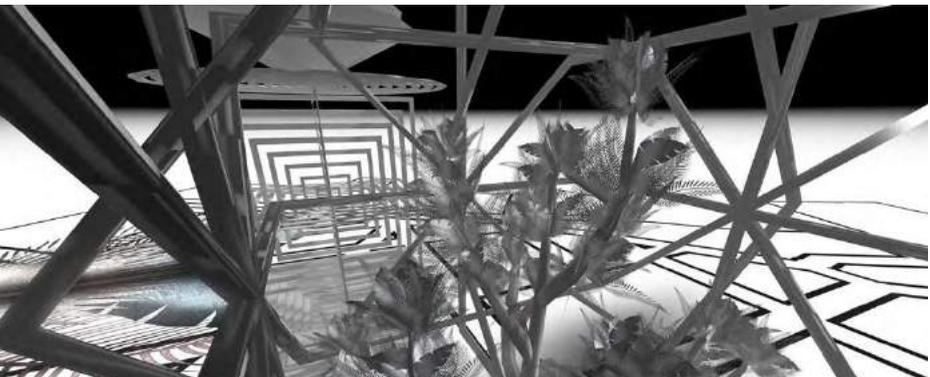


Figure 5: “Calima” is a vertically mirrored abstract ecology / architecture devoid of clear entry and exit points as well as a uniformly visible floor. Elif Ayiter. 2018. Second Life.

It is not only the visual attributes of these spaces, such as transparencies, repetitions, absences of floors and ceilings that are significant. When it comes to a search for ‘place’ these spaces are devoid of intimacy and personal appropriation, perhaps resembling site specific art works in the physical world. Yes, you may well build memories inside these art ecologies, but they will probably not be memories of belonging or of identity – unless you begin to utilize these ecologies as grounds for engaging relationships, as will be considered further below.

Conclusion

It would be foolhardy to claim that the metaverse abounds with the type of artistic building discussed in this paper. Most of what manifests inside virtual builders’ worlds has been built with the physical world in mind – to the extent where copies of real life buildings and locations are re- created virtually down to the last detail. However, even when constructs are fantasy based, more often than not they manifest as clearly recognizable medieval castles, cyberpunk cities and so forth. But, does the manner of building – whether it reflects spaces that in the physical world we can relate to as ‘places,’ change the identification with them from impersonal to personal? Even if the sort of hybridity between ‘smooth and ‘striated’ described in this text cannot be applied to metaverse building in general, the dichotomy of ‘place’ and ‘non-place’ appears to be omnipresent, leading us to the question as to whether avatars actually live in the metaverse or whether they should just be considered as cyber-agents who traverse these locations very much in the sense that Augé defines them as transitional ‘places of memory’ that are assigned to circumscribed positions?

The answer may reside in the concept of ‘virtual presence’ which is defined as a sense of ‘being there’ in a mediated environment. At its best ‘virtual presence’ creates an illusion of non-mediation in which a user no longer perceives the display medium as a separate entity. A high level of presence will help users in remembering a virtual environment as ‘a place visited,’ rather than as ‘a place seen.’ (Slater et al, 1999)

One of the determinants of our human biological design may be said to be our compulsion for social engagement which leads us to the research of Giuseppe Mantovani and Giuseppe Riva in which they examine ‘virtual presence’ from a social perspective by challenging the idea that experiencing a simulated environment is only a matter of perceiving its objective features:

‘Presence’ (real or simulated) means that individuals perceive themselves, objects, as well as others, not only as situated in an external space but as immersed in a socio-cultural web connected through interactions between objects and people. (Mantovani and Riva, 1999, 540 – 551)

Anthropological research conducted by Tom Boellstorff in *Second Life* shows us that avatars do in fact become ‘virtually present’ inside virtual spaces (Boellstorff, 2008) to an extent where a deep personal identification that would suggest an immersion into ‘place’ rather than ‘non-space’ comes about.

My own experience and my observations as a long-time habitué of builders’ worlds bring me to the veracity of Mantovani and Riva’s findings: What turns an impersonal ‘non-place’ into a personalized ‘place’ is the relationships we build

within that space, and not the physical attributes, or indeed the intended usages, of the space itself. And not only is it the avatars that we build relationships with that are of essence to a transformation from virtual ‘non-place’ to virtual ‘place’ – such heightened spatial engagements can also be brought about through objects; in other words, through creative activity.

Such creative activity does not have to be building alone; play will also qualify, as will the type of creative activity very commonly engaged in by metaverse avatars – artistic documentations through virtual photography or video. These will turn the most ‘smooth-like,’ hard to navigate spaces into playful mazes where the object may in fact be becoming lost and found, or turn confusion into exquisite backdrops for self-expression through a virtual lens. No matter whether you find yourself in a virtual Venice or inside vertiginous art ecology devoid of floors or ceilings and entries or exits, becoming creatively active therein will in all likelihood be the virtual counterpart for the nomad’s setting up of tent and thereby taking the first step from transforming a virtually ‘smooth non-place’ into a ‘striated place’ within which meaningful relationships can be built and furthered.

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COMPLEXITIES OF FORM: THOUGHTS ON A DE- ONTOLOGIZED AESTHETICS OF RECURSIVE PROCESSES

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Abstract

The objective of what follows is –as explicitly indicated in the title– to present and concisely discuss, in a simple and comprehensive manner, some preliminary thoughts pertaining to a general, deontologized, processual aesthetics, i.e. an aesthetics based not on fixed identities, closed substances and stable forms, but on an increasingly complexified architecture of trans-forms of differences and entangled recursive processes, i.e. processes that unfold and evolve by recursively folding back into (re-entering) their own plane of processual activity, thus giving rise to high-level complexities of self-reference, differ- entiation and transformation.

Keywords: *aesthetics, difference, process, recursion, trans-form.*

1.

What is so concisely being discussed here is immediately related to a general complexity-oriented epistemology, bringing together two distinct modes of thinking-inquiring that, in the course of modern and contemporary western rationality, with the exception of certain few –literally out-standing– cases, have regretfully been standing in stark contrast to one another: on the one hand, speculative-reflective ontometaphysics and, on the other, positivist, exact-scientific formalism. Although thoroughly elaborated and developed during the last five decades, the aforementioned generalized epistemological thinking mode has not yet managed to “contaminate” the particular, “hard” and “soft”, disciplinary sciences, thus remaining largely ignored. Be that as it may, its systematic exclusion from the institutional canon does not by any means reduce its unquestionable significance and major historical importance.

Indeed, when it comes to getting involved in (first-order) observing and decomplexifying phenomena of “restricted complexity” (whether they be of a macro-physical or of a mi- crophysical order), the particular sciences turn out to be exceptionally loquacious. They do what they are trained to do best: they produce data by making use of various novel methods and analytical tools of partialization, compartmentalization, formalization, modeling and implementation. But, when it comes to thinking upon what Morin (2008) calls “generalized complexity”, which entails a higher-order, recursive observing mode, one that requires first and foremost their reflexive re-entering into their own observational space (a process of incessant, critical auto-differentiation and

transformation or, alternatively, a process of reflecting upon their own reality and how they construct it), the particular sciences suddenly start to stutter; they become aphasic. That kind of generalized complexity-oriented thinking mode “requires... an epistemological rethinking, that is to say, bearing on the organization of knowledge itself” (Morin, 2008).

For the inquiring mind who shares the above epistemological concerns, a short, yet exceptionally lucid account of the “Why’s” and “How’s” underlying the divide between speculative-reflective and exact-scientific thinking mode, but also of the ironic twists and the inescapable re-emergence of speculative ontometaphysics at the very heart of “hard” science (as, for instance, in the cases of W. Heisenberg’s tackling the problem of causality in quantum mechanics and E. Schrödinger’s inquiry into the physical basis of consciousness and the matter-mind relation) has been handed down to us by Günther (1962), eminent Hegelian philosopher-logician-cyberneticist and a colleague of W. McCulloch and H. von Foerster at the renowned in the sixties Biological Computer Laboratory of the University of Illinois-Urbana.

2.

For the sake of argument, let us proceed from the premise (our primary, founding distinction) that what is termed “the observer” (that is, the state or act of observing embodied in the form of a perceiving-cognizing subject coupled with a so-called perceived objective reality), being itself a fabricated (symbolic-imaginary) construct generated through an act of observation (that is, through a distinction-drawing process engendering symbolic-imaginary world-forms, structured on the basis of observing subjects and observed objects that might as well be the very subjects that do the observing), is not taken as some sort of incontestable *Ding an sich* or an *a priori* empirical certainty, but as a mere convention: a general regulatory concept, principle or medium for reducing –and yet, paradoxically enough, for generating further– complexity. This paradoxical double gesture could be depicted as a Möbius strip: reducing complexity is tantamount to inducing further complexity – a seemingly contradictory condition that is immediately resolved as soon as we think of it in non-dualistic topological terms.

This is definitely not the place to point out the deep metaphysical origins of the irreducible, systematic and systemic complexities resulting from the inherently paradoxical ontological status of the circular causal relation between a whatever (individual or collective) observing-perceiving subject and its observed reality. To get a sense of the issue in question, one needs only consider for a while the Pascalian dizzying insights (Pascal, 1958) into the cosmic “parts & whole” feedback loop, in which the problem of the observer seems to find its utmost expression.

We define the “observer” as a general regulatory concept, principle or medium for reducing complexity, insofar as it serves to do away with the puzzling contradictions inherent in the scientific aspiration for an ultimate objective description of the world – a description that would be completely independent of partial subjective worldviews. These contradictions arise the very moment we reasonably assume that descriptions exist only insofar as there is at least one observing subject who endeavors to describe: “To remove these [contradictions] one had to account for an „observer“ (that is at least

for one subject): (i) Observations are not absolute but relative to an observer's point of view (i.e., his coordinate system: Einstein); (ii) Observations affect the observed so as to obliterate the observer's hope for prediction (i.e., his uncertainty is absolute: Heisenberg). After this, we are now in the possession of the truism that a description (of the universe) implies one who describes it (observes it). What we need now is the description of the „describer“ or, in other words, we need a theory of the observer” (von Foerster, 1982).

On the other hand (which, as we have already suggested, is essentially the same hand drawing itself as other), we define the “observer” as a general regulatory concept, principle or medium for generating further complexity insofar as its introduction into our thought-system gives rise to the possibility of an observer-dependent theory in which complexity –generated by recursion, reflexivity and self-reference– prevails. Paraphrasing H. von Foerster's formulation (von Foerster, 1991), a theory of the observer requires that an (individual or collective) observer assumes the task of writing it. From this follows that if that theory has any aspirations for completeness, it inevitably has to also account for the very writing of this theory. And even more fascinating and complicating, the writer of this theory also has to account for her or himself writing this theory. Which means that –contrary to traditional, orthodox scientific ways of proceeding, in which (subject-less) objectivity is the rule– this theory demands that the observer's observing should necessarily be included in her/his observations; that the observer must necessarily enter her/his own descriptions; that the properties of the observer not only *shall*, but also *must* enter the descriptions of her/his observations.

Thus, as far as the relation between the observer and the observed (or the subject and object of observation) is concerned, in the context of an observer-dependent theory, complexity –manifested in the form of paradox, self-reference, recursion and reflexivity– is unavoidably forever present. In search for completeness, an observer-dependent theory (that wishes to remain committed to its foundational principle of undecidability) will paradoxically (and yet, quite logically) lead to unending latency, ever-growing complementarity and eventually incompleteness. However, the latter is not raised as an issue to be resolved. To the contrary, it is invited insofar as it is the very condition of possibility of completeness. At that level of epistemological thinking completeness amounts by definition to deferred completeness.

Such an epistemological stance implies a different kind of bioethics and biopolitics of time which might be called “second-order cybernetic deconstructive”, insofar as it is fundamentally concerned with processes of infinite *re-progression* “in” and “out” of nested –one into another– contexts, that is with processes of ever-growing recursive contextualization. As noted by Rasch (2002), “what was once „the whole“... that could be seized... as a totality, now becomes an immanent field of observations, descriptions and communications, a „totality of facts“, as Wittgenstein wrote, that must contend with the uncomfortable situation that any observation of a fact is itself a fact that can be observed. The whole... is a whole that forever divides itself with every observation into more and more „facts“... a self-referential whole, thus an inescapably paradoxical one. Accordingly, we are no longer in the realm of a foundationalist „first“ philosophy, but rather in the realm of a „second-order“ philosophy of observations of... observations”.

3.

Reductionistic or over-simplistic as it may sound, it appears that these issues of self-reference, reflexivity and recursion have been so deeply rooted in the very foundations and course of development of our 2,300 year-long western rationality that the latter – from its very inception, that is since Aristotle’s official laying down the formal logical basis (laws and principles) of thought and scientific inquiry– might, in its entirety, be treated as an unremitting, inescapable confrontation with the onto-logically problematic, if not disastrous, implications of those (irremediably inherent in it) issues. Anyone with a rudimentary understanding of the classic Freudian schematization of the psychic apparatus’ three-fold structure as well as of the unavoidable recursive loops resulting from it, already gets the point: as in all dramatic tales of neuropsychotic systems seeking to chase away some firmly embedded in their own structure, disorganizing element that undermines their sense of self-control and unity, what is systematically repressed, inhibited, expelled, keeps coming back in through the back door reinforced, becoming the very organizing principle of the system itself.

Having been exhaustively elaborated in the context of eighteenth and nineteenth century (Kantian, Fichtean, Hegelian) transcendental idealist investigations into the reflexive and dialectical structures of subjective perception in its relation with objective being, the issues of self-reference, reflexivity and recursion were subsequently “resolved” (that is, bluntly expelled, forbidden, repressed) by early-twentieth century Russellian theory of types (van Heijenoort, 2002), then irreparably reinstalled by Gödel at the very heart of rationality, as a *sine qua non* “defect” of any mathematical formal system (Nagel & Newman, 2005), in order, eventually, to be reshaped and introduced anew by a number of intricately related areas of scientific inquiry such as: second-order cybernetics (that is, cybernetics of first-order feedback cybernetics or, alternatively put, cybernetics recursively applied to itself), radical constructivist bioepistemology of autopoiesis, social- communicational systems theory, as well as certain instances of philosophically oriented cognitive scientific research, as in the cases of Hofstadter (1999 & 2008) and Dennett (1992 & 2017).

These areas and practices of thinking-inquiring share a common epistemological ground in that they are expressly concerned with (the complications inherent in) writing the above-mentioned strangely loopy theory of the observer: an observer-dependent theory (a theory of observing observing), which accounts for its very own act of writing and even for its accounting for the accounting for its act of writing. And in doing so they all end up dealing with the fundamentals of circular processes: more precisely with a wide diversity of interrelated (biophysico-socio-cultural) recursive processes that unfold and evolve by recursively folding back into (re-entering) their own plane of processual activity, thus giving rise to high-level complexities of self-reference, differentiation and transformation.

By the terms “self-reference”, “differentiation” and “transformation”, we mean that these processes (re)produce themselves from themselves by interacting with themselves. But, in order to do so, they must first distinguish themselves from themselves. Each process of distinction-making, performed within and by a system, marks off a difference which, traveling through the circuits of the system, triggers further differences (trans-

forms of differences) that affect the very internal states of the system itself. This is one way of interpreting G. Bateson's famous notion of "difference" conceived as a product of distinction-drawing that makes a difference ("a difference which makes a difference"): "When you enter the world of communication, organization, etc., ...you enter a world in which „effects“... are brought about by differences" (Bateson, 2000).

Such a world is the world of the reflexive domains in which we presently take ourselves to exist. Following Varela (1979) and Maturana & Varela (1987), Kauffman (2016) gives the following description of how a reflexive domain could be imagined: "A reflexive domain is an abstract description of a conversational domain in which... each participant is also an actor who transforms that domain. In full reflexivity, each participant is entirely determined by how he or she acts in the domain, and the domain is entirely determined by its participants. [...] A Community of observers / participators forms a reflexive domain *D*. By this term I mean that each person in the domain is also an actor in that domain. Each one acts upon the others and each can be acted upon by the others and by himself".

Every choice, action and distinction taking place in the context of a reflexive domain contributes to its expansion which, in turn, affects the internal organizational pattern of the network of relations which constitute the reflexive domain. The domain unfolds and evolves by recursively folding back into (re-entering) its own plane of circular processual activity. In reality, the domain is not a Euclidean entity, but a dimensionless pattern. It has neither outside nor inside. It is us, the observers, who introduce these terms in order to capture it, frame it, describe it, shape it and make it intelligible. Yet, even these secondorder descriptions and distinctions, insofar as they take place in the context of the reflexive domain in which we exist as observers, actors and participants, are not external to the domain, but an integral part of it. Such reflexive domains cannot be understood in purely Euclidean terms, as if they were geographical entities, spaces or territories. It is impossible to say where a reflexive domain begins and where it ends. Reflexive domains are not measurable substances but interlacing organizational patterns that produce them- selves. They can only be conceived in topological terms.

4.

Let us conclude, at this point, by asking ourselves: in what way does the term "aesthetics", featured in the essay's title, enter into the discussion? How does aesthetics relate to fields of scientific inquiry, such as Einsteinian-Heisenbergian physics and second-order cybernetic epistemology, which appear to be alien to it? How is aesthetics brought into play?

Aesthetics is invoked here only as part of a wider and deeper epistemology of cognition. As a matter of fact, aesthetics has always already been from the start pure epistemology. One might even go so far as to claim that there never was and there will never be such a thing as "aesthetics" as a distinct discipline, independent from a science of knowledge and cognition. *Aesthesis* does not and cannot have an existence of its own. Since Aristotle and, much later on, since Kant, Schelling and Freud, we have come to realize that what we call *aesthesis* is constituted as such through a whole array of interconnected, primary and secondary, formal, transcendental logical, reflexive

and other (un)conscious mechanisms that function as a whole. Similarly, what we call *morphi* is far from being some *a priori* given entity floating somewhere “out there” waiting to be captured and processed: it is generated –through recursive processes of distinction-drawing– within the system of the (individual or collective) perceiver, who is actively constructing it, producing it, stabilizing it (Spencer-Brown, 1969; von Foerster, 2003; Kauffman 1987, 2003, 2005, 2009 & 2016).

The core problem that keeps cropping up in every discussion about aesthetics, aesthetic- sensory perception and experience lies, until this day, in the fallacious ontological distinction between a perceiving subject and a perceived object; a perceiving interiority (a cognizing agent) and a perceived exteriority (an object to be cognized by the latter); an observer and an observed. In contrast to an ontological dualistic approach, the objective of this essay was to point towards a constructivist mode of aesthetic inquiry, which treats the subject and the object of perception not as distinct ontological poles and closed substances, but as emergent processes generated within a common operating framework: within the horizon of observation.

In the context of that mode of aesthetic inquiry, the emphasis is not put on the *what* a thing *is*, i.e. on classic ontological issues of identity, substance and form, but on the *how* a thing is constituted, shaped, objectified, *becoming some-thing*, i.e. in ontogenetic issues concerning processes of mediation, differentiation and (trans)formation.

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DYNAMIC GENERATION AND EXPLORATION OF SYMMETRICAL TEXTURES FROM REAL-TIME CAMERA INPUT ON MOBILE DEVICES

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Abstract: Symmetrical patterns play significant roles on the development of the aesthetics of various art forms. The wide use of such patterns in modern design creates the need for digital tools that can facilitate their creation, experimentation and use by artists and designers. Responding to this need, we describe Symmetricon, our Android art/design app for mobile devices that supports real-time visual exploration of a multitude of symmetry types. In particular, we explore animated texture design based on the application of plane symmetry groups on real-time camera input and projected on various type of surfaces. Our art/design app is freely available on the Google Play store. We provide example videos for its use and possible application on YouTube.

Keywords: *Geometric design, symmetry, digital authoring tools, mobile computing.*

Introduction

Symmetrical patterns have been a constant source of inspiration for various visual art forms by evoking feelings of order, harmony or balance [1]. Furthermore, the existence of detailed mathematical descriptions for generating all possible symmetries on the plane has opened up the possibility of efficient, algorithmic generation of such patterns. However, the kinds of iconography that can be generated from symmetry is vast and can be made even bigger by combining symmetrical forms with color or motion animation or by introducing noise in such patterns in a principled way. In this case, the important question that concerns us is how we can efficiently help and motivate digital artists to create and experiment with symmetrical designs that are visually interesting and aesthetically pleasing. Our efforts in dealing with this question focus on the creation of digital environments for creative visual exploration of symmetrical patterns and their interplay with geometry and animation. We want to create tools that can be easily deployed by artists and designers, therefore we target mobile devices as our main development platform. To this end we have created and deployed Symmetricon [2], a free Android app for generating, animating and displaying, in real-time, plane symmetry patterns. In the rest of this paper, section 2 gives a brief description of the types of symmetry generated by Symmetricon, while section 3 explains the algorithms used for the efficient creation of such patterns in real time. Section 4 describes the use of the system and provides some examples of the designs that are possible with it. Finally, section 5 is a conclusions and future work section.

Symmetry

We think of symmetry as a system for organizing design components, referred to as tiles or cells, that are repeated in space. The repeated filling of space with tiles creates tessellations, i.e., complete coverings of the space without any gaps or overlaps. When we restrict ourselves to the two-dimensional space there are 17 ways by which cells can be combined to generate tessellations. We refer to them as the 17 *wallpaper groups* [3].

The basis of symmetrical surface design is to have a cell that orients in the same direction and repeats with no gaps or overlaps. Therefore, only certain shapes can be used as *primary cells* (i.e. the shapes that will be combined to form the final repeating cell). These are the triangles, quadrilaterals (all planar shapes with four sides) and the hexagon. In the case of quadrilaterals, if opposite sides are not equal in length or parallel to each other, then the tessellation process becomes more involved with various translation and rotations applied to each one of them in order to fit seamlessly in the tessellation. Triangles must also be combined with one of them turned upside down to form a quadrilateral cell.

All final repeating tiles are generated by four motions of the primary cell (see Fig. 1); *translation*, *rotation*, *reflection* and *glide*. Translation moves the primary cell sideways, horizontally, vertically or diagonally without a change in its orientation. Rotation turns the cell a certain number of degrees either around its geometrical center or around one of its vertices. Reflection flips the cell either horizontally or vertically. Finally, glide is a combination of a translation and a reflection. In this case, the cell can either be translated horizontally/vertically or then flipped vertically/horizontally.

All 17 possible symmetry groups on the plane are labeled with a notation system stemming from the one used by crystallographers to classify crystals but restricted to the plane [5]. The notation describes the combination of all the operations that are performed on a primary cell (translation, rotation, mirror, glide) to create a final tile that repeats through horizontal and/or vertical translation to produce the tessellation. Symmetricon uses this standard notation. It works as follows [6]:

- The first letter in all the groups is either a p or a c. The p stands for the primary cell, the c stands for centered cell which is akin to a primary cell.
- A number in the second position indicates the maximum order of rotation that is done in the symmetry. The center of rotation is determined by the letters that follow the number. An m directly following the number means that the cell must be mirrored first and then rotated along the angle formed by the mirror. If m comes in the fourth position after another letter, the primary cell must first be rotated and then the mirror applied to the result. For example, p2 means the cell is rotated two times (180°); p3 means it is rotated three times (120°); p4 means the cell is rotated four times (90°); and p6 means it is rotated six times (60°) to produce the final repeating cell. If there is no number in the label, it means that no rotation is applied during the creation of the final tile.
- The third letter (or second if there is no number in the label) indicates the first operation that is done to one of the sides of the primary cell (*m* = mirror, *g* = glide, *1* = no operation prior to rotation).

- The fourth position (or third if there is no number in the second position of the label) is also a letter and indicates what is done to an adjacent side of the cell.

For example, p4g means that the final cell consists of the primary cell rotated four times and then the resulting cell is glided, while pgg means that the primary cell is glided both horizontally and vertically.

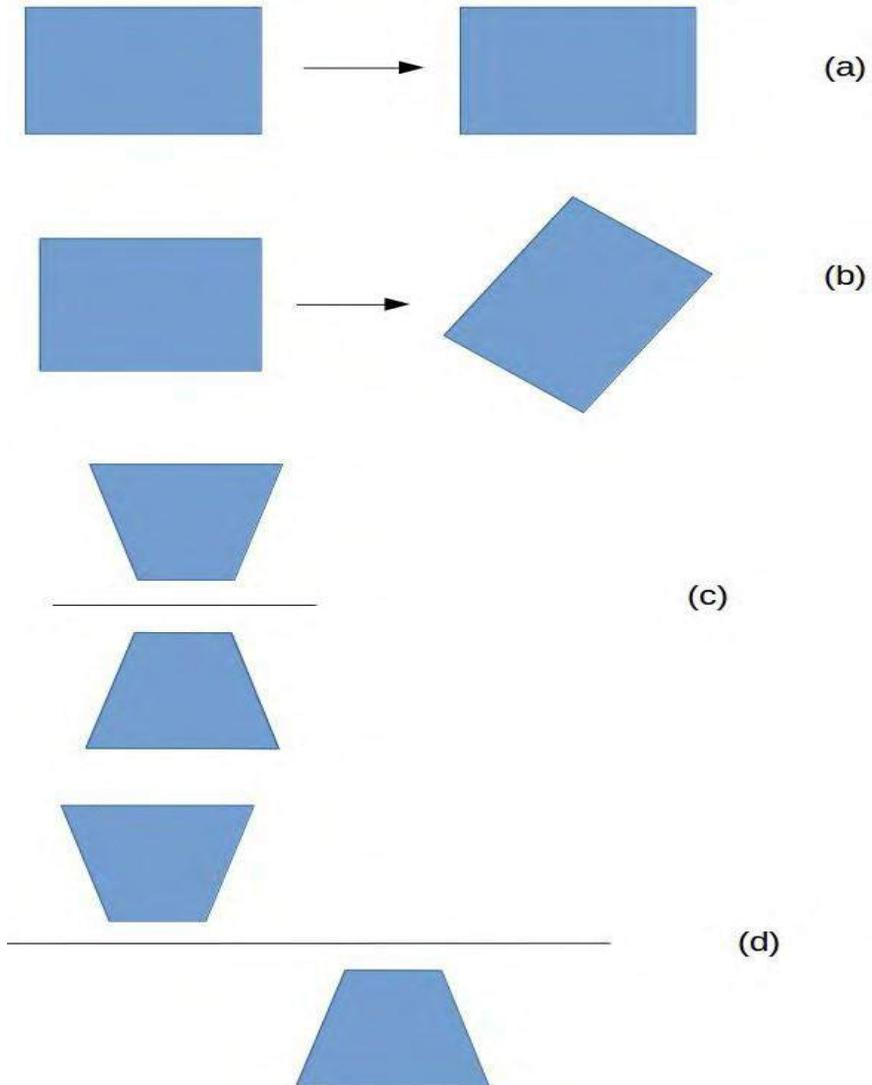


Figure 1: Examples of (a) horizontal translation, (b) rotation about the point of intersection of the diagonals, (c) vertical reflection, and, (d) glide. The black line in (c) and (d) depicts the axis of reflection.

Generation of Symmetrical Textures

The symmetrical texture generation process in Symmetricon receives as input the frames captured from the camera stream of a mobile phone. These frames comprise the primary cells for the subsequent operations. Symmetricon then generates the final repeating tile which is either a rectangle or a hexagon depending on the symmetry group specified by the user. This tile is a bitmap image which is passed as a texture unit to the fragment shader of an OpenGL environment. This is straightforward in the case of rectangular tiles. In the case of hexagon tiles, given that textures are rectangular in OpenGL, the hexagon tile is turned into a rectangle by adding the top left triangle to the bottom right side of the hexagon and so on. The rest of the operations consisting of all the motions (translations, rotations, reflections and glides) applied to the repeating cell in order to create the tessellation are being performed in the fragment shader in parallel thus speeding the tessellating process and achieving real-time performance. In parallel with the generation of the tessellation the fragment shader computes the animation pattern specified by the user in the GPU as well. This can either be a horizontal/vertical translation of adjacent rows/columns of the tessellation, a rotation of a 4x4 tile block around its geometrical center or non-linear vortex and tunnel effects.

The resulting tessellation is being pasted upon either a square surface, a sphere surface, a square grid (i.e., a square surface sampled with a grid of points) or a combination of the above depending on the user choice. These surfaces are created in the vertex shader of the OpenGL environment and are centered on a 3D coordinate system. The user can select a variety of animations that affect the position of the vertices of each surface displayed thus creating various wave and other geometrical deformation special effects.

User Interface (UI)

Symmetricon allows the user to select the types of symmetry groups he wants to use, the size of the tessellation along with the specific texturing surface (square, sphere or rugged plane) he wants to create and the type of animation he wants to employ on the pattern (none, horizontal, vertical, cyclical, vanishing, tunnel or pulsating effects). Based on these user specifications, the system creates a tessellation of the desired symmetrical pattern and embeds the resulting texture in a 3D scene. The user can then view the generated texture from any distance or viewing angle in this 3D space. He can also store the textures he finds interesting as images in his phone. Given that Symmetricon is a mobile app, we have sought to minimize all UI elements so that we can maximize the display of the tessellation on the device screen. The app window consists of a toolbar at the top that contains all the user interaction options and the main screen for displaying the tessellations (see [7] for a YouTube video depicting the system in use).

Toolbar

The toolbar contains a series of menu items for interacting with the app:

- the Symmetry option displays a menu of the 30 possible symmetry types supported by the system. Selecting any of the symmetries in this menu results in the application of this particular symmetry on the app input. The names for each symmetry type correspond to their crystallographical labeling. The complexity of generating each

symmetry group is not the same, therefore some groups (e.g. P6) may take more time to be displayed than others.

- the Repeats option determines the size of the tessellation. The size is the number of times that the cell will repeat in the horizontal and vertical directions. The current version of Symmetricon creates only square tessellations in which the number of repetitions is the same horizontally and vertically.
- the Input option opens a menu for selecting the input for creating the primary cell. Possible inputs are the front/back camera or a user-supplied image/video.
- the Animation option opens a menu for selecting the animation pattern that will be applied
- to the tessellation. Possible animation patterns include sliding of the tessellation rows or columns along with cyclical motions of adjacent cells. Furthermore, we offer versions of the vanishing, tunnel and vortex effects.
- the Surface option opens a menu for selecting the surface on which the resulting image will be textured. Possible options include a square (default), a sphere, a combination of both or a rigged square surface.
- the Take Snapshot option allows the user to take a jpeg snapshot of the screen contents and store the resulting image.
- the Set/Exit full screen options allow the app to use all available space in the device screen.
- the Help option displays a help dialog.

Main Screen

The main screen allows the user to change the angle and distance from which he observes the pattern by dragging gestures left/right and up/down. In each of these cases the textured surface always appears at the center of the screen. Using pinching gestures the user can zoom in or out of the scene.

Examples

Symmetricon provides the artist/designer with the opportunity to generate and test various motifs under an unlimited set of continuous and constantly changing imaging conditions. This enables the app to be used as a visual exploration environment that allows its users to create infinite color and geometrical variations of symmetrical textures using as raw material real-world scenes captured by the camera of a mobile device. In this case, the artist/designer can control the camera position and motion of the mobile device during the capturing of the raw material while also applying on it various animation patterns and projecting it on various surfaces. A video showing a selection of patterns created by an extended version of Symmetricon while randomly scanning a typical office space with the camera of the mobile device can be found in [4]. The particular app version used in the video is able to project the textures simultaneously on an unlimited set of texturing surfaces where each of these surfaces is specified by the user using 3D mathematical functions. Figure 2 provides some more examples of the possible tessellations that Symmetricon can create. The images used for the creation of these patterns are the frames captured from the camera stream of a mobile phone.

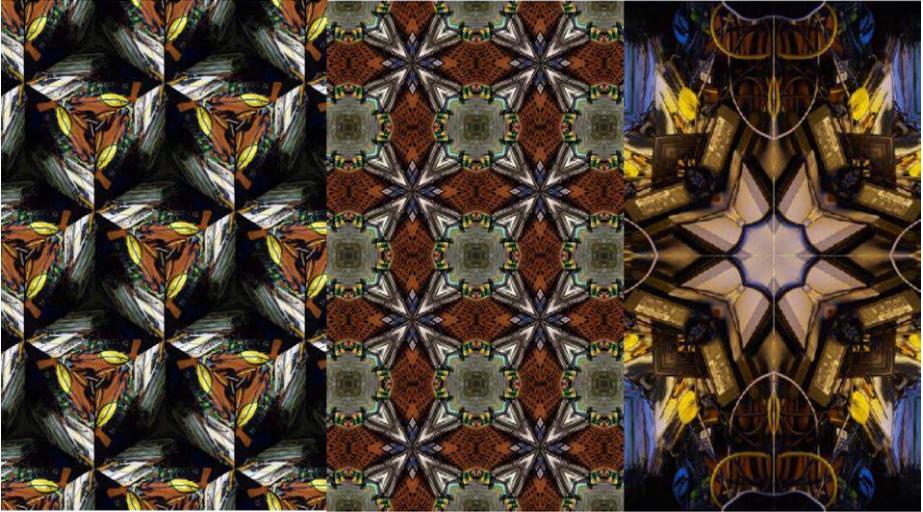


Figure 2: Three examples of tessellations generated by Symmetricon.

Conclusions & Future Work

We have described Symmetricon, our art/design app for creative exploration of planar symmetrical textures and their interaction with various surface geometries and animation patterns. Symmetricon is able to create 30 types of symmetries in real time from either the camera stream, or images and videos stored in a mobile device.

There exist a variety of mobile apps that focus on the generation of symmetrical patterns (e.g. Kaleidoscope Pro, Picasso, etc.). Most of them are drawing apps that allow the user to create the primary cell and then generate mainly kaleidoscope tessellations based on it. To the best of our knowledge Symmetricon is the only existing app that can generate animated, symmetrical tessellations from real-time camera stream and apply them as textures to various surfaces.

Our future research efforts will focus on speeding up further the tessellation process by parallelizing the primary cell generation which currently is executed on the CPU. In addition, we are exploring the dynamic generation of symmetrical patterns and the iconography they produce in their use in non-Euclidean geometries and in mobile virtual reality environments. Furthermore, we are pursuing collaborations with visual artists for the use of this technology in common projects along with the development of novel methods for the integration of such camera-based symmetrical texturing in virtual and/or mixed reality environments.

Acknowledgements

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INTERACTIVE ART APPLICATION OF A PROPOSED COSMOLOGICAL MODEL: INVESTIGATING THE CONNECTION OF THE STRING THEORY WITH JOHAN VAN MANEN'S "HYPERSPHERE"

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Abstract

The perception of the fourth spatial dimension can be given with the help of geometric hypersolids. We investigate Johan Van Manen's "fourth-dimensional globe" schema and we propose that it is not a hypersphere but a projection of a hypersolid whose hypersurface has some folds.

We combine Johan Van Manen's "hypersphere" schema with the Quantum Geometry of String Theory, which claims that if for some reason the Universe begins to contract due to the gravitational force, then this continues contraction, when it reaches the size limit of Planck's length, does not lead to a Universe 'crush' but to a Universe 'bounce'. Based on this idea we propose an artistic view for a new perception of our Universe, which has the form of Johan Van Manen's "hypersphere" schema.

Finally, we describe an interactive art application, which we designed and developed, that creates a dynamic sequence of images that logically emulate the cosmological model of this proposed 'closed' Universe.

Keywords: *fourth dimension, hypersphere, Johan Van Manen, string theory, quantum geometry, closed Universe model*

Introduction

Our physical transducers (eyes, ears, etc.) send two-dimensional data to our brain, which perceives the world we live in by creating a three-dimensional model of it. Similarly, four-dimensional shapes, such as the *hypercube* and the *hypersphere*, assuming they exist, cannot directly be perceived by our vision. In the past many attempts for accurate descriptions of four-dimensional shapes have emerged through mathematical logic, such as those of Poincare and Jouffret, that led their readers into imaginary worlds and artists into new forms of expression. (Henderson, 2013: 117, 158-162)

To mathematically describe the fourth spatial dimension, we begin with a point (zero dimension). If we move this point by one unit in a straight line then a *unit line* is created, as shown in Figure 1a, thus defining the first dimension. If this unit line is moved by one unit in a direction perpendicular to the line, as in Figure 1b, then a *unit square* is generated and, therefore, the second dimension is defined. If this unit square is moved by one unit in a direction at right angles to its two axes, then the result is a *unit*

cube and the third dimension is defined, as in Figure 1c. Let us now assume that this unit cube is shifted in a perpendicular direction, which does not belong to the familiar three dimensions of space, as in Figure 1d. This direction cannot be described as we are ‘trapped’ in perceiving the three-dimensional space. The hypersolid generated by such a shift is a unit hypercube whose hypersurface consists of eight cubes. (Gardner, 1989: 42-43)

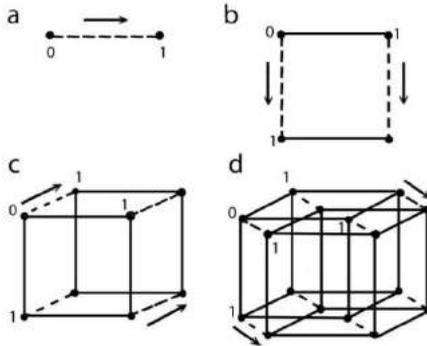


Figure 1: From a point to a hypercube. Source: Gardner (1989: 43).

In the fourth spatial dimension, the set of points whose distances are equally spaced from another point, called ‘center’, by define the **hypersphere**. Thus, the relation $x^2 + y^2 + z^2 + w^2 = r^2$ is valid, where x, y, z & w are the coordinates of the points on the axes of the four- dimensional coordinate system, having as its center the origin of the system and r the equal distance of the points from that, which also defines the radius of the hypersphere. (Thurston, 1997: 32)

Johan Van Manen’s “fourth-dimensional globe”

Numerous intuitive attempts exist to investigate the fourth dimension in the Universe. One of the most remarkable is that of Johan Van Manen’s, who describes accurately a ‘fourth- dimensional globe’; i.e., a hypersphere. His detailed drawing is given in Figure 2.



Figure 2: Johan Van Manen’s “fourth-dimensional globe” schema. Source: Ouspensky (1989: 133)

[...] I tried to visualize or think out the shape of a fourth-dimensional cube, which I imagined to be the simplest fourth-dimensional shape. To my great astonishment I saw plainly before me first a fourth-dimensional globe and afterwards a fourth-dimensional cube and learned only then from this object lesson that the globe is the simplest body, and not the cube, as the third-dimensional analogy ought to have told me beforehand. The remarkable thing was that the definite endeavor to see the one thing made me see the other [...] The fourth-dimensional globe can be better described. It was an ordinary three-dimensional globe, out of which on each side, beginning at its vertical circumference, bent tapering horns proceeded, which, with a circular bend, united their points above the globe from which they started. So three circles are formed, the lower one representing the initial globe, the upper one representing empty space, and the greater circle circumscribing the whole. If it be now understood that the upper circle [empty space] does not exist and the lower (small) circle is identical with the outer (large) circle, the impression [of the fourth-dimensional globe] will have been conveyed, at least to some extent [...] (Van Manen, 1913: 58)

But, is this drowning a hypersphere? We know that:

- a) two ways to approach the properties of a hypersolid are either to study its intersection with the three-dimensional space (Hinton, 1906: 12-14) or its projection through it. (Gardner, 1989: 46-47)
- b) the trace of the intersection of a hypersphere with the three-dimensional space is a three-dimensional sphere. (Guth, 2013b)
- c) the projection of a hypersphere can be viewed as a series of concentric toruses. (Dewdney, 1986: 15)

None of the above a-c show that Johan Van Manen's schema has any similarity with the hypersphere and, therefore, this drawing is not a hypersphere, as he claimed. Comparing Van Manen's "*fourth-dimensional globe*" schema with the projection of the hypercube to the three-dimensional space (Traperas and Kanellopoulos, 2018), which he mentions as a source of his inspiration, we see that they are similar. We propose, therefore, that his schema is an attempt to use the hypercube projection (Fig. 3, left) to the three-dimensional space, to the hypersphere (Fig. 3, right).

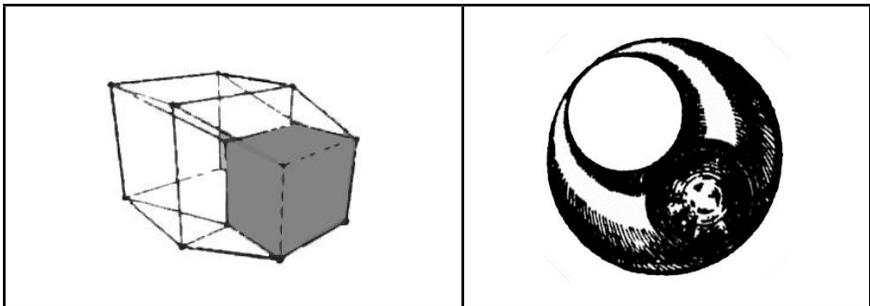


Figure 3: Similarities between the projection of the hypercube in three-dimensional space (left) (courtesy of the authors) and Johan Van Manen's so called "hypersphere" (right) (source: Ouspensky, 2005: 133).

It is geometrically proven that other shapes exist - closed hypersurfaces that enclose hypersolids in higher dimensions - which do not resemble the usual geometrical description of the hypersphere and have the property not to form corners and possibly forming folds. (Smith, 2011: 3) We propose that it is likely that Johan Van Manen envisioned not a hypersphere, but a projection to three-dimensional space of a hypersolid that has some folds. It is this 3d visualization that he named (wrongly) “*fourth-dimensional globe*”.

It is also interesting that Ouspensky does not agree with his interpretation of Johan Van Manen’s “fourth-dimensional globe” schema and comments that there might be a [...] possibility of constructing a certain pseudo-fourth dimension which, in actual fact, lies entirely in three dimensions. In my opinion the figure is full of motion. The whole figure seems to me moving, as though constantly arising in the meeting point of the sharp ends, spreading out from there and being re- absorbed there. (Ouspensky, 2005: 134-35)

Taking in account all of the above, and especially Ouspensky’s suggestion that this figure is ‘*full of motion*’, we envisioned Johan Van Manen’s schema as a three-dimensional projection of a hypersolid that has some folds, upon rotation of which to any direction, different projections may be created on the three-dimensional space. Thus, the ‘static’ schema given by Johan Van Manen can evolve into a ‘dynamic’ cluster, as its corresponding hypersolid rotates in the four-dimensional space. Then, the ‘outer’ sphere remains constant, while the ‘full’ inner sphere is shrinking and the ‘empty’ one is expanding (and vice-versa), keeping the sum of their diameters constant and equal to the diameter of the ‘outer’ sphere (Fig. 4,(a) to (f)).

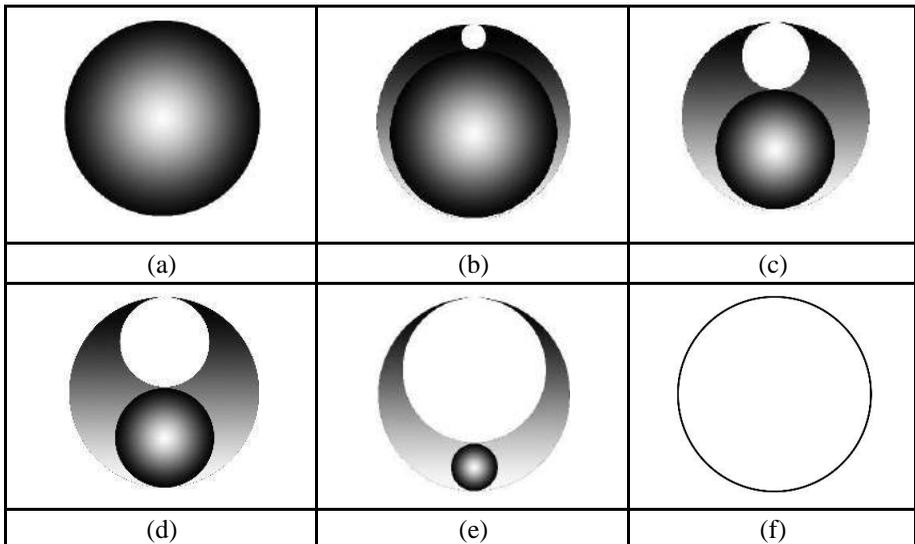


Figure 4: Johan Van Manen’s three-dimensional projections in sequence, resulting from the rotation of the corresponding hypersolid. Courtesy of the authors.

The two extreme situations occur when the ‘outer’ sphere is equal with the ‘filled’ sphere (where the ‘empty’ is nullified (Fig. 4 (a)) and when the ‘outer’ sphere is equal with the ‘empty’ sphere (where the ‘filled’ is nullified) (Fig. 4 (f)).

We designed and developed an interactive application; the user can influence Johan Van Manen’s three-dimensional projection by rotating, via simulation technique, the corresponding ‘folded’ hypersolid. With the help of the mouse and fluctuating the radii of the ‘inner’ spheres we may acquire familiarity with the three-dimensional schema from different angles (Fig. 4).

Proposed cosmological model

Consider that:

- a) One of the models of our Universe, supported by Cosmology, is the ‘closed’ Universe, which is described by the three-dimensional hypersurface of a four-dimensional hypersphere. According to this theory, the evolution of this Universe is initially the expansion and then its contraction. (Guth, 2013 a & b)
- b) While the General Theory of Relativity allows the Universe to start from a dimensionless point, as the ‘Big Bang’ theory argues, Quantum Theory claims that nothing can be compressed less than the Planck Length ($1.616 \cdot 10^{-33}$ cm). (Green, 2004: 337, 560-61) This incompatibility that exists at a microscopic level between those two Theories ceases to exist because of the Quantum Geometry of String Theory. According to this Theory, if we assume that for some reason the Universe begins to contract due to the gravitational force, then this continues contraction does not lead to a Universe ‘crush’ but to a Universe ‘bounce’. (Green, 2004: 342)
- c) In the model of the Interrelated Notions of Distance (Green, 2004: 342), if the radius of a circular dimension is less than the Planck’s Length and constantly decreases, based on Quantum Geometry, it does not differ from the natural processes where this dimension has a radius greater than the Planck’s Length and is constantly increasing.
- d) The physical consequence of Quantum Geometry is that the physical properties of the Universe, based on the properties of its elemental components, are the same for a Universe whose circular dimension has a radius R with a Universe having a radius $1/R$ (where the value 1 means 1 time the Planck’s Length). (Green, 2004: 353)
- e) Our Universe, on the basis of today’s data, stretches over 15 billion light years. However, we don’t know what happens beyond that distance; i.e., whether the dimensions are unlimited or circular. If the Universe is circular, it can be subjected to the matching of the R and $1/R$ circular dimensions of String Theory. (Green, 2004: 354)
- f) Johan Van Manen, at the end of his “hypersphere” schema description, states that: [...] If it be now understood that the upper circle does not exist and the lower (small) circle is identical with the outer (large) circle, the impression will have been conveyed, at least to some extent [...]. (Ouspensky, 2005: 133)

That is, he suggests that the small ‘full’ sphere is the same as the ‘outer’ that encloses everything and essentially forms a solid.

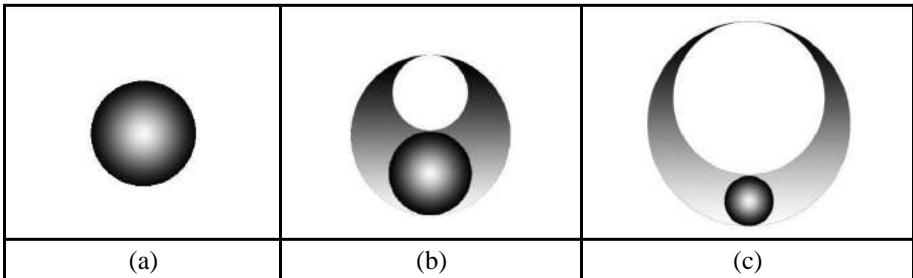
We propose a new cosmological model of our Universe combining of all the

above with emphasis on the model of the Interrelated Notions of Distance of Quantum Geometry (c above) with the statement of Johan Van Manen (f above). That is, its shape is similar with Johan Van Manen’s ‘folded’ hypersolid but the ‘outer’ sphere, which represents the ‘large’ Universe, has no fixed radius (R) and may be varied from infinity to zero. This variation affects the radius (1/R) of the smaller ‘full’ sphere, which, according to the Quantum Geometry Theory (d above), represents the parallel ‘small’ Universe, since there is an inverse ratio connecting the two radii (R and 1/R). So, the radius of the ‘full’ sphere conveys the value of the radius of the ‘empty’ sphere, since the sum of their diameters must be equal with the value of the ‘outer’ sphere’s diameter. When the two radii are equal to Planck’s Length ($R=1/R=1$), then the two ‘full’ spheres are equal and the ‘empty’ sphere is nullified (Fig.5 (a)) and when the radius R of the ‘outer’ sphere increases, the radius 1/R of the ‘full’ sphere decreases (Fig. 5 (b-d)). But, what happens while expanding the ‘outer’ sphere and the radius reaches (almost) an infinite value? Then, the ‘full’ sphere almost disappears, while the ‘empty’ sphere gets an (almost) infinite radius and occupies the innerspace of the ‘outer’ sphere (Fig. 5 (e)).

If we accept that the ‘full’ and the ‘outer’ sphere are four-dimensional and the value of the radius of one of them is almost infinite then, according to our proposed model, the final result should be a three-dimensional hypersurface of a four-dimensional hypersphere that is constantly expanding and represents the ‘closed’ three-dimensional Universe we live in.

Emulating our proposed cosmological model via an interactive art application

In our interactive art application, we combine Johan Van Manen’s “hypersphere” and Quantum Geometry of String Theory to emulate the above proposed cosmological model. The user can change the radius of the “Universe”, which we assume that has the shape of Johan Van Manen’s “hypersphere”. A cosmic bounce is created, each time the radius of the ‘outer’ sphere is reduced just below the unit value (Planck’s Length). Then the small “Universe” acquires a radius greater than Planck’s Length and takes on the role of the ‘outer’ sphere surrounding the other two. (refer from (a)-(e) of fig 5 for all of the above steps)



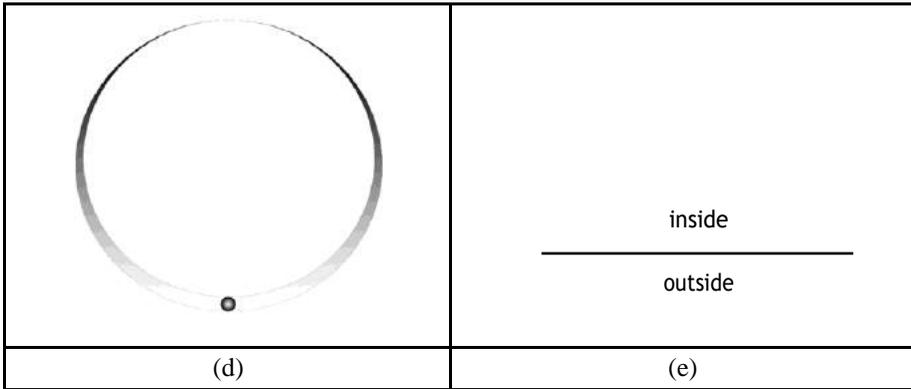


Figure 5: Evolution of the proposed cosmological model. Courtesy of the authors.

Conclusions

We proved that Johan Van Manen's "fourth-dimensional globe" schema has significant similarities with a projection phase of the hypercube in the three-dimensional space but is not essentially connected with a projection or intersection of the geometric hypersphere with the three-dimensional space. Therefore, although it is described by him, in an attempt to visualize the four-dimensional space, as a hypersphere, it is not.

We propose that Johan Van Manen's "hypersphere" schema is the projection of a hypersolid whose hypersurface has some folds and we developed an interactive application that depicts the three-dimensional projections of this 'folded' hypersolid.

By combining Johan Van Manen's "hypersphere" schema with the Quantum Geometry of String Theory and assuming that the 'closed Universe' Cosmology Theory applies, we acquired an inspiration of an artistic view for a new perception of our Universe which we propose that has the form of Johan Van Manen's "hypersphere" schema.

Finally, we developed an interactive art application that forms a sequence of images that logically describes the dynamic form of this 'closed' Universe.

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ART & TECHNOLOGY

BLOCKCHAIN AND PARATACTIC MEDIA WORKS

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Abstract

This paper is about public understanding of blockchain technology. Having been integrated to techno-capitalist ideology, blockchain is commonly represented with its strong attachment with finance. The limited knowledge about blockchain technology in public domain is managed by its conception as an emerging financial tool. Blockchain is represented with dualistic oppositions, either as a utopic revolution or as a dystopic catastrophe. It is also anchored with with crypto currencies and decentralization hype. The use of blockchain technology in other fields of everyday life obfuscated by such dominating representations. This paper suggests rethinking of critical uses of blockchain technology via a funding automaton suggested, designed and performed by a paratactical media work, “Harvest” (2018) by Julian Oliver.

Keywords: *blockchain, media art, paratactic, decentralization*

Introduction

Today, financialization emerges as the latest ubiquitous technology. Blockchain technology is used not only in financial transactions but also in a wide range of social domains, which are currently regulated and governed by centralized institutions.

In this paper, first, I will argue that the dominant representation of blockchain technology is based on a dualistic opposition and this kind of modern representation operates for the reproduction of techno-capitalist ideology. Second, I will argue that the construction of a dominant conception of blockchain as a finance technology emerges as a tactical control apparatus for the sake of super-centralized actors/networks in platform capitalism. In this part, I will critically analyze the hype of decentralization and elaborate on the alternative uses of blockchain technology in various fields of everyday life such as marriage, archiving, ecology, media archeology and real estate. In the last part, the focus will be given to a *paratactical* media work, “Harvest” (2018) of Julian Oliver, which challenges to change this dominant representation of blockchain technology for the sake of commons.

Based on literature review and ethnographic research, which is based on participative observation and unstructured interviews, the paper aims at becoming another source for alternative knowledge / power production for the public understanding of blockchain technology.

1. Public Understanding of Blockchain Technology:

A New Finance Tool

Technology is commonly understood as tools in public domain. It is usually not acknowledged that technology is also “a way of organization”, as Rudi Volti (1988:4) suggested. This dominant understanding of technology leads to a problem in which we would be disconnected from reflexive thinking about technology. With this regard, public understanding of technology studies demonstrate how technology is used, ignored, subverted and innovated by a variety of users.

Public understanding of technology is constructed with social representations. Social representations consist of constructed images, symbols, ideas, and thoughts that permeate common sense and everyday thinking (Moscovici, 1984). They particularly reflect how public makes sense of the unfamiliar via two main processes: ‘anchoring’ and ‘objectification’.

In anchoring, we see an “attempt to settle a new, and therefore strange, meaning into the established geography of symbols of a community; and in objectification, we observe that a new object of knowledge is given a ‘concrete, almost a “natural face”’ (Jovchelovitch, 2001: 173). In this paper, focus is given to the anchoring process of blockchain technology because public understanding of blockchain technology is strongly anchored with finance, particularly with money, which has established symbols in capitalist societies.

Although blockchain is commonly defined as “an open, distributed ledger that can record transactions between two parties” (Iansiti and Lakhani, 2017), today blockchain is commonly represented and understood as a new finance tool. Specifically, it is strongly anchored with crypto currencies in public. According to Talkwalker, a social media analytics and social media monitoring tool, for an account of all blockchain related posts in Twitter between September 15, 2018 and September 8, 2018, %48,6 of all posts include #crypto and #cryptocurrency, and %19 of all posts include #bitcoin.

Although the first work on a cryptographically secured chain of blocks was described in 1991 by Stuart Haber and W. Scott Stornetta, who aimed at designing a system where documents’ timestamps could not be tampered with or backdated, it is stated in Wikipedia that “Blockchain was invented by Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the crypto currency Bitcoin”.

Once we explore how blockchain technology is dominantly represented in public, we can also highlight minor representations of blockchain technology because today this technology is not only used for financial transaction. In recent years, it started to be used in various fields, such as political elections, marriage procedures, divorce contracts, art sales, real estate operations and notarial acts. Yet the dominant representation of blockchain, which constructs a common sense in public, obfuscates such uses.

2. Decentralization Hype: A Tactical Control in Platform Capitalism

Recent research (Kronberger, Holtz and Wagner, 2012; Courvoisier, Clémence and Green, 2013) in public understanding of technology studies reveal that the attitudes, perceptions, opinions and representations of users about novel technologies are being anchored in existing frames of knowledge / power. That means, public is informed

about novel technologies mostly with a link to the familiar, existing and centralized frames of knowledge / power.

In platform capitalism, users make use of the platform (i.e. etherium, Zcash, IOTA) to link existing systems of knowledge and power to the novel infrastructure. In doing so, the platform incentivizes the users to incorporate more of their own interests within its operational layers. The more users the platform has, the more power it gains.

In case of blockchain, users are integrated to various platforms via their profit-making interests. In fact digital currencies has been undoubtedly one of the best performing investments of 2017. Bitcoin, for example, grew by an astounding 1,300% last year. In a recent article published in *The Financial Times*, it was stated, “The current hype around blockchain is partly because of its link to the mania in crypto currencies” (Murphy and Stafford, 2018). More than 1,500 blockchain startups have been launched in 2017, eight times the number of recognized government-backed currencies. That means, there is an emerging way of organization besides central institutions, such as governments.

Hence in recent years, popularization of blockchain along with the current hype around crypto currencies has been anchored also with decentralization hype. If this would be a way of organization to control the use of blockchain, which has been strongly anchored with crypto currencies, what does decentralization hype obfuscate as a tactical control in “algorithmic cultures” (Striphas, 2015)?

We observe that the use of blockchain technology in other domains of everyday life remained weakly developed. In other words, the use of blockchain technology for social, economic and political life has been under control by way of the making of a dominant social representation and public understanding of blockchain technology.

3. Distributed Control and Paratactical Media Works

However recently popularization and social representation of blockchain began to change. A recent article in *Forbes* (Pokrandt, 2018) reveals, “blockchain is more than just currency”. The article has also emphasis on the advantages of decentralized systems, such as “no single point of failure, scalability advantage, democratic decision-making”.

Blockchain is a power-hungry network since data is the capital of production and exchange. Although decentralization hype operated to increase the number of users, users are now faced with an energy crisis, in which national states are not only actors to deal with the problem. Crypto currencies are highly energy consuming and that is costs for users and investors. For the operation of crypto currencies, a cluster of computers performing cryptographic hashing algorithms around the clock are required for verifying transactions made on the platform and this process is known as mining. “These computers can range from massive Bitcoin mining farms in rural China to small DIY mining rigs you can run out of your own home, but all of these mining operations are incredibly energy intensive. The Ethereum network, for instance, already uses more energy than the island nation of Cyprus, home to nearly 1.2 million people. The Bitcoin network, on the other hand, is on track to consume more electricity than Denmark by 2020” (Oberhaus, 2017).

In New York in April 2016, decentrally generated energy was sold directly between neighbors via a blockchain system for the first time. The goal was to establish a fully

decentralized or a distributed energy system, (i.e. not a state or corporation dependent system) in which energy supply contracts are made directly between energy producers and energy consumers (without involving a third-party intermediary) and carried out autonomously.

Hence central institutions and traditional intermediaries, e.g. a bank, are no longer required under this model, as the other users in the network act as witnesses to each transaction carried out between a provider and a customer. As such can afterwards also provide confirmation of the details of a transaction, because all relevant information is distributed to the network and stored on the computers of all users.

Generating supplementary funding for climate-change NGOs in a time where climate science itself is under siege from the fossil-fuelled interests of governments and corporations, Julian Oliver's "Harvest" (2018), a blockchain based work of critical engineering and computational climate art, uses wind-energy to mine crypto currency. The earnings are used as a source of funding for climate-change research. To develop a funding automaton, Oliver transformed "wind energy into the electricity required to meet the demanding task of mining crypto currency (here Zcash), a decentralised process where computers are financially rewarded for their work maintaining and verifying a public transaction ledger known as the blockchain" (Shahan, 2017).

Acting as a fully functional prototype beyond a media-art context, Julian Oliver's "Harvest" (2018) emerges as a paratactical work, in which tactical control (anchoring with decentralization hype, crypto currencies and finance) in platform capitalism is reused and subverted for commons.

Conclusion

Within capitalist ideology, technology is mostly represented with binary distinctions (Roseanu and Singh, 2002). If technology is also a way of organization, then we can discuss how novel ways of organization are locked and encrypted within dualistic representations, such as centralized vs. decentralized institutions, hope vs. disaster, utopia vs. dystopia and so on.

By introducing the emerging ways of organization via repeating knowledge / power of the existing and centralized agencies, it also becomes possible to preserve and update their knowledge / power by the changes and deviations suggested by the novel. This adjustment process should be in control for the sustainability of the existing actors, such as the states and the central banks. Hence, the anchoring of blockchain as a decentralized power against the institutions of central authority becomes a mediator for a kind of tactical control in platform capitalism. In this way, while central institutions are updating their knowledge / power along with their organizations and service infrastructures, alternative uses of blockchain (especially for commons) are procrastinated via the tactical control of public understanding of blockchain technology, which is strongly anchored with decentralization hype and crypto currencies.

This is also the obfuscation of the knowledge / power about the emerging ways of organizing hope, disaster, utopia and dystopia. Still one question remains: How can blockchain be understood as a way of organizing hope and disaster in our societies today? Paratactical works emerge as a way of organization in which artists explore

using existing infrastructures in alternate ways. They explore and suggest visionary means of workings for commons.

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SEEING

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Abstract

Augmented Reality (AR) has the potential to be an interface to access and display information for guided tours in museums and galleries, allowing visitors to access information previously only available in books and art history lectures. This would enhance the experience for visitors giving them a greater appreciation for the artwork on display. This paper looks at new advancements in the area of AR and how it can be used to enhance guided tours in galleries and museums, giving visitors greater levels of interaction and a deeper level of understanding allowing visitors to bring more to their seeing.

Keywords: *Augmented Reality, museums, knowledge access*

A person looks at a painting in a museum or a book they can either like it or not. They can read the accompanying paragraph or not to gain some descriptive insight, but real critical evaluation and analysis comes from having some knowledge about the artist or the movement or even the time in which it was created. People visiting a gallery or museum without the prior knowledge or skills gained through studying art history and art appreciation do not experience the artworks in the same way. As acclaimed architect and visual artist, George Nelson said, “What we see is what we bring to the seeing”.

Art appreciation, as part of art history, teaches students how to read a painting. Showing them how to see and understand rather than just look. Knowledge is gained by discussing different aspects of the painting from the structure and form of the painting to the colours, theme and application of the paint. Further information can be deduced by looking at the context of when the artwork was created, from the sociopolitical situation of the time, the artist herself, her influences, who commissioned it and the work of their contemporaries which may be reflected in the work.

The majority of art appreciation classes take place in a lecture room or theatre where the lecturer shows slides, goes through notes and facilitates a discussion. These classes create an appreciation in the students for the different styles and art movements as they gain a greater understanding about the works of art, why they were created and the backdrop that they were created against. These classes are taken by those who have a real interest in art or the classes may be part of a wider program of study.

Galleries and museums understand this and so provide description plaques on the walls beside the paintings. They also facilitate other information points such as brochures, guided tours, lunchtime and evening lectures.

One of their more popular tools is the guided tour in the form of an audio headset, where a visitor can navigate through an exhibition while the story of the artist and explanations about their work are verbally narrated. This type of tour has been in use for at least two decades, but is still popular and effective. However, with some recent developments in technology, it is possible that this form of tour, though well established, is just a stepping stone.

Augmented Reality (AR) is an experience that supplements the real world with a virtual layer of information (Lowry, 2015). While it has been around in various forms for the last ten years and discussed for 20 years before that, recent improvements in the technology have created a renewed interest in the technology among reviewers (IoT Institute, 2016; CNET, 2017; Rolling Stone, 2017; TechRadar, 2018; The Verge, 2018; PC Magazine 2018).

These new features have moved AR onto a new level of interaction and increased interest in the new wave of AR headsets. These developments have driven the production of creative content examples to showcase the technology. For example, one reviewer of the new headsets, Scott Stein for CNET (Stein, 2017), described the light field display, saying, “it projects what’s effectively a full 3D image onto your retinas that can be focused on in the same way that a real object can”. He said he was standing in a room, looking at a solar system projected in front of him, where he could focus on planets close to his eyes or on planets far off in the distance. This change from simple overlays on our field of vision to almost embedding information in our field of vision makes for a more immersive experience.

These recent developments in the hardware have opened opportunities to create a never-before-seen level of interaction between the artwork and the person viewing it. The technology has the potential to become an interface to artworks on display, unlocking their story which previously would only have been available in books, discussions and art history classes.

Utilising this technology, replaces the headphones with a headset which would allow for the audio tour to be added to by creating accompanying digital content which would enhance the experience. Analysis tools could be utilised by AR to map out areas of interest on the painting to show elements such as structure, composition and form, and the artists’ use of medium to create areas of light and shadow to set tone and theme. Developments such as the light field display, wider fields of view, use of sensors, multiple displays, eye tracking, voice control, object recognition, scene recognition and hand gesture control are the features that brings this new level of interaction. These developments means there is a better quality of AR coming to market which means better user experiences can be created. For instance, analysis tools could be utilised by AR to map out areas of interest on the painting to show elements such as structure, composition and form, and the artists’ use of medium to create areas of light and shadow to set tone and theme. Optional displays of contextual information giving insight into the time of creation provide a greater sense of the thought processes underlying and the

influences on the artwork. Suddenly, the audio tour has expanded to another dimension where more information is made available to users in a manner that does not overload them.

The technology that stands out the most with this new and improved AR systems are: the light field display, wider fields of view & eye tracking. Just a review of these can highlight how AR can be used to enhance guided audio tours in galleries and museums, giving visitors greater levels of interaction and a deeper level of understanding.

The light field displays have multiple focal planes, which give virtual objects a realistic appearance at various distances. For instance, an object placed in a user's immediate vicinity would be displayed in sharper focus than objects meant to be situated in the background. As a result, users can interact with objects and interfaces with more precision and observe the content with greater comfort to the eye. This makes the virtual information, less of an overlay and more integrated into the scene. So instead of it looking out of place it can blend into the view. A simple example of this would be the creation of a supplementary description plaque that could be displayed with the permanent wall plaque to give the user more information. Because of the placement and detail now achievable, the digital overlay could look as natural as the permanent plaque on the wall.

Coupled with this, is the wider field of view that is now available on the new headsets. This would mean that an interactive virtual menu and the supplementary virtual plaque would not hover in the users eye line and obstruct the users view of the painting. Instead, the plaque could be located in proximity to the wall mounted plaque and the menu below it or the painting.



Fig.1 Eye tracking can isolate areas and provide information about specific details.

The menu could hold links to different themes of information that can be displayed on the virtual plaque depending on the narrative as part of the exhibition but can include, bio of artist, explanation of the painting, social and political background which the painting was created against, who commissioned it, its place in history, techniques used, influences on the work, and how it influenced future work. Eye tracking has the ability to create a more intuitive interface. It can track where the user is looking and create a heat map of the painting that reads what the viewer is interested in. These could trigger point specific information for the user based on the parts of the painting they are looking at.

As per figure 1. these trigger points could relay information about the composition, the people, characters and or objects within the composition, the details within the visual narrative and painting techniques.



fig.2. Shows the variety of ways that the light field display can highlight areas of the painting to increase awareness of the area being discussed.

Figure 2. shows how these areas could be visually highlighted in a number of ways, from increasing the size of the area and showing it independently from the main painting or desaturating the colour of the remaining image, as it appears here on the left. Text or audio could be added to give more details about the highlighted section. Using the light field display, the section could be blown up to allow the user to view the detail, texture and brush strokes.

Just taking these three examples from all the new features showcases how they, potentially, are building blocks to a new user experience that could enhance visitors appreciation of the paintings on view and the exhibitions on display.

The last 20 years have seen a huge change in how people access information, which has had the knock-on effect of more people accessing it than ever before. Technology such as the internet and mobile phones have been a huge catalyst in this change in how people consume data. As we move forward so too does technology and the younger generations become more technically savvy. These digital natives will adapt to new

technologies faster and will come to expect to be able to use the different technologies when visiting art galleries or museums. AR is already revolutionizing education in industry and medicine. It is being utilised in retail to engage with younger generations. AR guided tours in art galleries and museums have the opportunity to change how people interact with art, history and culture and renew an appreciation across generations. Seeing is what you bring to it and AR can help to bring a lot.

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CYBORG ART AND THE RISE OF A SPECIFIC VOCABULARY: WHICH ARE THE CHALLENGES FOR CURATORS IN THE EXPRESSION OF A NEW POST-HUMAN IDENTITY?

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Abstract

“In Cyborg Art, the artwork, the audience and the museum is all in the same body”. Which are the implications of that statement, cited in the official page of Cyborg Foundation, for curating? Through an extended literature review including multidisciplinary discourses, cyborg artists’ interviews in various media, representative artworks and project examples, this paper focuses on the curating of cyborg art under the prism of language, philosophy, identity and research in the field. What does cyborgology mean for the post-human identity and how curators can express those ideas and represent the cyborg artists? It is crucial to stand in a few keywords that are part of a future language that does not concern only people with extended senses and bodies but future society in general. Among repeated words in almost any relative to cyborgology text are cybernetics, extension, hybrid, machine, artificial, device. How can curators of cyborg art explore the language at the service of art?

Keywords: *cyborg art, cyborg artists, cyborgology, curating, hybrid, language, post-human identity.*

Introduction

Millions of people worldwide have managed to restore lost body functions by adding prosthetic devices. Lately though, there is a rising, mainly artistic, movement that supports intentional self-enhance aiming to create, with the help of those devices, new senses or to enhance current senses. As Barfield and Williams (2017) state, the human body is becoming more and more mechanical and computational and thus less biological because of the use of prosthetic limbs, artificial heart pacers and defibrillators, implants creating brain–computer interfaces, cochlear implants, retinal prosthesis, magnets as implants, exoskeletons, and a host of other enhancement technologies. The writers explain that the body could be viewed now as a continuous information processing tool and people can be described as cyborgs, talking about a process that affects radically our perspective about human identity. Neil Harbisson, a Catalan-raised, British-born cyborg artist, transpecies activist and also an officially recognized cyborg by the British government, points out, during his speech at TEDGlobal in 2012, that *“we should all think that knowledge comes from our senses, so if we extend our senses, we will*

consequently extend our knowledge". According to the English Oxford dictionary the word "cyborg" is defined as:

"a fictional or a hypothetical person whose physical abilities are extended beyond normal human limitations by mechanical elements built into the body"

A rethinking of the dictionary's definition renders questionable how stable the human normality is. Which instinct led to experimentation of the physical with the mechanical? What started as a fantasy cited in fiction and literature, has nowadays turned into tangible reality. Is this need a bridge to self-exploration, to self-expression of just a simple continuity of the humanity's history? Clark (2003) uses the term "*natural born cyborgs*", as a way to describe the level of our adaptability to technological innovations that shape our everyday life, pointing out how natural and smooth this transition was. It is crucial to understand though what Gillett (2006) underlines explaining that when the brain unites with advanced technology, external and implantable, then the prospect of cyborgs takes on ethical significance, raising questions about what is a person and how one should treat a partly artificial being. As we are discussing about a partly artificial brain, the interest is oriented directly to the centre of the creature's being. This is not just a purely philosophical concern but also an arising question about the future of human to human relationships. New theories on identity will lead inevitably to novel social structures and technological advancements while questioning what legal rights are implicated by technology that is being used to repair, upgrade, and enhance the human body and mind.

In an attempt to explore these challenges concerning humanity in the future, the present study is based on different references that describe the power and influence of cyborgology on society, language and also art. We have to accept we face a social change where we redefine the boundaries and the characteristics of human identity. A change that may have started from a small group of activists but it now has an impact in main domains of our social life as philosophy, law and human rights, science and language. Based on these thoughts, the main focus of the paper is how art and curating can integrate and familiarize the audience with those social and cultural changes.

Cyborgology and human identity in a technologised world

Studying and exploring cyborgology does not just satisfy our curiosity and concern about the future but it also aims to identify the implications and effects of this reality in many parts of society, such as law, human rights, science, language and artistic expression.

Historically, it was after the Haraway's *Cyborg Manifesto* that cyborgology has become a growth industry in the academic community. Haraway (2000) explains that "*a cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction. Social reality is lived social relations, our most important political construction, a world-changing fiction*". As it is now a reality and a unique field of anthropological studies, it develops its own language with sociological and political extensions. Haraway (1991) states as well, that "*cyborg ontology centres*

on what it is and what it means to be human in an increasingly 'technologised' world". She added a political and feminist value on the issue, an idea that definitely intrigued the international scientific community. The Manifesto as a deeply political essay, enriches the relative research and studies how constructed identities regulate social relations. As Becker (2000) states, broadening Haraway's feminist view, "*new concepts of body and identity are explored, revealing fluid and open forms*". Beings like cyborgs and robots, multiple virtual bodies, avatars and agents, transhumanists and extropians are all over literature and it is almost impossible to perceive their differences as they claim their social, political and artistic position. Can cyborgs find their own -even sort of ironic- place in Darwin's theory of biological evolution?

Practically, it was in 2010 that Neil Harbisson and Moon Ribas, cyborg artists and activists, created the Cyborg Foundation, an international organization that aims to help humans become cyborgs. The foundation was created in response to the many letters and emails received from people interested in becoming cyborgs. The main objectives of the foundation are to widen the senses and human capabilities by creating and applying cybernetic extensions in the human body, to promote the use of cybernetics in cultural events and to defend the rights of cyborgs. Neil Harbisson, one of the founders of the foundation, is best known for having an antenna implanted in his skull and for being officially recognised as a cyborg by the British government. The antenna allows him to perceive visible and invisible colours such as infrareds and ultraviolets via sound waves. The antenna's internet connection allows him to receive colours from space as well as images, videos, music or phone calls directly into his head via external devices such as mobile phones or satellites. Harbisson achieved to integrate his extension/antenna in his image through the years. Interesting fact is that he had to battle with the UK Passport Authority, which at first opposed his aim of having a passport picture showing him with the antenna, but they finally accepted it. In this context, a new legislation was proposed in 2016 for protection of implants as part of someone's body. Following this case and as people are becoming more and more equipped with prosthetic devices, important issues of law and policy are raised which resulted in significant challenges for the established legal doctrine. In 2016, together with electronic civil rights and civil liberties, researcher and activist Rich MacKinnon proposed a list of Cyborg Civil Rights at SXSW conference-festival. The rights exposed the redefinition and defence of cyborg civil liberties and the sanctity of cyborg bodies. It also foresaw a battle for the ownership, licensing, and control of augmented, alternative, and synthetic anatomies; the communication, data and telemetry produced by them; and the very definition of what it means to be human (cyborgfoundation.com). Through the years, some major legal schemes legalized in different ways the concept of cognitive liberty and the use of prosthesis, both evolving areas of law for cyborgs.

Regarding the scientific perspective, since cyborg transition demands micro-chips and implants, the process includes a medical surgery. As Moon Ribas explained in her talk at Athens Digital Arts Festival in 2018 (2018.adaf.gr), there are many surgeons who are opposed to this kind of operations arguing that: it is not necessary, it is dangerous and it results to a completely different image of the person. These are also the exact same arguments that are usually posed before a sex reassignment surgery.

Another important field of everyday life that is highly affected by cyborgology is language. As expected, digital era has contributed many new words in our vocabulary and specifically cyborgology has its own vocabulary to be described. Micro-chips, implants, prosthetic limbs. Even the word cyborg is a neologism and it is untranslatable. As Pennycook (2016) underlines “*posthumanism in general, raises significant questions for applied linguistics in terms of our understandings of language, humans, objects, and agency*”. Cyborg terminology is related with new words that describe the human condition.

It is also important to highlight the implications of cyborgology and its constant evolution from a philosophical perspective since it basically concerns the transition of human identity and as the main concept of Cyborg Foundation states : “*we would the first generation able to decide what organs and senses we want to have*”. If cyborg community invites humans to redesign themselves, we should be prepared to redesign our perception about humans.

Research methodology

There are three main ways the cyborg concept is used within technoscience, cultural theory, literature, film and art:

Firstly, as a literal cyborg, referring to a human being having a prosthesis such as an artificial limb or organ; secondly, as a figural cyborg, which represents imaginative ways human bodies may actually be interfaced with technology; and thirdly, the metaphorical cyborg, which uses the concept of the cyborg – as a conjoining of separate ideas or entities – to allude to ethical, political and cultural aspects associated with organic and inorganic melding (Borst, 2009).

Curators should take under consideration the extents that the above concepts could have in art and artistic exhibitions/projects. The present study explores the main principles of cyborg art and the ways that it has been showcased until today. In this context, it examines a series of discourses and international literature works about cyborgology in order to get a wide insight of the arisen issues and approach cyborg art from different, equally important aspects. From past interviews, artworks and projects to academic papers, it sets the context and examines the challenges for curators interested in the field.

Curating cyborg art: a review on various practices and approaches

Art stands besides every social transition. Cyborg art is an artistic movement where artists extend/enhance their senses beyond their physical boundaries by applying technology into their bodies. There is an immense change on how we perceive ourselves not only in definition with external aspects and/or devices that we may use everyday but in definition to ourselves and our inner possibilities. The artwork of a cyborg artist is the new sense, but it's an artwork that happens inside the artist. Cyborg Foundation claims that in Cyborg Art “*the artwork, the audience, and the museum is all in the same body*”. This phrase could be extremely challenging for art curators and their attempts to

find new ways of communicating cyborg art outside this small community to a broader audience.

Cyborg art occurs simultaneously entities and metaphors as well as living beings and narrative constructions (Hayles, 1999). Curating challenges involve different aspects of technoscience and cybernetics, identity constructions and definitely the constant evolution of humans and their practices. The cyborg being was predominantly explored within comic books, science fiction, sculpture and literature but these are only visionary works of a close future. Curating or expression of cyborg art so far has to present few approaches, that are mainly related with the artist himself/herself.

For example, Neil Harbisson uses mostly the power of a speech so that the audience could be familiarized with the idea and condition of being a cyborg. He is generally keeping in mind the goals of a speaker, he reasonably chooses to use a more simplified and comprehensible vocabulary. He attempts, through his simple descriptions, to help people understand what a cyborg is, to clarify the confusion with robots and technology and to make the image of a cyborg more tangible and approachable to general public. He is also transforming his experience into paintings, visualisations of famous songs.

On the other hand, Moon Ribas, co-founder of the Cyborg Foundation and best known for developing the Seismic Sense uses the performance as a tool of expression. She has implanted in her hand an online seismic sensor that allows her to perceive in real time earthquakes taking place anywhere in the planet through vibrations. In order to share her experience, she then translates her seismic sense on stage. Ribas transposes the earthquakes into either sound, in her piece Seismic Percussion; or dance, in Waiting For Earthquakes. In these performances the Earth is the composer and the choreographer; and Ribas, the interpreter. Performance is a common tool for cyborg artists like Manel Muñoz and Stelarc.

Finally, there are only a few examples of exhibitions or art projects focused on cyborg art. One of the most popular would be the exhibition Human+ (2015) in Barcelona, curated by Cathrine Kramer. The exhibition explores potential future trajectories of our species by considering both historical and emerging technologies, as well as their cultural and ethical contexts. It was a representative work in the field that mainly focused on the historical view of the evolution of cyborgs and cyborg art. It posed questions such as:

Should we enhance ourselves, or seek to modify our descendants? Are we approaching a singularity of human-machine hybridization or de-skilling ourselves through our ever-increasing reliance on technological extensions of the body? Is extended human longevity a wonderful aspiration or a dire prospect for the planet?

As a premature example of curating cyborg art, it indicates the need for a more concrete curatorial proposal as cyborgology is evolving.

Discussion and implications for further research

Rethinking the idea of cyborgology, the main interest of this study is to underline that the cyborg movement is not just the dream of a group of activists but a new - or a not so

novel anymore - reality for humanity. The parallelism with Darwin's theory of evolution may have sounded ironic but it could be as well ideal in order to describe the social changes that cyborg perspective brings upon.

On the other hand, surpassing the historical linearity as a curatorial approach regarding cyborg art, the interest of this proposal is focused on the connections among language, society and cyborg art. Language, as a very vibrant and vital part of society is demanded to be in constant change in order to facilitate the understanding of social structures. Curating is demanded to have the same effect with art. Curators take care of the artworks and build a bridge of communication between the art and the audience, facilitating the understanding of its meanings. Cyborgology drastically affects, as described above, language in many fields. The main suggestion of the present paper is the use of language and of this new terminology as a starting point in the creation of a new narrative of cyborg art. From a curatorial perspective, the interest is oriented in the exploration of how new terms and vocabulary could contribute in the better understanding of this new human identity. Cyborg art is in constant progress, so language should follow these constant changes. And since art is inside a cyborg's body what are the challenges for curation within the absence of an institution or within the absence of artworks? Could language based cyborg art curating lead to a new dictionary? A new grammar with new verbs and genres? It is crucial to stand in a few keywords as part of a future vocabulary that does not concern only people with extended senses and bodies but the future society as a whole. Among repeated words in almost any relative to cyborgology text are cybernetics, extension, hybrid, machine, artificial, device. Can a physical space turn into an imaginary dictionary? How can curators of cyborg art explore the language at the service of art?

Finally, as Becker (2000) notes "*the peculiar idea that in the near future human beings will be able to escape their fragile bodies and survive as pure minds in machines is only an extreme version of old fantasies that seek to overcome the unavailability of one's own body and the strangeness of others by simply ignoring them*". By all means in the end of this paper the concern is still the same: what is the substance of human identity? What comes in the future? How fluid are the limits that compose the human condition?

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UNIVERSAL MONSTERS THE EARLY POSTHUMAN CULTURAL ICONS

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Abstract

In the early decades of cinema, spanning from the 1920s until the late 1950s, Universal Studios became the home of monsters, releasing numerous original films, as well as sequels and spin-offs featuring monster characters, including *Dracula*, *Frankenstein*, *The Mummy*, *The Invisible Man*, *Bride of Frankenstein*, *The Wolf Man* and *Creature from the Black Lagoon*. These films set the standards for a new horror genre that soon became a blockbuster and turn the different, the uncanny, the monstrous into the favourite characters of the audience. In this paper, we explore the Universal Monsters as the early cinematic depictions of the posthuman; “hybrid figures that blur the boundaries among humans, animals and machines”, creatures of “partial identities and contradictory standpoints”. More specifically, we explore in which way, each of the Monsters acts as an iconic figure of the post-anthropocentric model and defines the cultural impact of these “organic monsters” on comprehending the paradox of difference, synthesizing both “taboo and desire” of the posthuman future.

Keywords: *posthumanism, Universal Monsters, Universal Studios, film, cinema*

Introduction

monster, n., adv., and adj.

A mythical creature which is part animal and part human, or combines elements of two or more animal forms, and is frequently of great size and ferocious appearance. Later, more generally: any imaginary creature that is large, ugly, and frightening (Oxford English Dictionary).

In medieval times, the hybrid figure bearing diverse biological, botanical and racial features, without fully assimilating them was highly correlated with monstrosity; “monstrum” bore two meanings: “that which warns” (monere) and “that which reveals” (demonstrare) (Young, 2006). However, the word “monster”, according to Haraway (1991), “shares more than its root with the word, to demonstrate. Monsters signify”. Monsters are boundary creatures; symians, cyborgs and women, acting as a destabilizing force to the great Western narratives (Haraway, 1991).

Every monster human imagination created and depicted within tales, myths and legends represents the menace and insecurity threatening individuals’ identities;

according to Foucault, as the history of knowledge changes, so does the form of the monsters, who are always “on the prowl”, ghosting society’s norms related to identification (Kearney, 2005). Supernatural entities and monsters, real or imaginary allies and enemies, all inhabiting at the lands of the dead and the unknown; they do belong to the “others”, a fusion of myth, history, biology and imagination. These “others”, different and distant to social norms, are used as a boundary to define licit social characteristics and individual identities (Hiller, 2006).

Therefore, monsters represent the opportunities of the posthuman future, shifting the anthropocentric, humanist perception of the classical ideal man, perfectly depicted at Da Vinci’s Vitruvian Man, towards the forge of non-unitary identities and multiple allegiances between human and the “others”: anthropomorphic, zoo-morphic, organic and earth others (Braidotti, 2013b). For this reason, monsters are not to be considered as harbingers of cultural decadence, rather as “the unfolding of virtual possibilities that point to positive alternatives for us all” (Braidotti, 2000).

In horror, thriller and sci-fi films, the portrayal of monsters has got them “stuck in an ambivalent spectacle of fascination and horror, norm and deviance” (Volkart, 1997). Braidotti argues that since “the genre of science fiction horror movies is based on the disturbance of cultural norms, it is then ideally placed to represent states of crisis and change and to express the widespread anxiety of our times. As such this genre is as unstopable as the transformations it mirrors” (Braidotti, 2013a).

In this paper we explore the Universal Monsters, as the cultural depiction of the transcendental fusion of species, the “hopeful monsters”; the things born “before their time”, unbeknownst to the world if it is ready for them” (Mosley, 1990). Universal Monsters, crossing the boundaries of monstrosity, illustrated what Freud called the culture’s “unease” towards the embodiment of projected difference. They were the early posthuman icons, embodying the human “historical, identitarian and technological anxieties” (Herbrechter, 2013).

Universal’s Monsters

Since the mid-twenties, until the late fifties, Universal’s creative minds, based often on popular novels, had given life to its iconic monsters, including hybrids of humans and animals (*The WolfMan*, *Creature from the Blue Lagoon*, *Captive Wild Woman*), hybrids of humans and machines (*Frankenstein*, *Bride of Frankenstein*), disembodied entities (*The Invisible Man*), as well as a number of mythical creatures (*Count Dracula*, *The Mummy*, *Phantom of the Opera*, *The Hunchback of Notre Dame*). Although Universal had already released six films featuring monsters during 1920s, it was in 1931 that Carl Laemmle Jr., Universal Studios founder’s son, an avid reader of classic literature, took the initiative to bring to life *Dracula* and *Frankenstein* in two films that became overnight success and defined the legacy of Universal to the shaping of horror cinema. Since then, Universal Studios became the home of monsters, releasing numerous original films, sequels and spin-offs, setting the standards for a new horror genre that soon became a blockbuster and turn the different, the uncanny, the monstrous into the favourite characters of the audience.

Universal Monsters gave the early cinematic glimpses of the post-anthropocentric model, aligning to the three-phase process described by Braidotti, in order to keep *zoe*,

the “dynamic, self-organizing structure of life itself” at the centre, by eliminating the core role of *anthropos* (Braidotti, 2013b) in the cultural and societal and ecological structures. More specifically, we explore in which way, the Monsters act as iconic figures of the “becoming-animal, becoming-earth and becoming- machine” processes (Braidotti, 2013b) and define the cultural impact of these “organic monsters” being neither total strangers nor a completely familiar (Braidotti, 1999), “awful and awful” at the same time, on comprehending the paradox of difference, synthesizing both “taboo and desire” of the posthuman future (Graham, 2002).

becoming-animal

According to Braidotti, the “dialectics of otherness” has for long perpetuated human exceptionalism patterns of power and rule both onto “anthropomorphic others” and non human species. By eliminating the idea of anthropocentrism, the emergence of sympoietic and symbiotic practices fostered between human and non human species are allowed and reinforced, displacing humans from the hierarchical position they have assumed among other species. (Braidotti, 2013b). In the same manner, Haraway highlights the potential collaborative practices between species, which mark the beginning of a new epoch, namely Cthulucene, and the companion species; different species mutually affecting each other, coexisting and cofunctioning in ecologies devoid of known spatial and temporal limits (Haraway, 2016). The term companion species is primarily used to describe the emergence of animals as “part of a very particular historical relationship” with humans as well as the developing coevolutionary relationships between these post-cyborg entities, other species and technologies. In the material-semiotic paradigm, the inhabitants of Cthulucene are products of sympoiesis, without proper genealogy, devoid of genre, gender and any other conventional characteristics of human exceptionalism.

Braidotti (2013b) suggests, that in order to eliminate species-ism, it is crucial to re-evaluate the bodies of species in the course of human – animal interaction; though such representations entail imagining them as creatures of mixed characteristics and hybrid formations. In 1935, Universal Studios released *Werewolf of London*, the first moving picture focusing fully on the werewolf legend; the hybrid of animal and man and one of the earliest cinematic depictions of the becoming- animal process. The film was directed by Stuart Walker, and starring Henry Hull as Dr. Wilfred Glendon, a botanist turns into the titular werewolf; the film exhibits several transformation scenes, offering innovative depictions of the “human–animal continuum”. Lycanthropy is narrated as an infectious condition between the species, marking a distinction between folklore and the cinematic monster. Moreover, contrary to the werewolf tales, where a man transmutes completely into a wolf, Dr. Glendon turns into a hybrid creature, bearing the features of both species and retaining the intelligence of the human.

Although the *Werewolf of London* established the cinematic lycanthropic mythos, it remains to this day in the shadow of the *Wolf Man*, the second film of Universal dealing with the werewolf legend. The *Wolf Man* was released six years later, becoming Lon Chaney’s Jr. signature role, one that he would reprise four more times in respective sequels (*Frankenstein Meets the Wolf Man* (1943), *House of Frankenstein* (1944), *House of Dracula* (1945), *Abbott and Costello Meet Frankenstein* (1948)). The film, written

by Curt Siodmak, produced and directed by George Waggner, was a milestone to the genre and influenced all subsequent cinematic depictions of the lycanthrope, turning the Gothic Monster into a familiar, likeable creature, breeding sympathy to the audience for the uncanny, the threatening forces of normality.

The werewolf mythos manifested in one more Universal film, *She-Wolf of London*, released in 1946, though without the introduction of another monster. However, two iconic monsters, fusion of animal and man, celebrated the transpecies solidarity in six more Universal films; Gill-Man (the Creature) and Ape Woman. Gill-Man, the main character featured in *Creature from the Black Lagoon*, directed by Jack Arnold in 1954, and two sequels, namely *Revenge of the Creature* (1955) and *The Creature Walks Among Us* (1956), part-human and part-fish, powerful yet emotional, amphibious and photophobic, represented the evolutionary link between human and sea animals dating back to the Devonian period. *Creature from the Black Lagoon*, considered to be a crown achievement of Universal Studios, was one of one the first 3D stereoscopic films, and remains among the most memorable horror films of all time, introducing one audience's favourite monsters.

Similarly, Paula, the Ape Woman, one of the few female Universal Monsters, depicted either as zoomorphic or as anthropomorphic other (dark skinned female) was introduced in *Captive Wild Woman* (1943) and returned in two sequels, *Jungle Woman* (1944) and *The Jungle Captive* (1945). The monsters, as well as the non-human others, eg. the animals in the *Captive Wild Woman* film were often portrayed as being subject to human exceptionalism, highlighting the prevailing morals and aesthetics of Western society, marginalizing the abnormal, the deviant, the monster, the beast, which is perceived as unfit to the paradigm of the Vitruvian Man. Monsters culturally represented the imminent undermining force towards the grand Western narratives, paving the way for the ideas of post-anthropocentric model.

becoming-earth

In Braidotti's becoming-earth concept, the parameters of environmental and ecological sustainability are highlighted, in a larger scale than the becoming-animal process; the relationship between human species and nature needs to be redefined and reassessed, since earth is the common ground upon which human, non human species and technology display the symbiotic relationship of mutualism. The profound impact of humankind on Earth has resulted in significant climate changes, disruption of ecosystems, extinction of species, as well as overexploitation of natural resources amongst others. Anthropocene, having been proposed as a formal subdivision of geological time scale, has emerged as a trending concept across different disciplines, including science, art, literature and philosophy, in order to describe the epoch, wherein collective human activity has strongly influenced the planet. Becoming-earth emerges therefore as a crucial process in shaping the posthuman subject, which encompasses the human, the animal and the earth as a whole (Braidotti, 2013b).

Even though Anthropocene mirrors the contemporary zeitgeist, Haraway already challenges the term, stripping it from its epoch aspect, rather viewing it as a "boundary event" due to the discontinuities it signifies; Antropocene, she suggests, should be

rapidly overcome (Haraway, 2016). Becoming-earth introduces the ways of surpassing Anthropocene times, focusing on two main themes: the development of a sustainable, self-organizing materiality and the expansion of subjectivity of post-anthropocentric relations towards non human entities, denying man his exclusive prerogative. And although human species take pride in harnessing other species and taming nature, monsters signify the shifting subjectivity; the “abnormalities” man has failed to understand, the forces that strike with no prior warning or no physical continuity, being depicted as zoomorphic, hybrid or embodied versions of natural phenomena and disasters.

These monsters constitute the cultural portrayal of the becoming-earth axis and Universal Studios has pioneered in capturing them in film many decades ago. Gill-Man, the Ape Woman, the giant spider of *Tarantula* (1955), the deadly snakes of the *Cult of the Cobra* (1955), the praying mantis of *The Deadly Mantis* (1957), the caveman of *Monster on the Campus* (1958) and the black meteorite fragments of *The Monolith Monsters* (1957) belong amongst the earliest cinematic posthuman icons, questing the anthropocentric hierarchical relations, representing the nature–culture continuum and ghosting the margins between manmade world and nature. In *Curucu, Beast of the Amazon*, directed and written by Curt Siodmak and released in 1956, Tom Payne impersonating the birdlike monster, is protecting nature and the aboriginal people from the western civilization ways and abuse, in an attempt to reverse the role of humans from geological agents to biological ones, shifting audience’s view to the zoe-centered perspective.

becoming-machine

The becoming-machine axis refers to the “biotechnologically mediated relations” developing as the foundation of the posthuman subject, implying intimate relationships between humans and machines, getting involved in mutual modification practices (Braidotti, 2013b). The posthumanist environment becomes technologically mediated, conditioning the relationships between humans, non human others and nature. The role of the machine is not deterministic, rather enabling the transformation and becoming (Braidotti, 2013b), as cyborgs become equally important to humans in the social, economic and political aspects. Cyborgs and organic creatures are inextricably intertwined; attacking one component of this alliance would lead to the destruction of the other as well (Haraway, 2008). This transpecies interdependence requires the comprehension of the emerging ethics that permeate the consolidated posthuman ecology or “eco-sophy” in Braidotti’s terminology.

One of the cyborgian monsters that shaped western culture has undeniably been Victor Frankenstein’s sapient creation in Mary Shelley’s novel, *Frankenstein; or, The Modern Prometheus*, published in 1818. The Creature, epitomizing all the fears and hopes of emerging technologies blurs the boundaries between man and machine, human and non human, birth and creation, death and life, natural and artificial, inhabiting the reader’s imagination as a composite monstrosity, bearing hybrid features that challenge normality (Graham, 2002). The monster, robotic yet of human flesh is, according to Holmes (2008), “the most articulate person in the whole novel”, while Victor, his human

maker, assumes the role of a modern Prometheus, in his attempt to banish disease and death from humanity. The emerging relationship between Victor and the Creature, as well as between the Creature and other humans demands deidentification from the humanistic morality and rationale, in the vein of Braidotti's "post-anthropocentric posthumanism" and the shift towards intricate practices of mutual becoming with the cyborg. Yet it is the man who fails in the becoming-machine process, marginalizing the Creature and failing the "praxis"; the grounded shared project he has tried to build with the cyborg.

Universal Studios offered one of the first cinematic adaptations of *Frankenstein*, in 1931, with Boris Karloff portraying the Creature in one of the most iconic roles of horror cinema. Directed by James Whale, and featuring the make-up work of Jack Pierce, who has also been responsible for the look of the greatest Universal Monsters (including *Dracula*, *Wolf Man* and the *Mummy*) the film reflected the German expressionistic style and ruminated on the nature of man's destructive hierarchical quest. Yet, the Creature's yearning for cultivating bonds with the human, as well as certain humans' effort to connect socially and emotionally with the Creature in an equal relationship (eg. Maria, the farmer's young daughter) portray the opportunities of the becoming-machine axis. Universal made horror movie history by changing the novel's original ending in order to allow for sequels, including *Bride of Frankenstein* (1935), *Son of Frankenstein* (1939), *The Ghost of Frankenstein* (1942), *Frankenstein meets the Wolf Man* (1943), *House of Frankenstein* (1944), *House of Dracula* (1945) and *Abbott and Costello Meet Frankenstein* (1948).

The *Bride of Frankenstein*, the first sequel of *Frankenstein*, featuring Elsa Lancaster both in the role of Mary Shelley and the Monster's Mate, portrays the female cyborg both monstrous and beautiful, in one of the most charming depictions of the monster in cinema. The Monster's Mate, as the female cyborg exploits the themes of beauty beyond the fear of deceptiveness, as well as the indistinct borderline of human and machine within the female body (Halberstam, 1991). Moreover, the film is one of the first cinematic narratives allowing for queering readings, with main expression the character of Doctor Pretorius, who does not abide to the social conventions and social norms about gender and sexuality of the times, in the posthumanist vein.

the inhuman: life beyond death

Art taps into transcendental ideas beyond natural laws, social norms and bound identities, giving names and bodies to what is feared, hoped and imagined, to monsters, liminal creatures, sublime entities and transgressive characters. Through art all forms of organic and inorganic entities, human and non human become interconnected and life's infinite possibilities are explored; in this sense art becomes inhuman. Moreover, art is of posthuman nature, as it crosses the limits of embodiment and quests beyond the limits of life beyond death (Braidotti, 2013b).

Apart from *Frankenstein* and its sequels, arguing the very essence of life and death, *Dracula* (1931), directed by Tod Browning and starring Bela Lugosi as Count Dracula, is a monumental film capturing the visions of immortality. Count Dracula, a shapeshifter of different embodied forms, human and non human, acts as an icon

of modern cinematic culture and becomes merely inhuman, connecting harmoniously with a fabric of non human others (animals, insects, etc). The film also explores the inhuman other residing within, when the ego does not “wholly sovereign”, in the Lucy Weston-Vampire paradigm (Graham, 2002). Universal Studios released four sequels to the original film, including *Dracula's Daughter* (1936), *Son of Dracula* (1943), *House of Frankenstein* (1944), and *House of Dracula* (1945).

Similarly, the inhuman subject is animated in *The Mummy* (1932), directed by Karl Freund and starring Boris Karloff as Ardat Bay, Imhotep and the Mummy. The ancient Egyptian monster inspires the dreams of immortality, through the powers of the occult, in an early allegory of modern technology. The Mummy was followed by five sequels: *The Mummy's Hand* (1940), *The Mummy's Tomb* (1942), *The Mummy's Ghost* (1944), *The Mummy's Curse* (1944) and *Abbott and Costello Meet The Mummy* (1955). The theme of life beyond death perpetuates in more Universal Monsters films, including *Life Returns* (1935), *Night Life of the Gods* (1935), *Black Friday* (1940), *The Mad Ghoul* (1943), *The Mole People* (1956), *The Thing that Couldn't Die* (1958), *Curse of the Undead* (1959) and *The Leech Woman* (1960).

Conclusions

Since the release of one of the greatest films of the silent era, Fritz Lang's *Metropolis*, the horror and science fiction genres have introduced the posthuman subjectivities that surpass human rationale and species, building on a body of relationships between the human, the non-human and the hybrid, confronting the “ontological hygiene” of Western modernity (Graham, 2002).

The monster, as a single living organism that does not comply with the rules of any certain species, albeit having its roots at least at one, distinguishes itself from the other living beings by demonstrating “an excess of monstrosity rather than an infra-monstrosity”. Human beings are “redundant monsters”; biological monsters that aspire to become cultural monsters, aiming to cultural mutations and “meta-monsters”; monsters that create monsters and monsters who quest for human traits outside human species (Lestel, 2012).

In times where human exceptionalism is rejected, ecologies are at least trifold, according to Haraway, including human and non human living species and technologies, developing coevolutionary relationships and collaborative practices (Williams, 2018). This compost of multispecies, infectious to one another, human and non human, get mutually involved in sympoietic and symbiotic practices within systems of unspecified temporal and spatial boundaries (Haraway, 2016).

Since the boundaries between science fiction and social reality is an “optical illusion”, the cinematically illustrated “transgressed boundaries, potent fusions and dangerous possibilities” abide to the Haraway's “cyborg myth”, exploring the cyborg as the cinematic monster; in “social and bodily realities” where humans harmoniously coexist with animals and machines, and where humans are “not afraid of permanently partial identities and contradictory standpoints” (Haraway, 1991).

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MEDIATED SELF AND SUBJECTIVITY. SELFIE AS A NEGATION OF ALTERITY CINDY SHERMAN, INTI ROMERO AND MASSIVE AUTO-PHOGRAPHY

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Abstract

Selfies are assumingly the medium of transmitting into the world our identity and subjective viewing. The instagrammers though, have become a commodity through the branding of themselves, instead of being one person's eye into the world, or the marking of a personality in time, as self portraits once were. The specific aesthetics they promote have become an Instagramism as Lev Manovic puts it in his latest book on the Instagram, in the same way as we would talk about Impressionism or Surrealism a solid imagery that is, corresponding to specific iconological and formalistic norms.

The mediated self and the making of subjectivity go a long way back, in the process of hominisation and the intersection of becoming a subject and technics (Stiegler). This ontological analysis of subjectivity corresponds psychoanalytically also to the Mirror Stage (Lacan) with the Mirror being a technema, a technological achievement (P. Rigopoulou). Interwoven, subjectivity and technology demonstrate the progress in enhanced subjectivity. The selfies regardless being a technological medium coincide in their diffusion and mimesis, with subjection, not by chance, in the root of the word subjectivity (Butler). Subjection to a stereotype, conformity and annihilation of the Other (Baudrillard) and Difference (Deleuze). The artists Cindy Sherman and Inti Romero consider the selfies in a critical manner with Sherman transforming herself in an ironic edited persona and Inti Romero adding pixels to her photos, in an attempt to conceal the selfie focus.

Keywords: *digital culture, Inti Romero, selfies, Cindy Sherman, subjectivity.*

Introduction

In his latest book on the Instagram, Lev Manovic refers to the term Instagramism in order to refer to the world wide tension of taking and sharing photographs through the social media platform, that have a particular style ideology which could constitute a theory in the same way, as we would talk about surrealism or impressionism.

That style theory is reproduced through the successful instagram profiles providing them hundreds of thousands followers, creating a wave of imitators and finally developing the instagram language or to put it in Mac Luhan's words creating "the medium that's the message".

Continuing in the same book, Manovic refers to the Instagram aesthetics, as an aesthetic not belonging to the arts but to the commercial goods promoted through the various intagrammer profiles, and he refers to this aesthetic as not being part of the Society of the spectacle as Debord would sustain, but as an aesthetic society confined to its self. To this claiming I would like to differ using the situationist collective Tiqqun later in my presentation.

Subjectivity

Since we are talking about the social media transmitted self it would be very interesting to analyze briefly the ontology of subjectivity as a byproduct of techno-logy as Stiegler puts it in *Technics and Time*, as referred to, in the book *Life after the new media* by Sarah Kember and Zoanna Zylinska. Stiegler talks about our being with, and emerging from, technology as subjects and technical beings, referring to the ancient Greek myth of Prometheus as included in Plato's dialogue *Protagoras*. As Kember and Zylinska mention "Technology is positioned here as a force that brings man forth and is fully active in the process of hominization: it is not just an external device that can be picked up, appended, and then discarded at will"

So in Stigler's words human becoming and technics are one and the same. As a reference for this quote, in the myth of Prometheus and Epimetheus (the two gods assigned with endowing animals with survival qualities), arrive to man with no qualities left to give in order to protect himself. Epimetheus fault is to be compensated by the stealing of fire and *techne* (art, technique) from Athena and Hephaestus by Prometheus and his offering them to humans. In this way names were invented and things were created. Or as Stiegler has it, "the being of humankind is to be outside itself," the always already technical human is a human that is inevitably, prior to and perhaps even against his "will" — productively engaged with an alterity the ground for the formation of subjectivity I add.

The formation of subjectivity in Lacan holds a great interest for our research, since in the lacanian theory the subject becomes such in the infantile age, during the process of the mirror stage. The infant recognizes itself in the mirror as a whole, but in reality it has a fragmentary auto perception of its body, since it still doesn't hold full control of its body parts. This leads the infant to enter the Imaginary stage (the other two being the Symbolic and the Real) and get ahold of a specular image. The mirror stage and Narcissism (libidinal investment on the Ego, instead of an object) share a lot in common, but the special interest is held for us in the fact that the mirror is "a work of art, a *technema*, a technological achievement and at the same time a symbolic work" as Pepi Rigopoulou states in her book *The Body*. We are having a link here with the prior assumption with Stigler's point of view.

In Deleuze – Guattari's schizoanalysis there isn't a soul that speaks, an unconscious that dictates as Colebrook analyzes in *Understanding Deleuze*. There's a fragmentary "body" the parts of which fulfill the orders of the Law, the Father (in the Lacanian sense) or the hyper ego that transfers the ethics of the social complex." The mouth judges through speech, the eye controls and the mind limitates". In the selfies we have the fragmentation of an interrupted body, an ideal (in its edited edition) presence. These

fragmented bodies through auto-photography are members of a solid big body, that of the medium itself, the face presented is nothing but a repetition, a mirroring of the same represented idol. So in the selfies we are probably having the representation of a specular ideal self, a subject striving to identify with the Imaginary representation as a paranoid command.

Butler in “The psychic life of Power – Theories of subjection” mentions that the word subjection means both submission and subjectification, a binary meaning used also by Foucault in order to talk about biopower. Therefore subjectification in itself has no autonomy in the social field. How could it have in the highly normalizing field of the social media and especially instagram?

Alterity in this way, through the aesthetic leveling of the medium, is being annihilated via the uniformity, and the voice of the medium becomes the voice of the norme, a dictation filtered through not only in its iconological sufficiency, but also in its optical communication via the filter processing of the image. But in a homogenized (digital of real) reality what happens with the image of the Other? The Other targeted by seduction and the Other we should not be affiliated with since it is the main bearer of the Difference referred to by Baudrillard but also Deleuze in his encomium of Difference. Other and Difference are the foundations of identity

Imagery of the Selfies

It is time now to enter the aesthetics of the selfies. In his article “The Mutant Cute: Meitu, the Selfie, and the Rewriting of Global Identities” Patrick Lichty describes a project of his, called The horror of the Gaze in which he would use the Meitu a Chinese application for beautifying photographs of pirated facebook photos, or even fellow academics photographs in order to explore what he called the Augmented Selfie. Identity politics, global “cuteness” standards and intercultural problems, politics of “whiteness” arose since the application had algorithmic standards of “cuteness” deriving from the asian beauty ideals and stereotypes (paleness, large eyes, infantilization).The very familiar feminist concept of the male gaze in the arts and the spectacle, “ is being here substituted by a self – reflexive machine gaze” as Lichty writes.

In that same context let’s focus on the work of Cindy Sherman and her instagram profile where she manufactures her selfies using the application facetune with often grotesque results. Cindy Sherman in the oeuvre that made her famous in the 70s and the 80s would use in an almost cinematic way, images of various types of women that she would imitate as a scenery in order to narrate the female status and identity. Secretaries, housewives, and celebrities would be the syllabus in pictures, for the female representation in everyday life. In her Instagram profile though, she critiques the way in which we edit our pictures with an irony for the so called natural and healthy look we aim to create, (natural being the young, the rosy cheeked, the shiny complexion and the flawless features, wrinkle free. Nothing natural about it).These Cindy Sherman selfies can be considered a fruit of post internet art, an art that is inspired by and referential to, the digital culture, and foremost the internet and our lives within it. Cindy Sherman refers to social media as being vulgar in an interview of hers in the Guardian, and perhaps this vulgarity she tends to bring into the light with her selfies. Especially when

she draws a clown face and claims to be a makeup artist or when she paints her face green and asks for a detox. The words she uses as captions for her selfies describe the emotion of the scene with perky being, pink, large eyed, full of giant lashes and glossy lips. In theory this would be the perfect Kardashian selfie had it not been so frightful! In other selfies we have the so called lustful look, the inviting pose to an unknown audience. A full exposure to desire but with deformed cheekbones, contracted eyes, half open mouth surrendered to the Valentine the caption refers to.

On the other hand Inti Romero creates selfies she pixelises, towards anonymity and non recognicity of the person represented. We are being informed on her identity by the networking we witness, the responses she gets from her “friends” the information she shares. The face remains the most valuable of her personal data, the best hidden part of her sharing with the public. Yet this project is mostly revealing about the way we live in the internet creating and transmitting our identity that doesn’t really connect to the others, remaining a rizhomatic (anarchic and random) network rather than an arboreal (hierarchical) construction if we want to use the Deleuzian concepts. Goffman the great theorist of Identity stated in 1959 that we have different faces, for our different interconnections, our identity being a performance in different settings

Brooke Wendt in her book *The Allure of the Selfie* states in conclusion that “All of our selfies look almost identical on Instagram, which illustrates the power that the camera and the network have over us; it seems that this connection is so strong that we will our selfies to the program without a second thought, and we relinquish our personal distinctions, our identities, to be seen on Instagram. Ubiquity, although it is inherent to photography, is not inherent to identity, and it appears that we have yet to make this distinction for ourselves. We find our selfies in multitude more compelling, and more valued, than a thoughtful, single representation of ourselves.”

The selfies in their multitude, this massive data of photographed faces and bodies, have become a uniform product, which just happens to depict a person. The likes being the currency of this transaction, transform themselves some times in real life money. The “influencer’s” market the popular profiles that is, is a branding field with pretty much the same characteristics (how odd, to have products based on their similarity instead of their uniqueness?)

What have these “products” in common? The glossy image of an ideal representation of femininity, of being into this world, of giving the consumerist society an altar to worship, that of the goods as displayed upon the young bodies. In Tiquun’s book *The Preliminary Theory of the Young Girl*, the young girl isn’t a gendered stereotype but the symbol of a society surrendered to consumerism and spectacle, which invests to the young girl as being able only to consume and not produce. This young girl theory, could apply to both men and women if they are being submissive enough to the success narrative. Consume and be consumed.

As Tiquun put it: “In reality, the Young-Girl is simply the model citizen as redefined by consumer society since World War I, in explicit response to the revolutionary menace. As such, the Young-Girl is a polar figure, orienting, rather than dominating, outcomes

It is very impressive that a book written in 1999 is so applicable to Instagram even though, it should come as no surprise since it refers to the dictations for the Young Girl

prototype, provided by the women's magazines and the media. Today each Instagram profile could be acknowledged as a personal medium in surface, but it is a massively guided channel in deeper analysis.

Beaudrillard in *Screened Out* writes: "What we look for today, where the body is concerned, is not so much health, which is a state of organic equilibrium, but fitness, which is an ephemeral, hygienic, promotional radiance of the body - much more a performance than an ideal state — which turns sickness into failure. In terms of fashion and appearance, we no longer pursue beauty or seductiveness, but the 'look'".

And he continues: "All we can do is remind ourselves that seduction lies in non-reconciliation with the other, in preserving the alien status of the Other. One must not be reconciled with oneself or with one's body. One must not be reconciled with the other, one must not be reconciled with nature, one must not be reconciled with the feminine (that goes for women too). Therein lies the secret of a strange attraction".

For the purpose of this research I have made a connection with the Tiquun texts and real Instagram photographs I randomly collected through hashtags such as girl, beauty, body and so on. They serve as really matching captions to the photographs they accompany.

Illustrations

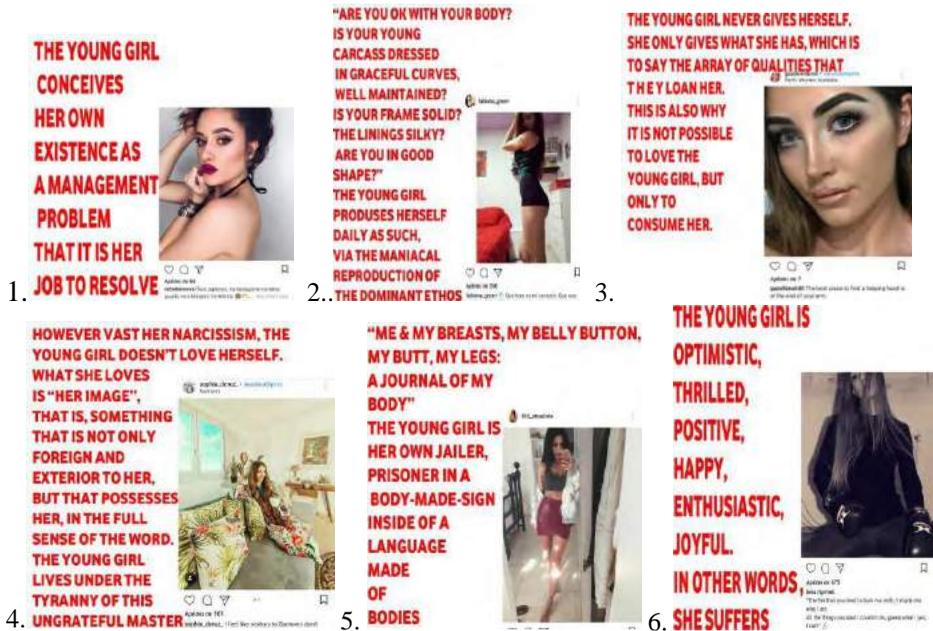
Sindy Sherman



Inti Romero



Tiqqun – Preliminary Materials for a Theory of the Young Girl



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DIGITAL CULTURE & TECHNOLOGIES I

REFERENTIALITY: VIDEO BOOK CASE STUDY

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Abstract

This paper discusses the use of video as theory in the after.video project, reflecting the structural and qualitative reevaluation it aims at discussing design and organisational level. In accordance with the qualitatively new situation video is set in, the paper discusses a multi-dimensional matrix which constitutes the virtual logical grid of the after.video project: a matrix of conceptual atoms is rendered into a multi-referential video-book that breaks with the idea of linear text. read from left to right, top to bottom, diagonal and in 'steps'.

Keywords: *Critical Video Editing, Database film-making, Participatory Culture, after.video, Off network, Alternative Media, Media Arts.*

after.video: A Video Book

after.video is a video book (Hadzi, Sakr, Schultz, & deSoto, 2017). It is a peer-produced and collectively facilitated volume of digital video edited into a physical object – a Raspberry Pi board. The theoretical aspect of this project is articulated in the scholarly gesture of making this video book, constituted as it is of digital processes and audio-visual assemblages. It is a contribution to thinking through the world after digital video. The purpose of this project is to argue that the imaginative and intellectual work undertaken by the after.video contributors and participants is, or can be, a form of research. As an area of individual, social and cultural inquiry, video as a format remains somewhat under-researched.

Unlike previous experiments with hypertext and interactive databases, after.video attempts to translate online modes into physical matter (microcomputer), thereby reflecting logics of new formats otherwise unnoticed.

Conceptual atoms are then re-combined differently throughout the video-book

– by rendering a dynamic, open structure, allowing for access to the after.video book over an 'after_video' WiFi SSID, approaching digital video and its assemblages as a mode of inquiry based on the theories, practices and contexts used by the after.video participants.

after.video uses Open Hypervideo (OHV) as a video platform for the video book. OHV is about interpreting the organizational concept of hypertext for a film environment. Imagine the World-Wide-Web (as a hypertext system) where all the interconnected

text fragments are replaced by film. The resulting web of film fragments becomes the organizational structure and the basis for document access. In the context of academic book culture this creates a digital, potentially networkable/connective object, that can be sculpted and designed, thereby resembling a “book” as traditionally conceived. This “videobook” object can hold the OHV-framework and itself be used as hybrid object. Part of this hybridity is to travel/mediate between the two domains of the digital and the physical (where traditional “books” and “papers” reside); another hybrid quality is a dual mode existence as offline and online device – while “offline” and non-connectivity answers to another trait associated with classical books, it also opens up to the aesthetics of maker-culture and the growing “offline”-movement (as it still remains attached to local uses of the “digital”).

The critical and creative investigations that occur in studios, galleries, on the Internet, in community spaces and in other places where makers, activists, artists, curators, organizers, editors and post-media splinter-cells gather, are forms of research based on practices of production. Rather than adopting methods of analysis adopted from the social sciences or understanding of theory in terms of pure ‘text’, these research practices subscribe to the view that similar goals such as dense referencing and theoretical framing can be achieved by following different yet complementary paths (Neves, Gabriel, Spreafico, & Tollmann, 2013). What they all have in common is the attention paid to quasi-systematic modes of inquiry that privilege the role of imagination, vision and multi-modal intellectual play in constructing knowledge that is not only new but has the capacity to transform human understanding.

Video as theory more particularly revolves around topics of a society whose re-assembled image sphere evokes new patterns and politics of visibility, in which networked and digital video produces novel forms of perception, publicity – and even (co-)presence. A thorough multi-faceted critique of media images that takes up perspectives from practitioners, theoreticians, sociologists, programmers, artists and political activists seems essential.

A short history: Post-Video and beyond

After video culture rose during the 1960s and 70s with portable devices like the Sony Portapak and other consumer grade video recorders it has subsequently undergone the digital shift. With this evolution the moving image inserted itself into broader, everyday use, but also extended its patterns of effect and its aesthetical language. Movie and television alike have transformed into what is now understood as media culture. Video has become pervasive, importing the principles of “tele-” and “cine-” into the human and social realm, thereby also propelling “image culture” to new heights and intensities (Beller, 2006; Cubitt, 2004; Sherman, 2008). YouTube, emblematic of network-and online-video, marks a second transformational step in this medium’s short evolutionary history. The question remains: what comes after YouTube? How might we understand a time when global bandwidth and multiplication of – often mobile – devices as well as moving image formats “re-assemble” both “the social” (Latour, 2005), as well as the medium formerly-known-as video itself? What is one supposed to call these continuously re-forming assemblages? Or: how should one name the ubiquitous moving

images in times when they are not identifiable any more as discrete video “clips”? Are we witnessing the rise of Post-Video? Extended video? To what extent has the old video frame been broken?

Given the rise of networked, viral and vernacular video, with video drones literally swarming into all pores of society – video has been ‘diffused’ in different ways: it has become an agent of change, as well as a register of governmentality; a tool of control society, as well as a carrier of a re-invented society of the spectacle (Adelmann, 2003); a vehicle for new knowledge practices as well as a weapon. However, it has also grown into a life – or a sphere – of its own, a ‘social beast’ of ambivalent qualities, yet to be deciphered. Video by now functions as a non-human ‘eye’, capturing reality with quadcopters or deepwater gear, adding an extra-dimension to surveillance techniques – and: it is even read by machines, discovering patterns to act upon. Video ‘perspectives’ now a from First Person View (FPV) inserted in a soldiers helmet or a gamers gear, to collective sights and crowd documentation, from individual views of remembrance to non-human ‘views’ of robots, from medical devices to military machines. This triggers a whole new wave of reflection on the role, reach and realities of the (moving) image and video. Forsure: No consumer product and no online media today could function and compete without video-like mini-formats; the same is true for identity creation, political discourses, let alone news. Then, on another social plane, the infrastructures of these extended video spheres – from YouTube, Smart TV to satellite images, from fibre optic cables to ‘image rights’ – are currently and for some time to come feverishly contested and embattled.

In light of new questions of critical visibility – with Abu Ghraib, remote drone attacks, Wikileaks and the Snowden files bringing home the point to everyone – the impulses to become invisible or to make things socially visible has gained urgency. In a society whose image economies push forward new patterns and strong pressures of visibility (Skype Video, iris and facial recognition, apps like Vine or Snapchat) (Verhoeff, 2012), a critique of media images and – now per-se political – representation practices, is essential (Holert, 2008). That is also why it becomes more and more important to look at what is (still) rendered invisible – such as working conditions in industrial and other ‘zones’, while in the meantime stock video footage seem to dominate the aesthetics and ‘realities’ seen in the visual domain; meanwhile users invent strategies to interrupt predominant moving image streams and create new visual and narrative styles and cultures (e.g. remix culture, supercuts, fake videos, etc.). New actors and formerly ‘peripheral’ subjects, especially the so-called ‘Global South’, enter this new domain of networked, flowing and moving images. This raises issues regarding the need to re-negotiate, exemplified by the discourses of ‘Fourth Cinema’ or image politics around indigenous cultures, as well as around activist discourses on Syntagma or Tahrir Square.

We have all recently witnessed hitherto unseen political, cultural and technological revolutions through the privileged and animated channels of global video culture. These revolutions span vernacular video clips taken on millions of mobile phones, via online platforms circulating clips as special form of evidence, at ever faster rates through the fragmented global public, to ever more dramatic narrations of the political within the video-saturated domains of news, documentation, art and infotainment. In this, it has

also become clear to us, as global collective, that there has been a further revolution of video itself. This revolution is a techno-visual revolution that is intrinsically tied up with the ‘revolutionary’ changes of global high-tech capitalism, as ruptured as high-tech capitalism might be. Indeed, video and its cultural formations have themselves become a site to experience these ruptures of global society in a concentrated and aesthetically concerted form.

Video Book as a time-capsule for future reference

With the ubiquity of video comes not only a need to reflect on its cultural status, beyond the online video revolution as now encapsulated by YouTube and the new players of networked capitalism, but also a need to acknowledge video itself, in its multiple new vernacular forms, as an integral part of the global cultural repertoire and horizon (Treske, 2015). Video might now be an integral part of the ‘collective intellect’ – what some call ‘cognitive capitalism’ and others ‘transmodernism’ (Beller, 2006). There is now, alongside these global labels, a world of video to be theorized together with all its new interrelations, affordances and contradictions (Steyerl, 2013).

Video, for better or worse, has become a new format for social communication and, by extension, theoretical reflection, including all kinds of ‘communities of interpretation’ and social movements. Video is also now a primary tool enlisted by the structures of the new ‘Societies of Control’. Reality ‘widely consists of images’, and as a way to cut-up and reshape the world, video postproduction has been generalized onto the whole of society (Steyerl, Aikens, Stedelijk Van Abbemuseum., & Institute of Modern Art (Brisbane, 2014).

Video cameras are now everyday tools on our mobiles, video editing software is cheaply available, online platforms such as YouTube are plentiful, and a culture of movies and television has sunk into our collective psyche, meaning video has become a mode of expression both produced and consumed by a wide community of reflective and critical minds. Video is now undoubtedly ‘a way of seeing’ (Mills, 2014), and acting – some might even say it is a corporeal being (Richardson, 2015).

after.video therefore intends to develop a theoretically engaged series of video books that not only reflects on the disseminations and hybridizations of video and its intimate blending with our general cultural and social fabric (Casetti, 2015), but also features video as a medial mode of seeing, referencing and expressing, including criticism and scholarship. In this respect it follows earlier projects that also attempted to engage with video as a form of theoretical reflection: *Vectors* (McPherson & Anderson, 2013), *Scalar*, *Liquid Theory TV* (Hall, Birchall, & Woodbridge, 2012), to name but a few. The extension of traditional textual theory into new medial modalities, particularly those concerned with the visual and video, is something that has previously been called for in several places, not least with regard to focussing on video essays as a ‘stylo’ (Faden, 2008) of choice. In this vein, after.video partakes in ‘a second-order examination of the mediation of everyday life’ (McPherson & Anderson, 2013), with a focus on video as a form, as well as a topical subject.

The after.video book is a time capsule for when the network (and Netflix, Popcorn Time and others) is down and for afro-futuristic (Akomfrah, 1996), satelliteless

movements and other amateur space travellers. It is a historic assembly of postcinematic media artefacts allowing future generations of media archaeologists to get a glimpse of fragments of after.video.

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THE ROLE OF RECOMMENDERS IN CULTURAL HERITAGE

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Abstract

Recommenders are, typically, systems that exploit knowledge regarding preferences of users on a set of items, in order to create user recommendations for unknown items. Recommenders are meant to create meaningful recommendations, enhancing the content personalisation and reducing the information overload. Applications of this type of technology have already appeared in the domain of cultural heritage, mainly in the form of museum and tourism recommenders. This paper reviews and explores the role of recommenders in cultural heritage and briefly discusses the main concepts, limitations, challenges and future directions.

Keywords – artificial intelligence, cultural heritage, museum guide, recommendation, recommender

Introduction

The goal of recommenders is to create meaningful recommendations for users regarding unknown items. The reasons for such systems mainly include the tackling of the information overload due to the vast amounts of information that overwhelm the users, and the personalisation of the served content, which, in general, relates to content that matches a user's profile, state of mind and information consumption context (i.e. educational, recreational) (Adomavicius and Tuzhilin, 2005; Aggarwal, 2016b; Asanov et al., 2011; Melville and Sindhvani, 2011). The relevant technology draws mainly on cognitive science, approximation theory, information retrieval, forecasting, management, and consumer modelling (Adomavicius & Tuzhilin, 2005). The most simplistic, yet highly effective recommender, suggests items based on popularity; this recommender is considered as the baseline against which any new method should be compared and win.

Tapestry (Goldberg, Nichols, Oki, & Terry, 1992) and GroupLens (Resnick, Iacovou, Suchak, Bergstrom, & Riedl, 1994), are considered to be the fathers of modern recommenders. It was then that a highly persistent approach in this field, collaborative filtering, was introduced, formulating the problem as an optimisation, seen either as a minimisation of a cost of an inaccurate prediction, or as a maximisation of a user's utility or satisfaction (Good et al., 1999; Iaquinta, de Gemmis, Lops, Semeraro, & Molino, 2010). In the bibliography in this domain three approaches are identified, the content-based systems, the collaborative filtering systems, and the hybrid systems (Adomavicius

& Tuzhilin, 2005; Aggarwal, 2016b; Anand & Mobasher, 2005; Bobadilla, Ortega, Hernando, & Gutiérrez, 2013; Jannach, Zanker, Felfernig, & Friedrich, 2011; Kaminskas & Ricci, 2012; Konstan, 2004; Lü et al., 2012; Ricci, Rokach, Shapira, & Kantor, 2011). Various evaluation methods applicable to recommenders and an in- depth discussion can be found in Aggarwal (2016c).

This paper focuses on their recommender system applications in cultural heritage, where they appeared, mainly, as techniques to enhance museum visits and tourism applications. The most significant advances are being listed and a brief discussion concludes on the main concepts, the limitations, the challenges and possible future directions.

Recommenders in Cultural Heritage

There is a high volume of published works related to recommenders in the cultural heritage domain. An identification of the most influential and interesting works in this field leads to a list of around two innovations per year since 1999. This section lists some of those works in a chronological order to convey the essence of the progress in this domain.

In 1999 the Hippy guide (Oppermann & Specht, 1999) was developed as an electronic guide for adaptive exhibition guidance. The innovation included exploiting awareness of visitor location and user modelling.

In 2002, the Sotto Voce (Aoki et al., 2002) was developed as a PDA audio guide focused on social aspects of museum visits, by supporting a mediated sharing of audio content (termed eavesdropping), and providing location-based recommendations.

Rocchi, Stock, Zancanaro, Kruppa, & Krüger (2004) developed a mobile system focused on cinematic techniques to enhance engagement, using also user localisation.

Chou, Hsieh, Gandon, & Sadeh (2005) developed a collection of PDA applications that adapted the recommendations to visitor profiles and visitor behaviours, focusing of context awareness using a number of sensing technologies, based on approaches by Miller et al. (2004).

The ARCHIE mobile guide (Luyten et al., 2006) focused on social awareness, influenced by studies like (Falk & Dierking, 2000), in which Wi-Fi-based visitor localisation was used.

Grieser, Baldwin, & Bird (2007), presented a recommender based on user modelling and item features, extracted from textual descriptions, using the typical *tf* – *idf* approach for the text- based similarity estimation and a probabilistic approach to assess the likelihood of a path.

Basile et al. (2008), under the framework of the CHAT project, developed a content-based recommender capable of learning user profiles from static and user-generated content, as a type of extension of the ITeM Recommender (Degemmis, Lops, & Semeraro, 2007).

Luh & Yang (2008) focused on recommendations based on visitor lifestyles based on collaborative filtering and a set of lifestyle factors proposed by the authors.

Between 2007 and 2010 several versions of a museum recommender were

developed under the framework of project CHIP (Rijksmuseum). Initially, Pechenizkiy & Calders (2007) developed a content-based personalisation framework. Wang et al.

(2008) proposed the creation of recommendations based on semantically-enriched museums collections adopting, again, a content-based approach for PDAs and sensor based localisation. A 2009 version appeared in a student research competition, focused on a mobile implementation for on-site museum visits (Roes, Stash, Wang, & Aroyo, 2009). Van Hage, Stash, Wang, & Aroyo (2010) presented a more advanced version of the system, equipped with routing functionalities based on localisation information.

Huang, Liu, Lee, & Huang (2012) developed a personalised guide, focusing on museum learning settings, based on a rule-based recommender. The interesting in this work was that it seems to be among the first to present an experimental evaluation design that targeted user satisfaction factors, as defined in Ong, Day, & Hsu (2009).

Maehara, Yatsugi, Kim, & Ushiyama (2012) developed a recommender that relies on a semantic network on museum exhibits based on item relations and user preferences, taking into account the limited timeframe of a visit.

Benouaret & Lenne (2015) proposed a combination of semantics (content-based) and collaborative filtering to create personalised museum tours, on smart mobile devices. The researchers used relevance, contextual information, time limitations, localisation, even weather information, to provide accurate context-aware recommendations.

Keller & Viennet (2015) presented a recommender within the AMMICO project focused on enhanced audio guidance in museum tours, claiming to tackle the challenges of the cold-start, the data sparsity, and an inherent over-specialisation as expressed in (Ardissono, Kuflik, & Petrelli, 2012).

Rossi, Barile, Improta, & Russo (2016) developed a collaborative filtering-based system to increase both individual and group visitor satisfaction, adopting matrix factorisation, along with localisation aspects.

Tavcar, Antonya, & Butila (2016) designed a hybrid recommender system within the eHERITAGE project that is based upon strong mash-up approach influences, combining technologies such as intelligent virtual assistants, Google Street View and recommenders.

Hashemi & Kamps (2017) developed a hybrid recommender within project meSch, adopting the free-roaming museum visit model, thus using localisation, online and on-site user behaviours, and content- and context-awareness.

Cardoso, Rodrigues, Pereira, & Sardo (2017) developed an association rule-based approach, within project M5SAR, clearly a hybrid method for museum visit recommendation, capable of supporting multiple visitors and multiple museums and sites, using the Apriori algorithm (Agrawal, Srikant, et al., 1994) to learn the rules, and utilised data from the open dataset of MoMA (Robot, 2018).

Kovavisaruch, Sanpechuda, Chinda, Sornlertlamvanich, & Kamolvej (2017) developed a probabilistic approach for a system capable of evaluating visitor paths in order to assess the effectiveness of a given museum exhibition organisation. Although the system naturally supports museum curators and exhibition designers, a very simplistic approach was described to exploit the model learned for visit recommendations.

Discussion

Most of the works on recommenders in cultural heritage, still conceptualise the museum as a gallery-like institution with linear narratives, which reveals a trend in the assumed visitor models or motivations by the involved researchers. This is a conception that needs to be revised since in the recent years the museums are transforming, mainly due to sustainability issues, adopting a different role closely related to education, study and enjoyment.

It is indicative that the “New toolkit for museum and heritage education” by ICOM-CECA proposed eighteen methods a museum can use to enhance its educational services (ICOM-CECA. (2017, Oct.)). In this report it is evident that the social and participatory factors are distributed among all the types of experiences, although there are strong requirements for support from the stakeholder, as these approaches need interesting storytelling, careful storyline organisation and fascinating narratives, meaningful and illustrative content and contextual structuring.

Social engagement and visitor participation aspects have already been considered, but the stakeholder’s role has not been properly defined and included in the loop, by being described as a type of repository curator. Although a modern view of an institution like a museum includes heavy investment on storytelling, history and narratives, aesthetics and education this new view has not been considered yet.

From a technical point of view, hybrid recommender approaches have proven their strength in the cultural heritage domain, matching the complexity inherent in this domain. Since this is a highly dynamic domain with a large variance in tastes and various biases, online methods that consider context awareness, temporal dynamics and biased behaviours can be considered as most appropriate. Modern approaches using methods like reinforcement learning and agent- based techniques have not appeared yet.

In addition, semantic data and linked open data approaches need to be more seriously included in the technology in the domain, as more and more repositories and collections move towards international standards for data interoperability.

Location and context awareness can be easily integrated into cultural heritage recommenders as the Internet of Everything becomes more and more pervasive with easily applicable solutions, along with always connected and low-cost high-power ubiquitous computing, even in small-form devices.

The fast-developing intelligent virtual assistants technology is another important addition to cultural heritage recommenders, and there are already available cultural applications which incorporate intelligent guides.

Overall, there is room for further development both in the conceptualisation of the role of cultural institutions and the motivation of the visitors, and in the technologies that support an intelligent recommender. Impressive new developments are expected to appear in the near future.

Conclusion

Recommenders are artificial intelligence systems that have already been proven efficient in tackling information overload and personalisation in various contexts.

Recommenders have appeared in the cultural heritage domain over the past decade to tackle personalisation in museum visits and cultural tourism applications. This paper reviewed works focused on cultural heritage applications of recommenders, a rather complex domain, in which basically hybrid approaches have been the most successful, although with limitations and assumptions. Challenges and benefits have been identified and a critical discussion on the reviewed approaches highlighted the foreseen future developments.

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SOUND ART AND TECHNOLOGY: EXPLORING THE AFFECTIVE INTENSITIES OF EMBODIED AUDIBILITY

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Abstract

The aim of this paper is to investigate the affective intensities of embodied audibility in sound art by using technology. Embodied audibility forms an expanded listening practice through the body's capacity to perceive, to be affected and to interact with audible, non - audible and non-sensuous sound waves as well as vibrational movements (i.e. affective intensities). This research extends the considerable interest in sound art theory, especially Steve Goodman's approach on the inaudible sound and its interaction with the body. Drawing on Ihde's post-phenomenological approach, the paper explores the ways in which technology unfolds the affective dimensions of embodied audibility in sound artworks presented in Greece, in order to demonstrate how the coupling of technology with sound art may enhance a multi-layered relation between humans and the environment.

Keywords: *affect, embodied audibility, postphenomenology, sound art, technology*

Introduction

This paper draws together theories from phenomenology and the notion of affect in order to investigate the affective intensities of embodied audibility with reference to examples in which sound art encounters technology. In contemporary cultural theory there is a growing interest in the ways human bodies interact with sonic materialities. This theoretical turn marks a move away from the production of meaning which is based on symbolic and linguistic representations. Resonating the work of Pierre Schaeffer, philosopher Christopher Cox(2011) points out that sound is in constant flux and has to be experienced beyond its context. Along this line of thought, many sound artists give prominence to a more sensorial mode of listening demonstrating the multiple ways of what Bernhard Leitner (1998:175) calls "haptic acoustics", that is, the ways with which sound can be felt with the whole body.

The human body can interact with sounds that are beyond the audible range. For example, sound combined with ultrasound can affect human brain in non-conscious ways (Oohashi, 2000). English sound theorist and dj Steve Goodman (2010: xx) introduces the term "unsound" to describe the affective intensities of sounds that are inaudible or not-yet audible. Unsound has two dimensions: a) it refers to sonic phenomena at the

peripheries of auditory perception, such as infra- and ultra-sounds which respectively affect the body and neurological functions, and b) it includes sonic rhythms, textures and compositions that are audible but they have not been actualised yet due to cultural, technological or other reasons (for example, scratching was an unsound before its establishment as a characteristic of hip-hop technique).

Goodman analyses different ways of how unsound is used in contemporary life within a context of a sonic warfare capable of modulating feeling, mood and the physical dimensions of the human body. For example, infrasound can be used as an acoustic weapon to control citizens, creating unpleasant feelings and harmful effects on the body, such as anxiety and nosebleeds. In the course of this paper, we discuss techniques of turning the two types of unsound into an audible experience with reference to the sound artworks “Hearing the magnetic storm”, “I/E Elefsis”, “Inhibition” and “Micropolitics of Noise”. Our analysis mainly draws on the postphenomenological work of Don Ihde on technological mediation and particularly on the multiple interrelations of humans, technology and the world through sound.

Postphenomenology

Phenomenology is concerned with the way humans experience the world particularly through perceptual bodily experiences. In classical phenomenology, technology is considered a functional tool of human experience. The post-phenomenologist thought of Don Ihde broadens this focus by investigating how technology contributes to the organisation of human practices and perceptions of the world. For Ihde, people, technology and the world are not predetermined entities but they are mutually constituted as they are related. Ihde discusses various modes of relations that highlight the role of technology as a mediator between human knowledge and subjectivity (Rosenberger & Verbeek, 2015). For example: in “embodiment relations”, humans and technologies form a unity (as in the case of microscope) which is directed at the world. In this way people perceive the world through technologies (Ihde, 1990:230). In “hermeneutic relations”, technologies form a unity with the world creating representations (as in the case of mapping). In these relations the world is transformed into code, text etc. Humans experience this transformation “via the direct experience and interpretation of technology itself” (Rosenberger & Verbeek, 2015).

Ihde argues that recent technologies broaden the human sensorium as they datify phenomena and in this way bring them into the realm of human perceivable experience. This technology is called “translational instrument” (Ihde, 2017:39). Ihde (2017:40) outlines two translational capacities of technology: “intra sensory translations (for example sound turns into image and vice versa) and translations from non perceivable dimensions into sensory ones (for example magnetic lines or x- rays are visualized).”

This study highlights the need that the discipline of phenomenology of sound which investigates “existential possibilities of auditory experience” (Ihde, 2007:23) is established.

I/E Elefsis

In the sound artwork “I/E Elefsis”, (Aeschylia festival, Elefsina, 2015) sound artist Tarek Atoui and field recordist Chris Watson focus on the materiality of sound of Elefsina City. In particular, they reached the hidden layers of the soundscape of Elefsina aiming at revealing the micro and macro vibrations of the city. In so doing, the artists used various recording devices and techniques. The sounds recorded were both audible and inaudible and they transcribe the historic identity of the place from ancient times until nowadays. For example, the artists recorded the vibrations of an ancient temple, the reverberation of a thunderstorm inside an abandoned factory. In the catalogue of the artwork, we read that the use of audio instruments such as recorders create a dialogue with the site “as sound matter” because artists explore “the acoustics, refractions and reverberations of the architecture of the space (the vibrations of the city)” (Carras & Hatzidaki, 2015).

In this paper we pay attention to the recorded sounds that the human ear cannot reach due to their volume level or their source’s position. These sounds, even though there are within the limits of human audition, are masked by other sounds of the environment. The artists make these sounds hearable through technological mediation, such as contact microphones and hydrophones. The above instruments provide translated perception for people as they capture and amplify sounds that humans are not able to hear without amplification. For example, contact microphone brings into perceptual experience the sounds produced inside a column. That means that these technologies sonify the inaudible and imperceptible sounds and represent the hidden soundscape of a place. Thus, an aspect of the world that is silent due to masking phenomena, becomes audible and available to human knowledge and experience.

“I/E Elefsis” acts in a way that does not only describe the unintentional relations between the human body and the site itself as a living sonic matter but also reconfigures them. Through the use of the aforementioned technology humans can learn auditorily the “unsound” and the unseen world. According to Massumi, human body accesses more of its potential (Zournazi, 2002) and expands the affective dimensions of its embodied audibility. By mediating capacities of technologies in sound artworks “our experience of listening itself is being transformed, and included in this transformation are the ideas we have about the world and ourselves” (Idhe, 2007:5).

Hearing the magnetic storm

“Hearing the magnetic storm” is a digital interactive environment created by Emmanouel Rovithis and Fiori Metallinou (Athens Science Festival, Athens 2016). The work translates the changes in the magnetic field of the Earth during magnetic storms into auditory sensory data. Solar storms have a dynamic impact on the Earth’s magnetic field as they cause magnetic storms. This field surrounds the Earth and protects it from cosmic and solar radiation. It has a significant role in its habitability (Magnetospheres, n.d. para.1) and also in human life. For example, it is proven that magnetic storms can deregulate driverless cars (Macdonald, 2018). Magnetic storms are not directly experiential, but the human body can interact with them unintentionally. This virtual presence of magnetic storm becomes audible in “Hearing the magnetic storm”. The

aim of this project is to educate and promote awareness of the physical world and solar activity (Rovithis, Metallinou & Floros, 2016).

Rovithis and Metallinou design an application in order to present and make us aware of this phenomenon by turning non-perceivable astronomic data into audible data. In doing so, they first represent sonically the magnetic field with the use of two sinusoidal sounds of almost the same frequency. Secondly, they represent the perturbations of the magnetic field by modulating the frequency and depth of the two sounds. Modulations represent the varying degrees of the phenomenon as it is being recorded with Dst index, which measures geomagnetic activity per hour. This technique of sonifying the magnetic field is called “Parameter mapping sonification” and “involves the association of information with auditory parameters for the purpose of data display” (Grond & Berger, 2011). In “Hearing the magnetic storm”, the severity of magnetic storms modulates the frequency and the timbre of sound. In addition, it changes the density and frequency of a third high tone that represents the movement of charged particles (Rovithis, Metallinou & Floros, 2016).

Although the data of Dst index that feed the application are scientifically documented, the selected variables and the sounds used to signify the magnetic field, emerge out of the creators’ creative thought. Implementing techniques and principles of sound design, the two sounds that represent the two poles of the magnetic field were chosen to be 110 and 110,5 Hz because low- frequency sounds help creating a warm and immersive drone. When the creators wanted to sonify moments that the magnetic storm was becoming severe and dangerous, then the sounds were becoming more high-pitched.

Inhibition

Artist and researcher Marinos Koutsomichalis designed a headset that is called “Inhibition” (Onassis Cultural Centre, Athens 2016-7) which has the capacity to monitor neurophysical activity in real time and to translate this activity into sound and rhythms. The headset is equipped with sensors and uses the method of electroencephalography (EEG) to capture brainwave data. Through algorithmic sound synthesis, it generates sounds that change and “detune” the cerebral rhythms of the user and inhibit his/her focus.

The hardware of the original headset records two-channel EEG activity via C++ programming language. Koutsomichalis used a Drive Right Leg (DRL) circuit which eliminates interference noise and three filters that cut specific frequencies. As a result, the hardware achieves an excellent performance at the 1-20Hz frequency range with low electric hum (Koutsomichalis, 2016 para. 4). A software driver, designed by the artist, interacts with a hardware analogue-to- digital convertor and samples the signal of the two channels in different time and sample rate. In the original headset the sample rate was 4000 (M. Koutsomichalis, personal communication, May 27, 2018).

The artist used SuperCollider platform to create a system for audio synthesis. The sound sources are pairs of sine oscillators and wavetable oscillators that scan data derived from electroencephalography and reproduce them in a different frequency.

Frequency or amplitude modulation is generated between the oscillators. The parameters of the dominant frequency generated by the brain and spectral features recorded by an artificial intelligence module define the above system. The basic concept is that, if the dominant frequency changes often and the spectral features are almost the same, the audio parameters will be unstable otherwise they will change. There are also random parameters in order to avoid static texture (M. Koutsomichalis, personal communication, May 27, 2018).

The above technology sonifies non audio and perceivable data that refer to cognitive processes. Users of “Inhibition” headset are able to perceive and listen to an interpretation of their cerebral activity according to parameters defined by the artist.

Micropolitics of Noise

Being inspired by Steve Goodman’s approaches about infrasound as a form of violence and technique of affective mobilization sound artist Lambros Pigounis focuses on the relationship between body and sonic materiality. In the sound performance “Micropolitics of Noise”, (Benaki Museum, Athens, 2016) Pigounis addressed sound vibration as a phenomenon of contact “at the level of the enfolding of affects into the body” (Goodman, 2010: 135) before its cognitive appropriation. Visitors can experience the conditions of a sonic war that took place in Gaza Strip. In this case, the low altitude flight of Israeli military aircrafts broke the sound barrier causing damages such as broken windows and health problems to the people. Pigounis wanted to show how these subsonic bombs are corporeally felt.

In order to liken these conditions of the infrasound vibrational field the artist used hardly audible and inaudible sounds and frequencies that are within human audible range. He created a sound space of high density and rich harmonic content produced by four subwoofer speakers of 10 Hz frequency and 6 kW volume. In this case non audible sound becomes audible. Visitors could walk and lie on a white platform with a sloping ramp that covered the largest part of the gallery space. To heighten the vibrations, Pigounis used practices related to the vibration of the platform itself. Through Max / Msp language programming he produced a low noise frequency of 0-45 Hz and sinusoidal waveforms of 10-60 Hz. He found the dominant frequency of the platform and he produced sinusoidal waveforms according to this. Pigounis achieved the maximum vibration of the platform. Hence, visitors could not listen to the infrasound with their ears but feel it instead with their whole body.

The immersion into that kind of high density sonic space creates a haptic sonic experience of sound and provokes resonance within the body. Sound was corporeally felt by creating effects on the body such as stomach ache. Body facilitates a transducer of vibrational affective intensities and understands its placement in relation to the unsound world. In this way translational instrumentation in sound art becomes a means of embodied audibility that modifies the acoustic sense of the body.

Conclusion

The above sound artworks which present sonically sounds that are inaudible in everyday life and worldly phenomena which are beyond the range of human hearing, use technological mediation to organise and enhance our perception and knowledge of the world. Drawing on the post-phenomenological work of Don Ihde we could notice that the artworks relate human audition, technological functions and the world by using different techniques of instrumental translational perception. These sound artworks present phenomena that are not only “unsound”, following Goodman’s definition, but also what we could call “non-sound”, that is temporal phenomena such as waves and vibrations that can be translated into sound through the transcription of their properties (frequency, phase, rhythm, intensity, etc).

In “I/E Elefsis”, humans listen through technology to the world. That is, the artists (i.e. the humans) use audio devices (i.e technology) in order to enhance aurally otherwise imperceptible events like the underground movement of the ants (i.e. the world). Similar to Marshall McLuhan’s thesis that media are extensions of the human sensorium, humans coupled with embodied audio instruments are directed at the world performing an augmented instrumentally translational perception. This human-technology relation is based aurally and metaphorically on what Ihde calls “amplification” and is isomorphic to the senses.

In “Hearing the magnetic storm”, a two-level expanded hermeneutic relation of human, technology and the world unfolds. In the case of Dst index, which feeds the application with data, a technology (i.e. datafication) couples with the world (i.e. magnetic storms) providing humans with raw material for producing meaning of a cosmic phenomenon. However, meaning producing undergoes a second - order technological mediation: drawing on their knowledge on sound design, the artists (i.e. humans) recall acoustic experiences with positive or negative psychological effects (i.e. the world) in order to select artificial sounds and the technics for their manipulation (i.e. technology).

In “Inhibition”, humans listen through technology to themselves. The artwork blends and re- directs the embodiment and hermeneutic relations that are at play in the two artworks we discussed above. In “Inhibition”, the coupling of the users (i.e. humans) with the headset (i.e the embodied technology) is not directed to the world but turns back to itself providing to humans with a new field of self-awareness (i.e. the sonification of their brain activity). In other words, humans experience the ways technology perceives and interprets them. In so doing, technological mediation results in a “reflexive intentionality” through which people may also immerse in technology’s intentionality (Rosenberger & Verbeek, 2015: 22).

“Micropolitics of Noise” creates a hermeneutic relation. Speakers, platform and Max/Msp programming language (i.e. technology) relates to the world (i.e. sonic bombs) in order visitors (i.e. humans) to experience the unsound. This kind of experience is produced in two ways: through hardly audible low frequency sounds and through the vibration of the platform (i.e. non – sound). In the latter case, sound is not rendered, however non - sound constitutes a form of sonification because it focuses on the experience of “haptic acoustics”. Hence, in “Micropolitics of Noise” the two capacities of technology are applied, following Ihde (2017:40) a) intra sensory translations

because what is corporeally felt is also hearable with the ears, b) translations from non-perceivable dimensions into sensory as the inaudible becomes audible.

In “I/E Elefsis” the ways in which the unsound becomes audible are analogous to the phenomenon and to the human senses. Through technology, sonic materiality enhances the phenomenon which, under any other conditions, would not be hearable. In this case, sound art deals with the phenomenon itself. In “Hearing the magnetic storm” and “Inhibition”, however, the instrumental translation of the unsound into audible experience is not isomorphic to the cosmic phenomenon and the cerebral activity as much as it is analogous to pleasant/unpleasant acoustic experiences on planet earth and artistic explorations. With the above sonification technique, sound art deals with the representation of the phenomena. “Micropolitics ofNoise” combines the above because it deals with the representation of the phenomena but it is isomorphic to the human senses as the sonic vibration is still corporeally felt.

In conclusion, the sound artworks presented in this paper employ different techniques of making audible the dynamic phenomena that are beyond audible range. They develop different forms of technological mediation reconnecting people with the world by helping people understand how the acoustic experience may be related to an extended vibrational spatiality and sonic materialities in which affective intensities become augmented and conscious.

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THE SOUNDSCAPE OF A TERRORIST ATTACK AS MATERIOLGY FOR LIVE PERFORMANCE AND ITS PERFORMATIVE, SOCIAL AND ETHICAL IMPLICATIONS.

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Abstract

The paper focuses on specific issues that arise from the use of a soundscape of a terrorist attack in music composition and its *performative, social* and *ethical* implications. It examines ways of transforming a disastrous event into an artistic statement which will be communicated in the listening context of a concert space. Among these issues are: how such unfortunate and devastating events can gestate powerful expressions of sonic art? Moreover, in which ways the electroacoustic medium can communicate a catastrophic event with impact on the social psyche - such as the defacement and destruction of sites and human lives - in a meaningful and intelligible way? Do sounds exist independently of any connotations we attach to them? Shall the soundscape of a terrorist attack, as the one in Brussels, be disconnected from the terrorist act and its memory? Which ethical considerations shall guide these decisions? A case study is provided through a short analysis of a piece - entitled "Winter Landscape 1: Brussels" - that uses soundscapes of a terrorist attack in Brussels.

Keywords: *soundscape, live performance, terrorist attack, live electronics, music composition*

1. When violent events strike...

...the global community responds in various ways. The social media and the World Wide Web are quickly flooded with works from artists, illustrators, designers, photographers, typographers and others expressing their support and anguish. Artists tend to respond expressing their solidarity by either creating art or commenting on the events. From Penderecki's "Threnody to the Victims of Hiroshima" to Stockhausen's controversial statement on the attacks at the World Trade Centre in New York (Wolfson, 2001), artists ensure that such events will never fall into oblivion. However, in my personal opinion, what mainly interpret the social reaction are the instantaneous and intuitive posts, responses and comments of the general public.

Both a terrorist attack and the instantaneous reactions that follow it on the mass and the social media share some common characteristics: they are instinctive, spontaneous, non- filtered and they do not leave space for argument and antithesis. They can be regarded both as acts of violence (either physical or verbal) and non-acceptance. They

are not the production of reflection and dialectics and, therefore, they can be interpreted as trials of destruction and anger. Opposite approaches (including some artistic ones) would argue that an artwork should create smoothing (and even healing) traces of memory and remembrance and carve a space where one can discuss, remember and evaluate.

1.2. Media Systems Dependency Theory.

In today's societies, people depend on the mass and social media for their understanding of an increasingly complex social, financial and political world. According to Ball-Rokeach and DeFleur's (1976) Media Systems Dependency theory, people's level of dependency is related to the number and importance of the specific information delivery functions served by a medium.

The unexpectedness and unpredictability of a terrorist attack is identified by the lack or/and inadequacy of first hand testimonies. Neither cameras nor microphones are installed prior to the event and the witnesses are too emotionally engaged for objective evaluations.

After such an event the role of the mass media become disproportionately important since they are considered as the only and immediate source of information. As a consequence, they become influential and authoritative and, often, they play the role of an opinionmaker.

How this information can be characterised? Two main factors affect and shape the first waves of information that emerge from the scene of a terrorist attack:

1. The public demand for immediate briefing and updates.
2. The foremost concern of the mass media to provide it.

Due to the lack of first hand testimonies and the above-mentioned factors, the mass media can simultaneously act as the transmitter and the moderator of the information. As the information needs increase, the public seeks mediated information, increasing thus, at the same time, its dependency on the media. Consequently, the likelihood for the media to affect the public becomes significant.

In an interview entitled "How do I live in the shadow of terrorism?" (Lyons & Davies, 2015), Phillip Hodson, spokesman for British Association of Counsellors and Psychotherapists, states: "The media probably contributes to the malaise and anxiety... There is a failure to provide a scale, for example to stress that Isis only has so many soldiers and volunteers, and only has the capability to kill so many people". Also: "When the imagination takes over, people think they're about to get their throat cut, when they're not. If the threat is measureable and strategic and specific, we can handle that."

Moreover, new variables have already entered this equation: the new media technologies and the social media. In his Ph.D. thesis, Yoonwhan Cho (2009, p. 1) highlights: "... new media technologies have become indispensable. We are living in an ever-changing new media environment in which people and media interact and influence each other in various and profound ways. People are adopting and using the newest applications of new media that are becoming ever so embedded into their daily life

which is akin to McLuhan's (1968) notion of invisible 'extension'. Unlike any other time, people are now participating in the creation of new media environments, playing multiple roles - users, producers, and transmitters of media content - and changing the very landscape of what is called media. This symbiotic relationship between people and new media technology best characterizes the current status of the new media environment".

The new media environment treats the information according to the symbiotic rules developed between the public and the media. In this environment, neither the first-order-treatment (first order sources: the event itself, camera, recording) nor the second-order-treatment (second order sources: eye- and/or ear-witnesses) of the information are always important. The availability and usability of new media technologies by the public has established a third-order-treatment of the information according to which, the social media deal mainly with instantaneous and intuitive responses and evaluations rather than objective analyses of the facts and the causes. The first and second order sources are often excluded or replaced by hearsay and speculative glances.

According to Cho (2009, p. 1), the public and the media interact (or communicate). The one is *exposed* to the other through their symbiotic relationship: "...media use, which is commonly considered to be a unidirectional or a 'one-way' process by media effects scholars (e.g., Lasswell, 1971; Lippmann, 1991), can also be understood as an interactive mechanism that makes the development of the relationships between people and media technology possible (Ball-Rokeach, 1985)". Tweets and Facebook uploads are common practices of this interactive mechanism and fruits of the new media technologies. They can either provide instantaneous guidance and instructions or emotional purification. They feed and shape in loops both the media and the public at the same time.

Whenever this mechanism serves as an intermediate between the information and its delivery to the audience, both the importance and the delivery functions of the information are mutually affected providing a bread-and-butter environment for artistic expression.

2. The soundscape of a terrorist attack...

...is not a typical soundscape that one can use in a composition. Although it possesses all the characteristics of a soundscape, it does not offer a research field that can be approached easily. One cannot contact a field research in order to study, identify and categorise its sonic content. The recording levels cannot be adjusted properly and the time and the conditions of the recording cannot be chosen prior to the event. These are only some of the technicalities concerning the recording of unforeseen circumstances.

Ethical considerations burst out imperatively, even in the case when a microphone is ready to record on-site. The decision between recording, providing assistance to the injured or escaping the scene is not to be taken lightheartedly. Moreover, listening to injured people screaming in the context of a musical performance could be considered inappropriate or unacceptable by parts of the audience. Soundscape audiences are familiar with recordings of animal screaming in the nature but not necessarily with

injured people's screamings. Each performance of a soundscape of a terrorist attack spotlights always a fine line between commemorating and exploiting.

The establishment of constant anxiety and fear in the public psyche is a side effect that should also be meticulously considered. Referring to the Paris attacks in 2015, Dr David Purves, a Reading-based psychologist specialising in trauma and post-traumatic stress states: "When something dramatic happens, such as the attacks in Paris, something called the 'availability heuristic' kicks in... Traumatization makes people feel more vulnerable... They start to make decisions based upon fear; making a decision based on fear reinforces that anxiety." (Lyons & Davies, 2015). The likelihood of experiencing again a traumatic incident produces vulnerability; an undesirable event seems more probable than it really is. As a result, a constant feeling of fear might be deeply rooted in the minds and hearts of people. The reminder of a terrorist attack and its emotional implications through repetitive performances which reproduce its soundscapes might feed these sentiments and resurface social discord and scapegoating.

1.1. "Winter Landscape 1: Brussels"...

... is a live performance piece of music that involves a narrator, live electronics and tape. It is a hybrid between live electronics and live acousmatics (pre-processed and pre-mixed sections that can be triggered in a predetermined but loose sequence). Its sonic material derives from the soundscapes of the deadly attacks at Brussels airport and the underground train station in Maelbeek, recorded and uploaded by eyewitnesses in March 22, 2016. The piece creates a neutral space in which excerpts from the live radio broadcasting of the attacks in Brussels and selected posts of the general public and authorities on the social media can be heard. At the same time, the narrator reads the first online announcements uploaded by the international media without uttering their meaning. The sounds in the piece are allowed to exist without emotional or conceptual content, and with no intentions of drawing a definite conclusion or inculcation. The piece acts as a filtered emotion versus the instantaneous, intuitive reactions of parts of the society which were expressed, immediately after the incidents, via Twitter, Facebook and the media headlines.

The element of the live electronics is provided by a Max patch, which consists of a real time process of the voice with a FFT (Fast Fourier Transform) algorithm (Image 1) that alters randomly its pitch (Image 2). The overall time structure of the piece is controlled by a part of the patch that also initiates the FFT process (Image 3).

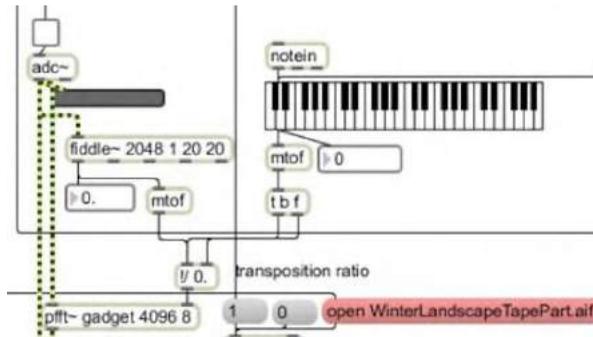


Image 1. Spectral audio processing of the voice using the Fast Fourier Transform (FFT).

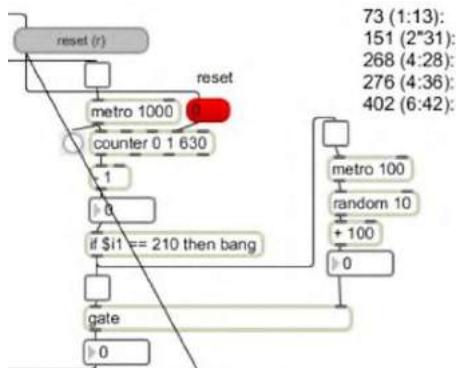


Image 2. Random pitch transpositions of the voice.

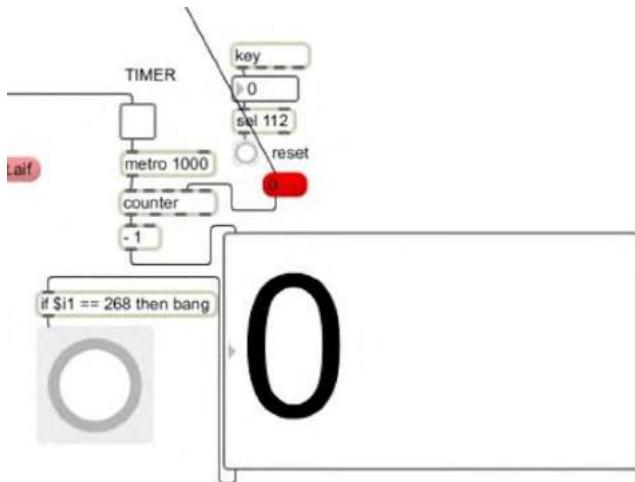


Image 3. Control of the time structure.

1.2. The passage of time...

...after a terrorist attack offers alienation from the actual event. Even the greatest atrocities are smoothed after enough time has passed and acceptance is established. "Winter Landscape 1: Brussels" uses the soundscapes of the blasting in Brussels within this context in order to commemorate the event. It offers a testimony well distanced from the heat of the event; a sonic place for collective evaluation, remembrance and contemplation.

1.3. Is it a typical soundscape composition?

"Winter Landscape 1: Brussels" fulfils grosso modo the 4 basic criteria of a soundscape composition as described by Westerkamp (1999):

1. *The recognisability of the place.* Selected sounds from the blasting can be heard and recognized. However, some of them have been surrogated due to signal processing techniques.
2. *The awareness of the listener in relation to the place.* A bond between the listener and the sites of the events is established through the recognisability of the place and its soundscapes, and the interpretation of the title and the program notes.
3. *The awareness of the composer in relation to the place.* Both the acts of composing and performing the piece contribute to a better understanding of the place and its soundscape.
4. *The promotion of knowledge and understanding.* Any artwork that contains material with social impact or comments on that triggers collective (positive or negative) discussion.

However, although the recordings of the blasting used in the piece reveal an extremely noisy and opaque lo-fi soundscape, the piece itself is composed with transparent, reverberant and whispery sonic environments.

3. Codetta.

All the ethical considerations that arise from the use of the soundscape of a terrorist attack lie beyond any strictly compositional processes. The acousmatic nature of the radio broadcasting and its schizophonic (Schafer, 1974) reproduction re-contextualise both the events of the attacks and their meaning. According to M. Schafer (1974), this perceptual split of sounds results into a de-familiarisation, which consequently, leads to a perceptual alienation. The latter is taking place on both social/political and cultural level. The electroacoustic medium engages the composer to shift the focus away from the media aided representation of the terrorist attacks to the aesthetic sides of artistic creation and communication. The level of surrogacy (Smalley, 1986) bonded with perceptual alienation is an important and critical tool for the preservation of meaning, semantics and memory. During the compositional process, the illocutionary decision of including (or not) the utterance of the radio broadcasting and its semantics, and the voices and screaming of the injured, determine the communicative effect to the audience of the performance. However, this is an ethical decision and not a compositional one. The relation between the mass and social media with the society becomes an affair between the composer and the audience.

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IMMORTALITY AND RESURRECTION OF THE DIGITAL SELF

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Abstract

We can safely predict that sometime in the future there will be more social media profiles belonging to dead than living people. In this work, we begin by characterizing the cultural meaning of the technological affordances that social media institutions have already associated with profiles that belong to dead people. We analyze current practices and we present future trends under the scope of the remediation theory, which suggests that at least initially, new media practices are just a mimesis of existing practices. In particular, we examine Facebook, which has already introduced several options for user profiles that belong to dead users. Finally, we raise awareness about novel technological and cultural issues that have been neglected or are not in the interests of social media institutions.

Keywords: social media, culture, religion, personality, privacy, big data, machine learning, bot

Goal and method

We can safely predict that sometime in the future there will be more social media profiles belonging to dead than living people. In this work, we begin by characterizing the cultural meaning of the technological affordances that social media institutions have already associated with profiles that belong to dead people. We analyze current practices and we present future trends under the scope of the remediation theory (Bolter and Grusin [2000](#)), which suggests that at least initially, new media practices are just a mimesis of existing practices. In particular, we examine Facebook, which has already introduced several options for user profiles that belong to dead users. Finally, we raise awareness about novel technological and cultural issues that have been neglected or are not in the interests of social media institutions.

Social media as heirlooms

By late 2017, Facebook had reported 2.2 billion active users (logged-in at least once monthly). Assuming an average age of 30 years old and a mean life expectancy of 80 years, then we can predict that by 2070 the majority of them will be dead. Although Facebook itself might not exist by that time, there might be other social networks that will attract the online activities of those users, who have become accustomed and enjoy to express themselves publicly on digital media. In contrast to our body and the rest of our material possessions, our social media profile consists of digital information and it is

potentially eternal. Some people might present an idealized self on their timeline (Back et al. [2010](#)), but we can assume that the majority of them might be more natural (Bargh and Chartrand [1999](#)) in their chat sessions, voice commands, and browsing habits.

In life off-line, most of the time, and with good reason, people are not concerned with what happens to them, or to their (material or intellectual) property after death. Some people might choose to leave a testament, which might be considered according to national legislation and depending to the requests by relatives. Moreover, there is usually national legislation or religious heritage that might define inheritance or burial practices. Thus, it is possible that social media institutions might need to regulate further the information content practices according to varying and evolving contemporary practices. In any case, we should also consider privacy matters, as well as individual wishes.

Who owns our social media profile after death?

The management of post death activities that regard the body and the (material or intellectual) properties are a matter of national legislation, religion, and choices made by the individual and by the relatives, which usually act according to contemporary cultural practices. Currently, Facebook supports the following profile actions after a death, which might be associated with traditional cultural practices, as follows:

- Delete (Cremation)
- Locked (Mummification)
- Memorialization (Cemetery)
- Legacy contact (Testament)

It is currently unclear what happens to our social media profiles after the death of the legacy contact. Should our profile be inherited together with the profile of our legacy contact to the next legacy contact and so on (e.g., just like that ring that our great-grandmama passed down)? Alternatively, if we consider the intellectual property legislation, then it becomes possible to transfer a social media profile to the commons after a number of years. Even if we decide to delete our personal copies of online interactions, some of them might be impossible to delete, such as chat and voice history, email, and photo (Gemmell et al. [2002](#)), which have been stored in personal storage, in the cloud, or at other user terminals. Therefore, there is an emerging technological opportunity that digital data might be leveraged to extend our digital self eternally, either in archival format or even as a dynamic and evolving digital entity.

Is our social media profile going to go to paradise?

We are already familiar and we might have read the private letters of famous individuals at museums and edited volumes. Most of us should agree that reading love letters that do not concern us personally is a significant privacy breach, more so, when they concern a living person. Nevertheless, it is culturally established that at least for the famous among us, our cognitive heritage will be certainly archived and publicly displayed regardless of our wishes. Notably, the applicability of this analysis is already valid even for humans that do not own or have never created a social media account. For example, we can find Google Scholar profiles for important individuals, who are long dead (e.g., Herbert

A. Simon died in 2001, which is long before Google introduced the Scholar service). Although scholarly publications are just a small aspect of a life, it is straightforward to extrapolate this contemporary practice to the rest of our technologically mediated selves.

Our embodied consciousness might remain uncertain about the happenings in afterlife, but there is some hope about its disembodied digital reflection. In the future, it is very likely that there will be social media profiles of dead people curated by relatives, other interested parties, or even automatically by mining our digital remains that are distributed all over the internet. We suggest that technological determinism should not be the only guiding force in such matters and that cultural aspects might be more important in shaping the respective technologies and the new mediated practices. Therefore, we expect that religious institutions might become more active in shaping digital media practices. Moreover, existing religions might need to evolve themselves in order to provide suitable narratives and rituals for our digital selves.

Online resurrection

Besides social media profiles (friends, videos, photos, status updates), there is also a growing number of text messages and interactions with media content produced by others. Although text messages might be considered as a rather casual medium about not so important matters, they are an important representation of the self to others. There are already technological systems that could be trained with the text chat and voice archives left by an individual as an input, in order to produce a bot that behaves similarly to the individual, at least with regard to casual interactions (Newton, [n.d.](#)). The more data available for the training, the more believable the bot might seem (or even sound like). Moreover, new media technologies, such as virtual reality, augmented reality, and holography, might enable additional traces of online actions, which could be enacted in a future digital self.

In addition to verbal communication, a bot might also be enabled to produce new interactions (views, likes, emotions, etc) on new content created by other users. In this way, the digital remains might become the source of a generative and eternal interaction stream long after death. We suggest that as long as living individuals are happy to interact with others through social media (e.g., chat, like, etc) then it becomes technologically possible that there will soon be little difference between the living and the dead, at least with regard to our online interactions. Therefore, the more effort we invest in our online activities the more data we create for our future digital selves. Previous works have debated the balance among the real self, the idealized self, experimental selves (Turkle [2011](#)), as well as contextualized selves (Goffman [2002](#)). Technology will soon enable us to consider the resurrected immortal digital self (Harari [2016](#)).

The last judgement of our immortal self

What actually happens to our social media profile after death is arguably of small importance to us at that time, since we will probably not be able to control or perceive its status. Nevertheless, there are several immediate, significant, and wide implications for ourselves and for research in various domains. As soon as we become aware that the respective data will live forever, or even that the data could be leveraged to *resurrect*

an eternal digital self, we might want to reconsider how we present ourselves online. In this way, at least for some people, the current presentation of themselves online might be significantly affected towards the curation of an eternal digital self. Moreover, depending on the quality of the reincarnated digital self, it might become obsolete to invest any effort to cure cognitive symptoms of diseases, such as Alzheimers. In terms of computing practices, when the hardware is failing we are moving the data and the software to new hardware.

In summary, we suggest that the current practices of death online are only a shallow mimesis of the richness and breadth of the cultural practices associated with death offline. One possible explanation is that digital information is very special and contrary to human nature it is disembodied and potentially eternal, which makes it difficult to comprehend and to control, at least in the context of death. Thus, we call for a more careful examination of both the cultural practices and the humane wishes in the design of technological systems that concern the digital remains of individuals after death. It is currently unforeseen if and when the last judgement might happen, but it is quite certain that our digital selves will be forever judged, as soon as we depart.

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DIGITAL CULTURE & TECHNOLOGIES II

THE NEW MEDIA ARTIST AS THE CREATOR OF POTENTIAL SPACE AND TIME HETEROGENEITIES

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Abstract

This essay explores the abilities of the artist who works with the new media to redefine, reconstitute, rearrange the space as well as the sensory perception, the experience and the cognition of the viewer, thus creating new narratives, postmodern landscapes, and fluid spaces. Taking as a starting point, the project called Echo Chamber (2017), a video - sounding-mapping installation by the artists Stelios Dexis, Myrto Vounatsou, Cynthia Gerothanasiou, Ioanna Kazaki and Panagiotis Triantafyllidis, there is an attempt to explore the concept of the project, its specific features, and ultimately the new ‘realities’ that it creates, highlighting the artist as the architect of the space of events, the designer of inexhaustible worlds and virtual stories.

Keywords: *video mapping projection, montage of realities, time-space heterogeneities, potential space, virtualities, echo chamber*

Introduction

Perception describes the multiple ways in which people receive information from their environment, allowing them to recognize it. Noisis, or the way people understand the environment, happens through the direct sensory experience, in combination with memories and experiences from the past, as well as expectations and fears for the future.

According to J. L. Borges there are three tenses and they all refer to the present (P. Bartoloni, 2003). The present is the one we perceive, in which we reflect and the one which is fragile and fleeting, because it immediately becomes the past. Then there is the past of the present, that is the past the way we perceive it in the here and now and it refers to memory. Finally, there is the present of the future, which is whatever we hope for, expect, and fear. Borges himself suggests us “to deny the reality of the past and the future” outlining Schopenhauer and Marcus Aurelius’s opinions.

“The form in which the will manifests itself is always the present. It’s never the past of the present: these exist only for the perception and for the smooth evolution of consciousness, subject to the principle of logic. No one has lived in the past, no one will live in the future. The present is the form of all life” (The world as will and representation, Volume A’, 54). ... Marcus Aurelius repeats: “Whoever has seen the present, has seen it all: what happened in the unexplored past, what will happen in the future” (Meditations, Book 6, 37) (J. L. Borges, El Tiempo Circular).

Also, according to Einstein's theories about time, the notions of the past, present, and future are identical "*People like us, who believe in physics, know that the distinction between past, present and future is only a stubbornly persistent illusion.*" (A. Einstein, a letter to the Michele Besso's family).

Certain types of art, and especially those that deal with space, time, as well as digital media, are more capable of involving the sensory experience of the viewer, the memories and their expectations. Through the editing of 'realities', they can create a utopia regarding the 'present', the rupture with whatever is considered known and familiar and finally the conception of a space-time entity.

"Art can make the vertiginous jump in the virtualization, that we so often blindly and unwillingly perform, perceivable and accessible to the senses and the awe. But art can also intervene or influence the process..." (P. Levy, 1999, p.189)

ECHO CHAMBER (2017), triple synchronized video projection mapping installation with sound. Duration: 1min 47sec

With the video-sounding installation Echo Chamber (2017) as a trigger, artists Stelios Dexis, Myrto Vounatsou, Cynthia Gerothanasiou, Ioanna Kazaki and Panagiotis Triantafyllidis are investigating the "*conversion of a semiotically loaded material, the rubble, into a contradictory, controversial space between reality and dream, truth, deceptiveness, illusion and deceit*" (V. A. Vayenou, 2017).

Through the analysis of the project, an approach is sought for how through the process of a widened 'montage' between real spaces, objects and sound on the one hand, and images created through digital media on the other hand, the essence of the material itself can be changed, reducing it from a simple means of recording to a malleable material for creating a new space- time reality that plays with the viewer's perception.

Analysis of the project

The *Echo Chamber* (2017) project was created with the following stages:

1st Stage: Design and materialization of the installation. A structure of crushed concrete boulders and twisted iron bars was created on a 2 x 3 m gray-colored surface. The final composition points to the ruins of a bombarded landscape (figure1).



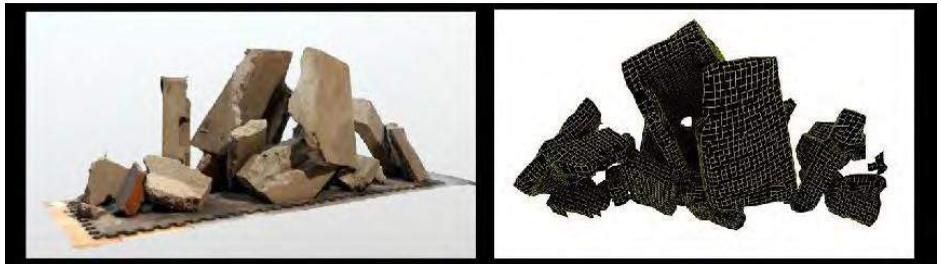
figure1

2nd Stage: Photoshoot of the structure. This space was photographed from a fixed focal length, (250 still frames), thus capturing the installation into an imaginary 180 ° dome in space as well as in 3 dimensions (figure2)



figure2

3rd Stage: Importing the photos into a software that performs photogrammetric processing of digital images and generates 3D spatial data (Agrisoft PhotoScan) and then into a 3D computer graphics software (Blender) in order to be transformed into a three-dimensional wireframe (figures 3 &4).



figures 3 & 4

4th Stage: Creation and edit of three videos and sound.

- 1st Video: The wireframe was inserted into a compositing software (Adobe After Effects), and a rudimentary synthetic motion was added to it that gave the grid a sense of fluidity. Afterwards, a basic animation was created that depicts an animal (a sheep) that is jumping over an obstacle. The animation was multiplied and placed in specific positions-paths relative to the wireframe (figures 5).



figure 5



figure 5-detail

2nd video: This captures the course of a large flock of sheep that gets squeezed at the exit of a paddock (bird eye view) and eventually gets lead out of the scene and disappears in the dark, with a direction from left to right (figure 6).

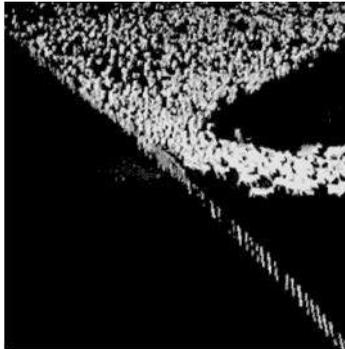


figure 6

3rd video: The particular video depicts a small sheep that stands still and that is constantly looking at the viewers (figure 7)



figure 7

- Sound design: An audio file was created based on a well-known children's lullaby to which further interventions were made. The rhythm for the editing of the 1st video was organized based on that sound.

5th Stage: Organization of the final installation.

The final installation includes 3 videos and a structure of crushed concrete boulders and twisted iron bars.

The 1st video was projected onto the structure of concrete boulders.

The 2nd one was projected on the back of the structure, on the ground of the space. These two parts of the project were synchronized using a mapping projection software (Resolume Arena 5).

The 3rd video was screened at another place in the room by a mini projector. All videos were playing in loop under a sound-edited lullaby (figure 8).

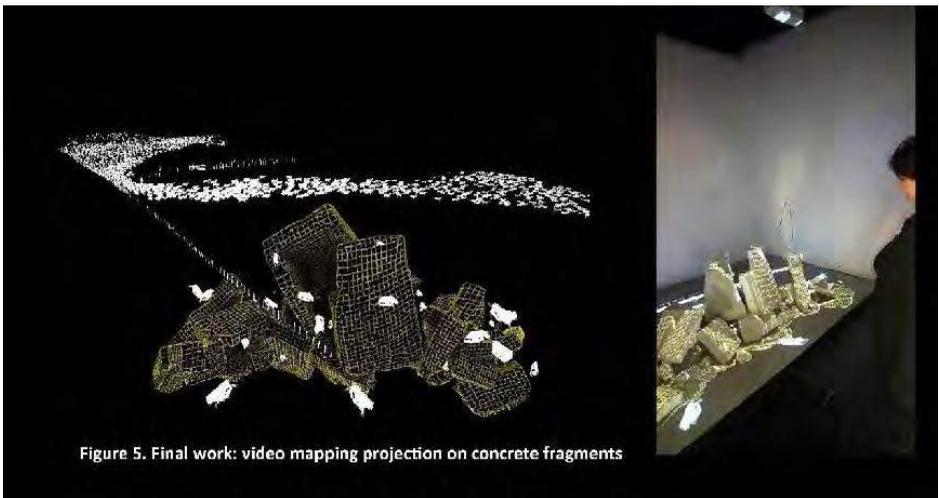


figure 8

The Concept of the project

The combination of the use of traditional symbolism and stereotypical images and sounds, along with the visual and audible repeatability, leads to the spectator's 'tuning' and 'hypnosis'.

"The news media term 'echo chamber' refers to the condition in which information generated and manipulated by power is reproduced, homogenized, accepted without critical filtering and ultimately established as correct and universal by means of their 'bombardistic' repetition by the mass media.... The artists use the combination of the traditional symbolism of the elements of their work with the inherent ability of visual and sonic repeatability to 'put to sleep' and 'hypnotize' the viewer to comment on the practice of power systems to put citizens in a 'passive' mode, avoiding thus any notion of risk." (V. A. Vayenou, 2017).

Much of our perception of the world is based not on experience, but on conclusions drawn from prefabricated or even false information that give the illusion of control over 'things', free will and a sense of security.

"Essentially, the work deals with the contradiction of 'risk taking' in its most realistic, contemporary version, at a time when truth and ignorance alternate without distinction by the ruling power according to its purposes. The seemingly safe or the precarious daily life is to a great extent a product of 'processing' and determining the consciousness of the masses by the power systems. Consequently, 'risk' and 'non-risk' s are not defined by objective criteria or healthy consciences, but by whom, how and why the role of the patron of society has been obtained. The idea that 'seeking the truth requires risk' is not of philosophical nature, but a fundamental principle of the protection of basic human rights" (V. A. Vayenou, 2017).

Objectives:

The objectives of the project through the paradox of the video-mapping installation are

- To transit the viewer from a passive attitude to an active process.
- To test their perceptual ability, through their senses and memories, in recognizing the multi-level and complex concept of space to produce ideas and associations.
- To inspire a debate and raise questions about the practices of power and control systems that want to put the citizens in a 'passive' function, avoiding any sense of risk.

The project as a blending of 'realities'

The project is part of the category of the mapping projection videos which are the modern video-scapes. Video projectors are used to display artificial images (3d, edited images) over existing structures {buildings, sculptures, landscapes (urban or non-urban)}. The ephemeral light of the projector interferes, redefining urban design issues, spatial planning or design issues. This visual language interprets the architecture of a space and articulates new narratives through fragments of both real and CGs edited images. Some works of mapping projections go beyond a simple projection of the visual content that matches the size of the structure of the architecture, the landscape, or the object. They try to articulate a new artistic language through the blending of the narrative interventions of sound and image with the overall conception of space, architecture, acoustics or whatever else determines this space, which mixes the real with the virtual.

"I like to do a project in such a way that it looks very organic," says Bart Kresa an projection mapping expert. "We bring it in as art. We create a fantasy world and put people in a dream state. We try to make it impossible to comprehend what's going on before their eyes."

Due to the projections, this project is transformed from a static structure of cement fragments, into a miniature city, a fragmented urban landscape full of motion. Little carefree lambs are jumping on the ruins. However, as a result of the abstract design, they also look like mice that seem to be hiding in the cracks of the structure or even falling into the void, therefore leading the viewer into ambiguous interpretations. The sound, which is a digitally edited lullaby, has a feel of military march. The whole project

transforms the sculpture-structure into an experiential experience, redefining its space and thus its time, and giving it the narratives of her creators.

Physical reality can also be 'virtualized' with or without the help of new media.

"Street lighting might also be considered protovirtualized physical space, changing night into artificial day. In such ways, physical space has been transformed into the 'nonspace of the mind'" (M. Morse, 1998 p.192).

Literature, which uses imagination, has come first on the level of the creation of a space that is virtualized, due to projecting on it an image that was created at another time. In 'Morel's invention', the hero, through an accurate and chronological record of his experiences on an island, describes a series of events that create a system of holographic imprinting and projection machines. These machines record a reality (which involves a series of characters and actions) in the past. The machines then project this recording (the projection does not only consist of light, but also includes a material state and characteristics, such as ambient temperature {heat} etc.), in the 'present' tense that the hero is experiencing. The result is the creation of a space determined by the mix of all tenses at a paradoxical present. The recorded reality and its holographic projection become more real and present than the reality of the hero itself.

'.... I looked at the wall I was bewildered. I looked for the opening I had made. It was not there...Thinking that this was just an interesting optical illusion, I stepped to one side to see if it persisted. As if I were blind, I held out my arms and felt all the walls. I bent down to pick up some of the pieces of tile I had knocked off the wall when I made the opening. After touching and retouching that part of the wall repeatedly, I had to accept the fact that it had been repaired. I looked for the spot where I had made the opening, and then I began to tap on the wall, thinking that it would be easier to break the fresh plaster. I tapped for a long time, with increasing desperation. The tile was invulnerable. ... I was overcome by the horror of being in an enchanted place and by the confused realization that its vengeful magic was effective in spite of my disbelief... But then I understood: These walls are projections of the machines. They coincide with the walls made by the masons (they are the same walls taken by the machines and then projected on themselves). Where I have broken or removed the first wall, the projected one remains' (A.B. Casares, 1964 e-book, p.81-82).

The false and the real blend together. In editor's notes Casares highlights that *"the fact of the coexistence, in one space, of an object and its whole image, suggests the possibility that the world is made up exclusively of sensations"* (A.B. Casares, 1940, p.145).

"Virtual reality is not at all a fictional or imaginative world. Instead, virtualization is the very momentum of the common world, it is that through which we share a common reality. Far from being the kingdom of the false, the virtual is precisely the way of existence from which both truth and falsehood emerge equally" (P. Levy, 1999, p. 188).

Lev Koulesov believed that the ideas in the cinema are created by linking fragmentary details that produce a single action. These details may be totally unrelated to real life.

Through his experiments and by the fragmentation of the material and its reconstruction, he creates a virtual- cinematic space and time, that exists regardless of the real one.

“A few years later I made a more complex experiment: we shot a complete scene. Khokhlova and Obolensky acted in it. We filmed them in the following way: Khokhlova is walking along Petrov Street in Moscow near the ‘Mostorg’ store. Obolensky is walking along the embankment of the Moscow River—at a distance of about two miles away. They see each other, smile, and begin to walk toward one another. Their meeting is filmed at the Boulevard Prechistensk. This boulevard is in an entirely different section of the city. They clasp hands, with Gogol’s monument as a background, and look—at the White House! —for at this point, we cut in a segment from an American film, The White House in Washington. In the next shot they are once again on the Boulevard Prechistensk. Deciding to go farther, they leave and climb up the enormous staircase of The Cathedral of Christ the Savior. We film them, edit the film, and the result is that they are seen walking up the steps of the White House.” (L. Kuleshov, 1974 p.52)

Painting has always been able to create worlds that are plausible, which have, however, been created by fragments of details of people and landscapes. El Greco’s painting *View of Toledo* is a clear example (Eisenstein, 1990). The view of this landscape does not really exist and some of the elements that consist it would be impossible to be seen from that point of view. Some of these would have been hidden. Willumsen’s view is that “(the painting) is nothing more than a synthesis of motifs and visual elements, that have been selected independently in order to be edited into the non-existent and arbitrary construction of a unique view angle. The painting meets completely the intimate compositional needs that were guiding the painter” (*El Greco y el cine* (1990)). The *View of Toledo* was not based on what the painter saw but on what he knew. It is a mental mapping (a term referred to in Stanley Milgram and Denise Jodelet, 1970), which is unrelated to the true mapping of a space. The residents, who live in a city, map out some important elements of the city selectively by linking them through their everyday experiences as well as through their own social representations of places, which may not be part of their everyday experience. Toledo has eventually been used as a starting point, so that the painter, by imposing his own view and by fragmenting the reality, recreates it in such a way that is aligned to the capture of the image he had in mind.

If space can be produced, meaning that it is a product of social development, and social, political, economic and natural reasons play a primary role in its production, so that space is not defined only as material, but also through the perspective of time (Lefebvre, 1996), then projects such as mapping projections that are based on the viewer’s personal perception and interpretation, take a different meaning. Space is ultimately built from material products (sounds, lights, movement) and non-material products (experiences, personal perception, etc.)

Digital media have brought new possibilities, but also more ruptures with reality. Mapping projections artworks, and even more augmented reality artworks, reveal the experimental nature of art, which in combination with the achievements of technology, require another type of artist, the mechanic - researcher who is capable of creating transitions from the real or the actual existing to the virtual.

“Art here does no longer consist of the synthesis of a ‘message’, but in the creation of a mechanism that will allow the still mute piece of cosmic creation to make its own song heard. A new type of artist appears, who no longer narrates a story. This is an

event space architect, a world designer for millions of stories that are to come. He directly carves the virtual” (P. Levy 1999, p.189).

Conclusion

As digital artists and co-creators of Echo Chamber, but also of many other similar projects based on new technologies - through the process of an expanded ‘editing’ and with digital technology as a tool, we have the ability to redefine, reconstruct, and rearrange the space. This is because ‘editing’ (whether it is time-editing or space-editing) can follow the quality of the ‘flow of consciousness’. The latter does not follow the course of the clock, but instead it requires the freedom of the back and forth, the blending of the past, the present and the imaginary future (R. Humphrey, 1962).

This process makes the creator able to reveal the multiple aspects of a psychological space- time, an extended temporality that is directly interwoven with the viewer’s inner experience, associations, the personal, mental, and psychological involvements, their memories and their mind, the accumulation of private interpretations and the creation of personal symbols.

And a Question...

In the future, will the artist be able to create worlds of fragments of his/her thought and reality, not only using the light (of a projector or a computer) that is based on illusion, but in an empiric, holographic, or time-space way? Will he/she be able to create narratives that will contain matter and edited ‘soul material’? Perhaps the viewer will not only be part of the depicted world, experiencing it with the five senses, but their soul material will also be part of that world. Perhaps in the future the artist will not only make new narratives or postmodern landscapes. But will he/she be able to create invisible places and space-time heterogeneities with soul and consciousness?

“My soul has not yet passed to the image; To the person who, based on this reference, then invents a machine that can assemble disjoined presences, I make this request: Find Faustine (heroes beloved lover) and me, let me enter the heaven of her consciousness. It will be an act of piety” (A.B. Casares, 1940, last page).

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LITERALLY UN-LOCK AND SPEED-UP YOUR CONTAINERISED DEVELOPMENT ON EMBEDDED DEVICES

by example of a standalone gadget with orientation sensors sending Open Sound Control

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Abstract

The application in and to the Internet of Things mentioned in the subtitle demonstrates a case study of how Literate Programming strategies based on Emacs' org-mode can be generally employed to break free from limiting, often vendor imposed patterns in modern, all so 'eazy' and ever more container-oriented software development. It shall be argued that by adopting the proposed method, the typical cycle of building, deploying and updating software on embedded devices will not only gain in speed, transparency and freedom but will also reach out to new frontiers of rapid prototyping and add extra value to the domain of education and creative experimentation.

Keywords: media literacy, IoT, Linux containers, literate programming, Docker, creative technologies, e-Learning.

1 Introduction

Talking and reporting at a conference on 'interdisciplinary creativity' about the beneficial consequences of a tiny and rather specific application in the vast domain broadly identified as the 'Internet of Things' (IoT) asks for a contextualisation of motivation and a clarification of terms. Now, if this encompassing domain—or even our 'world'—of the IoT can be defined as the manner of (i) being connected (ii) by smart devices (iii) everywhere (iv) all the time, then any application to the organisational realm of this fourfold of being must be expected to induce fundamental changes to our entire media infrastructure. If, moreover, the present infrastructure of information processing is defined by the corresponding tetrad of technology, namely (i) by a heterogeneous grid (ii) of cyber-physical devices (iii) and distributed services (iv) cooperating in near real-time, then what we used to call 'software' nowadays constitutes this very organisational realm that is governing our overall mediation and, consequentially, is shaping our existence in the world. Programmable media, to put the given ontology differently, even if conceived as being controlled by a human written 'software' or if regarded as 'physically' manifested by embedded devices right at hand, are nonetheless no more things at our disposal like pencils or screwdrivers were. In contrast, they do act by themselves and, therefore, can neither be understood as tools like the traditional humanist's stance still holds, nor can they be conceptualised as 'facilities for creativity'

extending our brains or bodies in the vein of McLuhan (1964). Media not merely reveal and decide upon what presence means to man, they have grown—through their sheer ubiquity and indispensability—to an entity of their own.

Only such an updated ontological perspective (Heidegger, 1950/1977), and thus more comprehensive view, allows us to recognise and further cognise what the quite recent ‘containerisation’ of software and services actually implies and why this event amounts to nothing less than the most significant media upheaval that we are currently facing. Since, however, there is no Software (Kittler, 1995) anyway, but [...] there are just Services (Kaldrack & Leeker, 2015), the respective media-theoretical viewpoint which follows from these denoted standpoints may not only remind us of the principle fact that any sensing, transmission and processing of information depends on restrictions and possible interceptions imposed by the underlying hardware, but shall also make us understand that the systematic—and not at least historical—piling up of software layers and language levels along with the inevitably resulting logical ‘sponginess’ and insecure ‘porosity’ is running that ubiquitous discourse network which intervenes ever more in our social discourse, political opinion formation and disposition towards knowledge.

Considering, furthermore and more locally concrete, that until a last year’s presentation, ‘containerisation’ proved to be an alien concept at the Department of Audio and Visual Arts and that Docker Inc.—this striking “cloud ‘container’ company” (Fortune.com, 2015) growing even faster than Amazon.com Inc. or than Google Inc. ever did—was an unheard name, it becomes likewise inevitable to point out, at least briefly, what merits and drawbacks a containerised application development methodology brings about in general terms, and in particular, how it concerns the field of education and an “Interdisciplinary Creativity in Arts and Technology” (DCAC, 2018). Because given the above outlined media condition, ‘creativity’ in both, an artistic as well as in a technological sense, cannot mean anymore to simply ‘use’ some all-so-smart and ready-made devices in order to deliver some arty ‘content’ or to supply some fancy ‘conceptual media artwork’ to be soaked up by the banalising cultural networks and their secondary market interests in innovation or mere communication. Creativity today rather must entail to insert actual processors and algorithms into the very realm that reshapes presence as such and thereby our standing in the domain of the internet of things—if creativity, at last, shall lead to more than “σύγχρονες εκφράσεις”¹ (Γιώργος Γραμματικάκης, 2017).

As a consequence, everything starts from gaining an appropriate computer literacy. As such, the introductory section shall be closed by referring to the remarkably creative and educative project Origami Singing of Manty Albani (2018) exhibited in parallel to this conference at the 12th Audiovisual Arts festival for her dedication of bringing embedded devices to children living in remote villages at the island of Corfu in order to practically familiarise them with the elementary and so unerringly taken up media-triad of sensing, transmitting and processing as stated by the small bill next to the final work which made her intervention that perfectly clear:

[...] Sensors of a “BBC micro:bit” micro computer, attached to the Origami collect information which is then transmitted and processed into sound.² [...] the project is part

of a theoretical framework that includes S.T.E.A.M (Science, Technology, Engineering, Arts, Mathematics), the “D.I.Y.” and “maker culture” movement. This attitude also involves a political opposition to the dominant culture of mass consumption and uniformity.

2 Coding cultures, virtualisation and Linux Container Technology

2.1 Grabbing code and pasting it on embedded devices has never been that ‘easy’

What has to be appreciated as pioneering steps towards a sound foundation in computer literacy at elementary schools when carrying out first steps of programming cyber-physical devices via a “JavaScript Blocks Editor” or a virtualised dummy device through an always ready MicroPython web portal invitingly calling for “Let’s Code” (Micro.bit.org, 2018a), such an “Easy Peasy” approach of the British Broadcasting Corporation proudly advertising “no software required”,³ or a continued reliance on Arduino’s celebrated “easy-to-use hardware and software” (Arduino.cc, 2018a) not even able to run a proper language interpreter on their “playground” of micro controllers (Arduino.cc, 2018b), cannot remain the model for graduate students of a university’s media arts department. Equally, if uncritically buying some MicroPython-enabled chips off-the-shelf now available, we are staying behind. Since always having been save-guarded by closed environments in the consumer’s comfort zone, we will have never learned to creatively step out of our pre-manufactured padded cells and to cope with neither macro nor micro ‘computers’ of the real world deserving the name and ruling the game.

Saying this, however, is not to insist, like any true Linux nerd most probably would, that proper computer literacy only begins, if you have managed to compile your first custom kernel or device driver. On the contrary, as shown by example of the New Out Of the Box Software installer NOOBS (raspberrypi.org, 2018a), far more capable circuit boards in about the same price range that are really in line for becoming “Your Next Linux PC” (Hartley, 2015) allow any tinkerer to freely choose between a pretty wide range of almost entirely Linux-based operating systems (raspberrypi.org, 2018b), each specialising on another flavour of interest and individual needs to reach out for “insanely innovative, incredibly cool creations” (PCWorld,

2018). Linux, thus, proves once more and now in the domain of IoT to be the true source of flexibility and freedom of the ‘in-dividual’ in all literal sense. Sustainably boosted by the coding culture of Free/Libre and Open Source Software (FLOSS) (Stallman, 2013/2016), it firmly remains as the only reliable gateway to mature creativity. Hence, the actual disgrace of fostering incompetence and inclusion through an addictive ‘ease of use’ and coddling comfort is rather to be detected where the versatility and openness of Linux tends to be disguised or is about to be perverted, if not abused.

That threat is given, if the overwhelming and thereby double-edged ‘delivery of all wishes’ is served by the ‘gift’ to simply skip any involvement in community-based coding, but instead to grab everything ready for use from free image repositories encompassing the whole range from a huge variety of pre-made system distributions, over diversely pre-configured software packages, until fully pre-checked and practically

approved services. This heavenly and false paradise at once, though, has already become a reality for the cloud business by means of what we are focussing on: containerisation. Accordingly, the market leader's promise, finally becoming irresistible for anyone, from the individual SysOp over the DevOps departments until the software management headquarters, plainly bids:

“Build, Ship, and Run Any App, Anywhere” (docker.com, 2016).

Yet, why shall this heaven for the high cloud biz concern the earth-bound D.I.Y. maker and sober students of media art, theory and engineering? Well, what other is Docker's marketing slogan than the ubiquitous fulfilment of the aspiration implied by the term: The Internet of Things? What then, since we already run Linux, should prevent that this reality for today's services in the cloud shall not become true on the embedded earth of tomorrow, meaning for the building, deploying and updating of software on and for tiny cyber-physical devices just as well?

Still, the decisive difference between shipping ‘dockered’ containers and dealing with codes and systems the ‘Linux way’, is finally to be articulated by words like ‘transparency’ and ‘free-dom’. But, the advantages in efficiency and the enrichment of possibilities are undeniable and too powerful to fight against or to do away with them by moral reservations. The general quest, however, what's going on within our media—as now with containerisation—is not and never foremost an ethical one, like when asking: How only could this have happened to us? The media-theoretical question and starting point for what can be done about something, is rather and always: What made all this so inevitably necessary?

In preliminary terms, the answer has already been given. At the bottom line it is the pressing need to slim down what above has been called the logical sponginess of software and language layering from which the promise to raise efficiency and to seal-off the sponge's porosity in software development and service management took its drive to accumulate a never seen stream of venture capital investment making Docker—while building on Linux Container Technology (LCT)—the shifter of a paradigm. The paradoxical irony of this shift lies in the successful strategy not to decrease layering, as one may expect, but to increase it by an enforced granularisation of virtualisation. The perversity about the achieved solution, not merely being ironic, is that—ostensibly for security reasons—any pile of docker containers gets dependent on an all-pervasive daemon process called dockerd which seriously undermines the flexibility and independence of your containerised applications on Linux. Accordingly, the media-theoretical answer is: privatising “Integrated Security” sells (docker.com, 2018). Again, we have reached the stage where everything starts from computer literacy, since there is no way not to know upon which technological grounds each time a certain power structure has been build.

22 Foundation and prospects employing containers on embedded devices

Now, the strategy of virtualisation is nothing new at all; neither is the encapsulation of processes to achieve it. If an isolated filesystem gets added, such an aggregation is called either a system container or an application container. Each instance of the former, as possible with Linux Containers (LXC), runs a fully virtualised Linux operating

system, whereas the latter, as spawned by dockerd, is just an ordinary process with separated namespaces (pid, net, mnt etc.) and resource limitations (CPU, memory, block I/O. etc.) controlled by cgroups. Control groups reached the mainline Linux kernel 2.6.24 by 2008, namespaces date even back to 2.4.19 in 2002. But full container virtualisation relies on user namespaces, only finished by release 3.8 in February 2013. In fact, LXC was ready one month before docker has been introduced by Solomon Hykes at his French company called dotCloud. Setting out as an high-level feature-wrapper around LXC, insulation was soon achieved by docker's own libcontainer.

In contrast to full-fledged virtual machines depending on total hardware abstraction by an hypervisor, containers running directly by the kernel are obviously far more lightweight making them eligible for embedded devices in the first place. In effect, experimentation with slim custom kernels and ports of dockerd for several ARM-based architectures begun almost immediately. Among the most matured resinOS (balena.io, 2013) and hypriotOS (hypriot.com, 2015) are to be named. Yet, also the pioneering, all docker-based environment gadgetOS with the accompanied command line interface (CLI) gadget developed by Next Thing Corporation (NTC) is worth mentioning for targeting their extraordinary feature-laden, very low-costs and super tiny C.H.I.P. Pro product, bringing thus, for the first time, truly wearable wireless audio projects in sight (NTC, 2016). At latest since Docker Inc. officially supports Paspberry Pi (docker.com, 2017), all sorts of applications may stimulate the makers' imagination, reaching from experimentation with a fleet of distributed networked sensors and effectors until inter- and intranet service prototyping scenarios on affordable local cluster arrangements.

All these applications have one thing in common. They are closing an imaginary gap between the big cloud biz and low-budget tinker projects, namely by the common need for orchestration. That is essentially the frequent, repetitive and thus boring building, deploying and updating of software for a possibly heterogeneous grid of computing devices, and secondly an optionally automated scheduling, scaling, load-balancing and monitoring of container instances. Here again, at the core—notwithstanding the unmatched interface to free multi-architecture image repositories or industrial orchestrators like Google's Kubernetes offered by Docker—there, where we depend on dockerd to build our own application container first and foremost, we face the essential bottleneck of the overall system. Especially when the size of images really matters, like with embedded devices, building and updating containers the 'Docker way' gets pretty cumbersome and painfully slow. Fortunately, there are rivals trying, on the one hand, to liberate the launching and controlling of containers the 'Linux way' by an init system, like systemd, on the other hand, to undertake the standardisation of container formats such that building them can be more efficient and secure from the outset, like both is currently pursued by rkt of CoreOS. Yet, for the time being, the lessons learned with gadgetOS during the project mentioned in the subtitle, the strategy applied and solutions found, shall be briefly described next.

3 Literate Programming and software orchestration

The point of intervention, thus, is to break free from the monolithic dockerfile format specifying the container building process. The gadget CLI accesses it, while relying on the docker API, through an almost incredibly easy to use triad of commands in order to get your application on the C.H.I.P.: build, deploy and run. The strategy to literally un-lock, modularise, secure and speed-up your containerised development is to employ the capacity of Literate Programming (LP) to make any coding more flexible and transparent. Although LP appears to be an age-old concept, originated by Knuth (1984), the father of T_EX, its most powerful implementation by org-babel for Emacs (orgmode.org, 2018) has extended its applicability considerably. By means of the classical LP methods called ‘tangling’ and ‘nowebbing’ org-babel allows to extract and connect arbitrary and parametrisable code-blocks of diverse languages on the fly, such that they ‘literally’ transform into a dynamically created chain of executables. Hence, as a methodological motto, we may say, if literate programming applied to code-writing means:

“Don’t comment—write a book!”, then, in the days of software container shipment, this maxim translates to: ‘Don’t trust the container ferryman—tangle your own orchestration!’. The solutions achieved following this proverb, can be outlined as follows:

1. dynamically ‘tangle’ the central yaml config file, rather than building the dockerfile monolithically by the gadget CLI
2. ‘no-web’ the necessary UUIDs directly from a parametrised docker go-lang executable
3. safely incorporate private git-repositories during container build-time rather than exposing your private ssh-key to a potentially public dockerfile.
4. modularise and rearrange the container building process in such a way that the resulting image can still be shrunk to fit on the C.H.I.P.

The corresponding code and explanations which would never have fit on six pages can be retrieved at Carlé (2018) along with a full set of instructions to reproduce the results. Or, if you prefer it the easy way: get docker for ‘free’, grab my pre-made image and simply execute deploy & run.

4 Conclusion

After awareness was raised during the introduction for the current media condition as living by a double set of four, the ‘fourfold of being’ and the ‘tetrad of technology’, that in short may be called the Tetraktys in Square of our times in a world of the Internet of Things, focus could be set on the hot-spot of containerisation resulting in an irresolvable double-sidedness of the ease of use of software tightly intertwined with the value of education and a meaningful reference to creativity. The general lesson learned from a particular pilot project employing the sole production-ready container technology at percent, revealed that a fair balance of the involved merits and drawbacks can be achieved in general, by enforcing transparency and freedom of use, in particular,

by an adaptation of the respective time-proven concepts of Literate Programming. As a result, container building and deploying becomes significantly faster, truly easy, literally teachable, more secure and flexible, such that new frontiers of rapid prototyping and creative experimentation are pushed open. The example application originated with a commitment to the Performance Environments Research Lab (PEARL) of the Ionian University contributing to a sensor-laden dance project to be synchronously performed around the globe (Zannos & Carlé, 2018). In such cases, given the distributedness of devices, the need for an agile management of small teams with varying tech-savviness and a hot loop of software development during rehearsals, containerisation even amounts to an ‘enabling technology’.

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Notes

1. Trans. “contemporary expressions”. Giorgos Grammatikakis was Chairman of the Ionian University and responsible for founding the Department of Audio and Visual Arts.
2. This part of the work was realised with SuperCollider running on a Raspberry Pi and has been carried out by Vasilis Agiomyriganakis.
3. Micro:bit.org, 2018b: “Easy Peasy: It can be coded from any web browser in Blocks, Javascript, Python, Scratch and more; no software required.”

EXAMINING THE USE OF AUGMENTED REALITY AND COMPUTER VISION TECHNOLOGIES IN DIGITAL ARTWORKS, THE CASE OF: “PoNR/ANOMIE”

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Abstract

This paper is an extensive technical and creative review on the interactive, audiovisual art installation “PoNR/Anomie - Point of No Return/Lawlessness” that was presented in Athens Digital Arts Festival in May, 2018. The artwork was submitted after a call for pieces inspired by Singularities. It was based on the concept of Black Holes and was implemented mainly with Augmented Reality techniques, integrated with Computer Vision and extremely focused sound to create a unique experience for each viewer.

To achieve this goal, we had to examine and take into consideration the scientific theory and elements of Black Holes, and then use them to invent a metaphor for the artwork’s plot. Inspired by the “Event Horizon” within which both Particles and Energy are inevitably dragged to collapse into an unpredictable Singularity, ignoring any established Physical Law, we created an installation that once the viewer is found within its active area, gets trapped in a personal experience of unremitting consecutive sentimental stages: Attraction and Inability to Escape, Catalysis / Abolishment of Information and Identity, and finally Compression / Annihilation in the Singularity.

Keywords: *Augmented Reality, Computer Vision, Singularity, Black Hole, digital art*

Introduction

This is an extensive technical and creative review on the interactive, audiovisual art installation “PoNR/Anomie - Point of No Return/Lawlessness” which was implemented with Augmented Reality techniques, integrated with Computer Vision. This experiential piece was created to be presented in the 14th Athens Digital Arts Festival (ADAF2018) held in May, 2018 in Athens Concert Hall after an open call on the theme of Singularities. For our project, we chose Black Holes as examples of Space Singularities and attempted to create a metaphor with parallelisms to the theoretical experience of being captured by a Black Hole.



Photo 01. View of the art installation in ADAF2018

In Astronomy, the term “Black Hole” describes a region of spacetime exhibiting such strong gravitational effects that nothing, neither matter, nor energy, can escape once entering inside it. What’s more, as the particles and energy are collapsing into a single point of extreme mass in space, their identity as types of matter or photons ceases to exist. The fact that no one actually knows what happens inside a Black Hole, added to the mystery we required for our story. This “Event Horizon” in the center of a Black Hole was the main conceptual idea for the plot of our experiential interactive artwork: Within its limits, both Particles and Energy are inevitably dragged into an unpredictable Singularity, ignoring any established physical law, while capturing and dissolving any form of Information.

Taking the theory into consideration, we recognised the challenge to create an act where the viewer, once attracted by the Event Horizon, gets trapped in a personal experience of the following unremitting, consecutive, sentimental stages: Attraction and Inability to Escape, Catalysis / Abolishment of Information and Identity, and finally Compression / Annihilation in the Singularity.

To build this emotional experience, we had to find a way to recreate a large scale interactive spectacle of a three-dimensional Black Hole and enrich it with characteristics of personalised experience for each viewer. For this reason we selected Augmented Reality as the main carrier of the experience but also because it conveniently added to the allegory of the artwork. An AR enabled portable device acts as a visor for the viewer to see a spectacle that scientists have not actually spotted yet and definitely invisible to the naked eye. Supporting our metaphor, we also had to find a way to “lure” the viewer

to bring himself near the Event Horizon (Point of No Return), into the accretion disk of our virtual Black Hole, and for this purpose we decided to utilise a form of focused sound. Once found there, the unsuspecting viewer is presented with a tablet running our AR application, where he watches a symbolic entity with physical characteristics of himself, captured without knowing, to participate in an already commenced, predefined sequence of allegorical events, where the inevitable end is to collapse inside the Singularity. All this act is taking place in the vicinity of a physical installation, containing the various supporting devices and also acting as a trigger and calibration marker for the AR system.

Methods

The project's implementation is divided into two main separate sections, the scientific theory inspired plot and related creative tasks, and the systems integration that was required to realise it for the public.

Artwork Scenario / Interaction Plot

The first step of interaction, was to attract the random viewer into the vicinity of the artwork. To achieve this, we used a special sound device that produced an extremely narrow beam of sound, in front of the installation. This unusual sound form was enough to stun and catch their attention, and also attract the viewers towards the installation, imperceptibly forcing them to approach while staying within the sound beam, and thus following a straight path in front of the artwork.

As they approach staying on a defined path, a computer vision device frames the viewers' face and when the video sampling feed matches the required quality threshold, the device captures a picture of it, crops it and saves it on a local image server.

At this point, the viewer has already approached to a close vicinity of the installation, where he is presented with a tablet computer acting as our Augmented Reality visor, and is guided to aim it towards the installation. Through the visor, the viewer now sees a sizeable three dimensional representation of a Black Hole and also discovers that he is already standing within its rotating, warping accretion disk (approx. 5m wide) while its center, i.e. the "Event Horizon", is placed at the spot of the physical installation.

As soon as the viewer realizes that the Point of No Return is already crossed, while watching the spectacle through the visor he sees a symbolic human face mask to bypass him from the side with a trajectory towards the center of the Black Hole. The mask momentarily turns towards the viewer, who can now see his actual face, captured without his knowledge, moments before, mapped onto it.

The mask with the face of the viewer shatters, and gets drawn within the Black Hole vortex following an accelerating spiral path. As the pieces approach rotating the Event Horizon, they shrink until reaching particle size, radiate a momentary glow, and then disappear into the Singularity. This ends the experiential sequence of the artwork with the viewer being exposed to the following sentimental stages: Attraction and Inability to Escape, Catalysis / Abolishment of Information and Identity, and finally Compression / Annihilation in the Singularity.

Graphics

The piece required for the following real-time 3D Graphics assets creation: The Black Hole. This 3D model though not particularly difficult to create, posed a couple of challenges in design. Firstly, the initial research for its form revealed a series of form concepts proposed over the time, since this space spectacle has only a theoretical representation and no human eye has ever actually seen it. The evolving mathematics and physics models have come up with varying shape forms, with the newest being perhaps more accurate, though not perfectly aligned with the established public perception of its shape, created over the years mainly through art, movies etc. or the earlier scientific representations.

Taking this into consideration, and since it was primarily an art project trying to create emotional states, we decided to partially ignore the latest scientifically proposed shapes and adopt a more familiar, though updated design, in order to cause the least confusion to the audience.

Another creative issue with a technical aspect was related to the use of animated textures for the rotating/warping disk around the Event Horizon. This issue emerged as the Augmented Reality system was being developed for a portable device. Both the graphics engines used to develop 3D environments for portable applications and the hardware of these devices (GPU, storage) set very strict limitations to the use of traditional animated textures. To overcome this without sacrificing any quality or visual features in our design, we utilised a technique where instead of animated textures (footage), keyframed, loop-animated UV coordinates are applied (keyframes). This 2D coordinate animation and the use of seamless textures for the accretion disk combined with texture layering, produced the rotation/swirl (spiral warp) effect as required and also without any quality loss due to compression or resolution degradation. This texture property was experimentally integrated in the latest version of the Unity Game Engine that we used and although not without issues, allowed us to achieve the required effect and also remove a GPU/Storage overhead for the portable device by a rate of 1:240, for a 10 second texture animation loop at 24 frames per second calculated by the following formula:

$$\text{rate} = (\text{movie texture fps} * \text{movie texture duration})^{-1}$$

The Fracturing Mask.

For the embedment of the symbolic entity of the viewer within the act of the artwork we came up with the idea of the fracturing mask. This asset was quite straightforward to create, having to take into consideration the fact that the model should have the minimum of characteristics in order to be able to represent both sexes, after being mapped with an adequate texture. After modeling, a facial canvas/guide was created based on the 3d mesh in order to have the properties of the required texture that the computer vision system should produce and serve later as images of faces for texturing. The 3d mesh object was fractured with one of Blender3D modeling tools (based on Voronoi tessellation). These fragments were animated with physics onto a rough colliding path on the Black Hole model. The physics animation was then plotted

into keyframes animation, reusable and also capable of importing into Unity Game Engine

Sound

This project had two separate and quite different sound requirements. The first sound source was integrated into the physical installation of the artwork, while the second sound was emitted by the application running on the tablet.

Installation Sound.

As described, the sound emitted from the installation serves mainly as a means of attraction for the viewer towards the installation itself. For this reason a special type of speaker, called Parametric Speaker, was integrated into the installation. This device, instead of using a traditional diaphragm moved by a voice coil to produce sound audible waves, uses an array of modulated ultrasonic transducers that can make air molecules compress and decompress, in a manner that audible soundwaves are produced. These speakers produce very clear, long travelling, low attenuation sounds on a very narrow beam and without the requirement for high volumes. We used a ready commercial product for our needs, SoundLazer SL-01. The sound content playing was an “endless” mix of abstract procedurally generated synthesizer tunes, just intriguing enough to catch the viewer’s attention and initiate our interaction plot.

Application Sound.

For the application the sound had a very different purpose. This sound was audible through the tablet speakers, and existed to provide a soundscape for the interaction experience. Since the viewer’s position was available thanks to the Augmented Reality engine’s camera solving, this sound had spatial properties, in relation to its virtual source, the center of the Singularity. The sound itself was a looping sample of two Black Holes Colliding captured as Gravitational waves and converted to sound waves.

Systems Integration

High Level overview

From a technical perspective, the piece consists of a mobile application and a single-board computer exchanging information over the same network. An infrared camera module assisted by an external infrared lamp provide the required video input while a parametric speaker connected to a portable MP3 player are responsible for the focused sound.

The raw image input from the camera is constantly processed from a script running on the single-board computer and when a face is detected, if certain requirements are met, a properly edited image is stored on the file system. A second script is responsible for serving over the local network the most recent image found. The mobile application receives that image and when the viewer’s distance to the AR marker exceeds a predefined threshold, the animation sequence is triggered.

All the components are housed in a custom construction made of oriented strand board (OSB) which also acts as the mounting base installation for the AR marker and - figuratively - the location of the Black Hole. In the following sections we will describe in more detail the different components and the design of the whole system.

Single-board Computer

The computer we use is a Raspberry Pi 3 Model B+ running its official operating system, Raspbian 9 (also known as “Stretch”). For storage, we use a 32GB SD card and the connection to the router is done using the onboard LAN controller. Video input is retrieved with the help of an 8 Megapixel infrared camera, the “NoIR Camera Board v2”, connected on the board’s dedicated serial interface (CSI-2).

Since the main role of the Raspberry Pi is to process the camera’s raw feed in real-time, we decided to use the popular OpenCV library which offers most of the desired functionality. OpenCV supports Linux and has a Python interface, making it possible to run on a Raspberry Pi. Installing OpenCV was a relatively lengthy process mostly because of the need to compile it from the source. We followed the detailed build instructions which produced the appropriate environment for using the OpenCV library in a Python script. In addition to that, we used the picamera interface since it gives easy access to many of the camera’s features.

The Computer Vision script

The goal of the script is to detect faces in the camera feed, crop and straighten the acquired image and store it in the SD card. The output image should have a predefined size and the eyes should be at specific points, so that the texture mapping will properly work. Firstly, we setup the camera’s video resolution, ISO sensitivity and aperture value using the relevant commands of the picamera interface. We also convert the raw input to grayscale since it helps later on with the face detection and apply a blur threshold so that the output image meets our desired quality criteria. By using OpenCV’s Haar Feature-based Cascade Classifiers, we retrieve a rectangle containing a detected face. Within this rectangle we apply another Cascade Classifier used for eye detection, returning the coordinates of 2 points, one for each detected eye. Using these coordinates, we can apply a rotation matrix to the image in order to transform it to the required dimensions. After that, we dump the in-memory rectangle to a file and store it to a predefined folder of the SD card.

Server script

In order to share the image of the detected face over the local network, we use Flask (<http://flask.pocoo.org/>), a Python server framework. Our script gets the most recent image from the aforementioned predefined folder of the SD card and using Flask’s restful API serves the image over the network. A periodic task deletes the folder’s contents every 10 minutes leaving just one image, in order to preserve empty space and make sure no personal data is stored apart from the ones needed for the current viewer’s experience.

Mobile Application

The mobile application targets the iOS platform and is created in Unity 2018 and Xcode 9. During the Athens Digital Arts Festival it was running on an iPad, however, thanks to Unity's export mechanism, it is possible to work on different devices (e.g. iPhones) and platforms (e.g. Android).

The Augmented Reality functionality of the app was managed by Vuforia Engine, which is integrated in Unity. When pointing the iPad's camera towards the image marker, Vuforia reports its location and the 3d scene can be rendered taking into account the location of this marker in the "real" world. In addition to providing an anchor, Vuforia is also used to calculate the distance between the image marker and the iPad. This distance acts as the threshold to trigger a new animation as the viewer approaches the piece.

When the animation is triggered, Unity makes a request and fetches the latest image from the local server. This image, already transformed in the desired dimensions, is set during runtime as texture to the Fracturing Mask and playback starts. After the animation finishes, all its components are reset to their original state and the application is idle again.

Results

By practically combining all the aforementioned parts, firstly we managed to create a multidisciplinary artwork that integrated some contemporary technologies but also had to fulfill some predefined artistic requirements. This means that while the project was heavily dependent on technology, this should not be so prominent to aesthetically harm the artwork's integrity and immersion characteristics. To actually evaluate positively the technology utilisation, this should result in an almost invisible application, in a state that it "just works" and leaves the viewer unobscured to experience the piece. This was actually achieved for the majority of the viewers.

What's more, the integration of Augmented Reality with Computer Vision, as proposed in a form of toolset in this project, allowed us as artists for a deeper viewer immersion by effectively adding his entity in the artwork and his active participation, leading to a more sentimentally focused interactive experience. Finally this implementation allowed us for accurately creating this experience for the viewer as imagined/designed while keeping the piece open to interpretations and avoiding a strict narration form.

Discussion

The use of Augmented Reality in a digital artwork installation project like the one described can be justified after taking into account several aspects of the project, both technical and also artistic/symbolic. The alternatives considered as means of presenting the spectacle were normal Video projection or Virtual Reality.

Firstly, using an AR system allowed us for producing a large scale virtual scene without serious actual space occupation in an exhibition hall. The projection also supports 3D spatial interaction, in a way that the viewer can watch the action from varying perspectives using the provided mobile device as a virtual periscope, staying

true to the fact that Black Holes are still theoretical phenomena unseen by the human eye. The portable visor itself as a technological device was completely wireless and was put in a special protective case to blend more into the artwork installation without ruining its atmosphere. AR also presents the

3D scene floating in the actual space of the viewer, producing an interesting visual experience and imitating the actual Black Holes.

In contrast, examining the other options, we believe that video projection immersion capabilities cannot compare with AR, as interaction features are much fewer. On the other hand, VR with its poor portability and complete lack of connection to the physical space, would not be able to fit in our artistic standards set for the piece, forcing it to shape into a completely different and less desired form. Integrating AR with Computer Vision, we also managed to achieve a personalised experience and to amplify the desired emotions for this artwork.

Finally one more important upshot for us, deduced as we worked on the given toolset, is its power as a new form of Storytelling. AR, especially when enhanced with interaction technologies such as Computer Vision as proposed, is very likely to be a new emerging player in the field of content presentation, as it manages to impress the audience, while keeping the interest on the story, be it reality or fiction, in a quite effective way, as we discovered firsthand during the ADAF2018 exhibition.

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GAMIFICATION - AUGMENTED REALITY

ASTROSONIC: AN EDUCATIONAL AUDIO GAMIFICATION APPROACH

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Abstract

This paper introduces the work-in-progress AstroSonic, an educational audio-only game on the subject of Astronomy that aims to investigate the efficiency of applying game mechanics on non-speech audio content to convey non-musical, scientific curricula. First, the authors establish the theoretical framework by analyzing the positive impact of audio interaction in the context of educational and game environments, discussing the directions, in which educational audio games have been developed, and describing the ways, in which sound has been implemented for the sonification of astronomical data. Then, the first two levels of the game are presented in terms of concept, sound, and mechanics design, as well as how these reflect on the targeted curriculum by guiding players to fly their spaceship into low earth orbit and collect hazardous space debris.

Keywords: *astronomy, audio games, audio mechanics, data sonification, edutainment*

Introduction

Audio Games (AG) are electronic games that utilize mainly or exclusively sonic interaction design techniques to realize all aspects of the gameplay, including space, content, mechanics, and communication language. Thus, players need to employ their sense of hearing, in order to navigate, explore, interact, and essentially understand and perform all necessary actions towards achieving the game's goal. Due to the lack of visual stimuli AG have traditionally addressed the community of visually impaired people and thus greatly contributed to their social integration. On the other hand, they have exploited the benefits of mobile technology, and thus recently become one of the most promising genres in mobile entertainment. However, the implementation of AG for educational purposes is still an under-developed field with the majority of existing approaches focusing mainly on the subject of Music, while also relying heavily on the use of graphic representations.

AstroSonic is a research project-in-progress that aims to extend the scope of educational AG to the non-musical subject of Astronomy, and thus serve as proof of concept that AG can successfully utilize non-speech sound for the delivery of scientific curricula. In particular, an audio-only environment comprised of two levels with different AG mechanics is currently under development. In the first one, players have to guide their space rocket into Low Earth Orbit (LEO), and in the second one they have to clear

up the space in their orbit from space debris. This prototype will be subsequently tested in terms of its efficiency to inform and raise awareness on the specific matters, and if the positive expectations raised by theoretical research are experimentally validated, it will be extended to deal with further astronomical aspects.

Current paper establishes the theoretical framework for the development of AstroSonic on three axes, namely the beneficial impact of interacting with sound, the directions, in which educational audio systems have already been developed, and the directions, in which sound has been so far utilized to represent scientific data. In the second part of the paper, the audio mechanics of the game's two levels are described focusing on the process, through which the targeted curriculum was embedded in the game content.

Theoretical Background

Educational Sonic Interaction Design

Since their early implementation in education, electronic games have exhibited remarkable results in supporting the learning process (Randel, et al., 1992). The latest generations of educational electronic games have evolved into systems that motivate students by giving them an active role in the centre of an interactive experience (Stapleton, 2004). Research has shown that educational electronic games promote students to accomplish their goals and abstain from prejudicial behavior (Griffiths, 2002), while enhancing their self-esteem, creativity, memory, concentration and analytical thought (Susi, Johannesson and Backlund, 2007), as well as their communication and co-operation skills (Sancho, et al., 2009).

As a sub-genre of electronic games, AG are closely connected to the aforementioned characteristics, yet this research focuses on the fundamental building block of their gameplay, which is sound itself and the facilitated modes of interaction between the user and the system through the auditory channel. This inherent feature of AG was approached from two perspectives: a) the systematic use of sound in educational interactive software to support visual information, and b) the utilization of eye-free, audio-only interaction techniques within a gaming context.

In terms of the former, many researchers argue for sound's potential in helping users to develop their dexterity and master complex tools (Franinović and Serafin, 2013). Mapping the multifaceted acoustic and music phenomena to multilayered patterns of information results in the deeper understanding of targeted curricula (Bishop, Amankwatia and Cates, 2008). Sound also attracts and retains users' attention against competing stimuli (Bishop and Sonnenschein, 2012). Music interfaces in particular provide beginners with the means to become acquainted with musical concepts and elaborate on their own creative ideas without any related prerequisite (Seddon, 2007; Berndt, 2011).

In terms of the latter, the absence of visual stimuli has been found to enhance memory and concentration (Targett and Fernström, 2003). Relying solely on the perception of acoustic information clears the way for fantasy to unfold (Liljedahl and Papworth, 2008). It has also been suggested that aural stimuli can act as emotion

triggers in ways possible only through the auditory channel (Parker and Heerema, 2008). Combined with sound spatialization techniques and surround sound technologies, AG gain an increased level of immersion, as players are no longer required to look at a screen, but freely explore the surrounding space instead (Röber and Masuch, 2005).

Directions in Educational AG Design

Despite this promising potential, AG have been implemented for educational purposes in a few ways, which are, in their majority, strongly dependent on graphic information, instead of exploiting the potential of audio-only mechanics. Due to the scarcity of examples, this research included not only educational AG in the strict sense of games, as systems engaging players in an artificial conflict governed by rules towards a measurable goal (Salen and Zimmerman, 2004), but also interactive systems that make use of gaming elements in the scope of delivering a specific curriculum. The following directions in the design of such systems were discerned:

- *Gamification of a music exercise*

This category includes systems that target a specific musical or acoustic property and essentially enrich a drill exercise with game elements. For example, in (Staff Wars, 2018) players control a spaceship and try to shoot down notes that are passing from the one end of a staff to the other. Pressing the key that correctly identifies each note results in a well-aimed shot. Input may also be audio itself, like in the case of the Hedgehog Game (Hämäläinen, et al., 2004), in which players sing into the microphone in order to control a hedgehog ; as long as the pitch of the melody is correct, the hedgehog stays on the right path. Games in this category are not necessarily restricted to a specific sound property, but can address a more extensive curriculum instead. In the case of (Syntorial, 2018), users are introduced to electronic synthesis by first listening to a sound, while the controls of the synthesizer are hidden, and then try to emulate that sound by manipulating the buttons and faders.

- *Gamification of a music performance*

This category refers to systems that focus mainly on music creation by providing a playful interface, through which even beginners can be introduced to musical concepts, including composition and improvisation. Such systems establish a language of communication between player and machine, not necessarily corresponding to the conventional musical language, but facilitating music interaction in the specific context of the game. An indicative example would be Xenakis' UPIC (Xenakis and Solomos, 2001), in which learners use a pen to draw shapes and listen to their audio interpretation. In that way they can apply intuitive or experienced knowledge from fields, such as geometry, design, language and mathematics, in order to play music, without being discouraged by instrumental practice. There have been quite a few such approaches, some posing musical restrictions, while others none whatsoever ; the more 'conventionally musical' control users wish to have, the further they must diverge from simply interacting with squares and bubbles in pleasant soundscapes.

The above distinction serves does not encompass all possible outcomes, which are limited only by the fantasy of the designer. An indicative hybrid approach would be Kronos (Rovithis, Mniestris and Floros, 2014), which tries to balance between the discipline of a music exercise and the freedom of music improvisation. In this project, players have to complete a series of AG, each one targeting a different skill and rewarding with a relevant module, in order to assemble their audio production instrument.

Still, in all aforementioned examples, one thing is in common: they all rely strongly on visual information for the action to take place. Thus, the third category is:

- *Audio-only educational systems*

Primarily developed towards the inclusion of visually impaired people in the learning process, such systems implement mostly text-to-speech technology, and in few cases sonification techniques including auditory icons, i.e. sounds that refer to objects or processes in a realistic way (Gaver, 1986), and earcons, i.e. sounds that refer to objects or processes in a symbolic way (Blattner, Sumikawa and Greenberg, 1989). In (Torrente, et al., 2012) the combination of these techniques is suggested for the development of point-to-click eye-free educational AG interfaces. The most commonly used one, spoken language as a medium to describe on-screen objects and processes, allows players to explore any virtual environment, and thus facilitates the extension of AG curricula to non-musical subjects, including Mathematics, Programming, Biology and Science (Balan, et al., 2014). Despite being practical though, the translation of all game elements into words restricts acoustic and musical properties, such as pitch, timbre and rhythm, from taking a central role in the game experience.

Directions in Scientific Data Sonification

The final step in establishing the theoretical framework for the design of an educational AG on the subject of Astronomy is to investigate the directions, in which sound has been used for the representation of astronomical data. Research has revealed two approaches forming an axis, whose one end hosts works of art, while the other tools for science.

The artistic approach includes works that interpret astronomical data in an arbitrary way aiming at the audience's entertainment. In essence, all music action is triggered by the behavior of the data, but without any intention of educating the listener. Any information disclosed on the process transforming the system's input into sound serves only the communication of the composer's conceptual design. A well-known example is the 1961 work of John Cage "Atlas Eclipticalis", in which the composer used a star map of Czech astronomer Antonín Bečvář in a way that the position of the stars would define the notes to be played (Atlas Eclipticalis, 2018). A more recent example is "Supernova Sonata" by composer/astronomer Alex Parker, who traces supernova explosions in telescope video recordings and lets each note's intensity, pitch and timbre be defined by each explosion's distance, brightness and direction respectively (Supernova Sonata, 2018).

The scientific approach refers to systems that directly translate astronomical data to sound, in the scope of observation and analysis. Since space offers no medium for sound to travel, any wave emissions collected by the scientific instruments of spacecrafts and satellites are scaled onto the acoustic range and become audible by mapping their

dynamic behavior as a function of frequency in time, allowing scientists to monitor the signals' activity through the acoustic channel and to extract useful conclusions, like for example the nature of the signal or the surroundings of the instrument that collected it. In (Spooky Space Sounds, 2018) NASA displays sounds collected from space, such as Voyager exiting the heliosphere resulting in plasma waves rising from 300Hz to 2-3kHz due to the denser gases of the interstellar medium.

Audio Mechanics Design in AstroSonic

Project's Goal and Methodology

AstroSonic is assigned to the middle part of the aforementioned axis. It does not audify astronomical data directly, but neither aims solely at players' entertainment. Its goal is to deliver information on a matter, such as the layers of Earth's atmosphere, and raise awareness on another, such as the problem of space debris, through an entertaining audio-only activity. The sonification method applied is not to remain concealed, but instead can become a tool in the hands of the teacher to explain the targeted curriculum. In terms of research, the project aims to address the following question:

- Can AG serve as efficient educational tools regarding non-musical scientific data?

The methodology followed for the design of the game is an adaptation of the one suggested by the authors in (Rovithis, et al., 2014). First, the curriculum was organised in terms of its characteristics and sonified through parameter mapping, a technique, which maps acoustic properties to complex informational structures by seeking analogies between the two fields (Grond and Berger, 2011). Finally, the appropriate mechanics were designed to conceptually match the game's objective.

Level 1: Into Orbit

In the game's first level players have to fly their space rocket into Low Earth Orbit (LEO). To do so, they need to cross the layers of Earth's atmosphere until they reach outer space. There are 4 layers in Earth's atmosphere: Troposphere (0-12km), Stratosphere (12-50km), Mesosphere (50-80km), and Thermosphere (80-700km). Apart from their difference in size (which was quoted here on average), each one has different characteristics in terms of temperature and composition. The Troposphere is where most of the phenomena associated with day-to-day weather occur, as well as the altitude, in which most commercial jets fly. Temperature decreases with height. The Stratosphere contains the ozone layer. It is weather-free, with temperature rising with height. The Mesosphere is regarded the coldest place on Earth, with temperature decreasing with height. It is also the place, where meteors burn up. Finally, the Thermosphere is where aurora is produced. It is cloudless, contains the Ionosphere and has a temperature that increases with height.

Before applying sonification techniques to all these elements, they were categorized into continuous, including thickness and temperature, and discrete, including all other special phenomena that may occur in each layer. The former were sonified through parameter mapping on constant sounds: filtered noise, whose center frequency changes

with height, was assigned to thickness and a granular texture is granulated according to temperature. The latter were realistically described through auditory icons, such as the sounds of rain and airplanes, or abstractedly represented through earcons, such as a harmonic, vibrating synth pad for the aurora.

Gameplay mechanics refer to the actions that have to be performed and repeated, in order to achieve the game's goal. One research on video games suggests that the fundamental building blocks of gameplay can be described as "Game Bricks" comprised of an action evaluated by rules and producing a result (Djaouti, et al., 2008). The design of AstroSonic was partially based on that concept, but in this case a reverse engineering process was followed. Two actions were identified as the building blocks of the game's first level: to guide (the spaceship) and to escape (Earth's atmosphere). These were then applied to the aforementioned audio content as follows: to guide was interpreted as a series of movements performed by the player with the cursor on the screen, whereas to escape was interpreted as the course from the sound of the atmosphere to the silence of space. Thus, following mechanics were designed: players must find and follow a path, through which the atmosphere's noise is high-pass filtered in an ascending way. As long as they stay on the right track, they will proceed from one layer to the other and hear the respective changes in the soundscape. The duration of each layer's path is relative to its thickness. If the frequency center of the filter is descending, it means that their spaceship is losing height and heading to the surface.

Level 2: Collecting Space Debris

In the game's second level players have to clear up their orbit from space debris. The problem of space debris (or space junk) originates mainly from artificially created objects, such as old satellites and spent rocket stages, that are now defunct. Their disintegration, erosion, and collisions has resulted in a cloud of fragments around Earth that can be very dangerous for space stations, operative satellites and, in the future, spacecrafts that pass through. All space debris were assigned to oscillating sound events, whose timbre and pitch depend on the objects' type and size, whereas distance and trajectory are signified through intensity and spatialization respectively.

The building blocks of the game's second level are to collect (the debris) and to avoid (collisions). To collect was interpreted as grabbing something that lies in front, whereas to avoid was interpreted as doing it within the given frame of time. Thus, following mechanics were designed: players are constantly on a collision course with various objects coming from many directions and need to move accordingly to bring those objects to the center of the stereo field, when they are near enough to be collected.

Conclusion

It has been theoretically proven that AG can be designed as valid tools for education due not only to their inherited properties from educational video games, but also to their inherent feature of relying on sound to establish modes of interaction between the player and the system. Nevertheless, the development of educational AG focuses mostly on music exercises, with the additional help of graphic information, whereas audio-only approaches are scarce and addressed to the visually impaired community.

The educational AG AstroSonic was presented as the authors' suggestion for investigating the efficiency of audio-only game environments to deliver a non-musical curriculum through interaction with non-speech audio content. The game's development is currently in progress ; this paper described the concept, sound, and mechanics design of the first two levels, in which players fly their spaceship into Low Earth Orbit to collect space debris. Future testing sessions to evaluate whether this thesis will find empirical support are of highest priority.

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DIY FILM MAKING IN GREECE, IN THE DIGITAL ERA

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Abstract

The advent of new technologies in the last two decades has facilitated filmmakers to an extraordinary degree. Digital technology offers artists the ability to shoot, edit, distribute and advertise their films in an unprecedented manner. All this is done by the filmmakers themselves, in the spirit of DIY – Do It Yourself. This paper aims to present how these developments have helped filmmakers in Greece, especially in the genres of horror, sci-fi, and fantasy. The methodology of the paper will be based on the relevant literature concerning filmmaking, digital technologies and the film industry. Moreover, it will draw on examples of films such as *Evil* (2005), *Evil II* (2009), *Kamme Koumando* (2012) and others.

Keywords: *Digital Filmmaking, DIY, Internet, Horror*

Introduction

Between my submitting the proposal for the 1st DCAC Conference and the writing of this paper, a Greek film was released by the title of *Too Much Info Clouding Over My Head* (Christofilakis, 2018). When I was preparing my proposal I was not aware of the existence and imminent release of said film, but I believe that it falls into the subject(s) that I want to speak of, even in a slightly indirect manner.

The protagonist is a man in his thirties who has made only one film thus far, entitled *Gay Nazi Cyborg Zombies In Love*. He is currently struggling to find the financing and the cast for his second film, a more conventional love story set at the start of the 20th century. While he basically lives off his girlfriend and his big-time lawyer mother, the financing for this upcoming film is supposed to come from some of his own occasional acting, stage directing or even photographic jobs that he eventually fails miserably albeit hilariously at.

It could be argued that *Too Much Info Clouding Over My Head* (Christofilakis, 2018) is the third film in an unofficial, unintentional line of Greek, black and white, low budget –or even no budget- films that offer an equal number of variations on the story of the struggling, underground director who goes to great pains to finish his first/next filmic project or just to find the financing for it. *Too much info Clouding Over My Head* (Christofilakis, 2018) tells the tale from the perspective of a bourgeois Woody Allen-esque character, whereas Dimitri Athanitis' *Goodbye Berlin* (Athanitis, 1994) is an Aki Kaurismaki-influenced tale of the absurd. *No Budget Story* (Haralambides, 1997), falls somewhere between the two, both chronologically and in terms of content, presenting a basically realistic story, set in a specific sociological context, but with

nuances of, as I mentioned earlier, the absurd. The absurd is defined by the Merriam-Webster Online Dictionary as “the state or condition in which human beings exist in an irrational and meaningless universe and in which human life has no ultimate meaning” (Merriam-Webster Online Dictionary). To quote from Camus: “This world in itself is not reasonable, that is all that can be said. But what is absurd is the confrontation of this irrational and the wild longing for clarity whose call echoes in the human heart. The absurd depends as much on man as on the world. For the moment it is all that links them together. It binds them one to the other as only hatred can weld two creatures together” (Camus 1965: 15). In business terms, *Too Much Info Clouding Over My Head* (Christofilakis, 2018) was probably the most expensive to make out of all three, costing, by the director’s own admission in a recent interview, roughly 16,000 Euros (Bakatselos 2018).

It is worth noting that the connection between the three films was actually acknowledged by the director of *Goodbye Berlin* in a recent Facebook post. In all of these three films, the actual, real-life film maker is burdened with a variety of responsibilities, apart from just directing. Athanitis also served as producer and played a small part. Haralambides also served as music supervisor, co-producer, writer and star. Christofilakis also served as co-producer, writer and star. On the other hand, as is often the case in indie cinema, the process of filming is also a matter of solidarity and a spirit of selfless collaboration, meaning that the film makers have received a significant amount of help from their friends and relatives, as relevant interviews by these three filmmakers will reveal.

Homo Universalis / The Writer as Producer / The D.I.Y. Approach

It is of course common knowledge that a film maker is supposed to acquire a variety of skills apart from directing, such as writing, editing, shooting, acting and even producing/finding the financing for each project. If at older times, the actual combination of all these skills in one project was to be admired but also to be avoided, nowadays it can be viewed both as a necessity and as an easier process, thanks in part to the financial recession and in part to the advent of new technologies. In fact a whole film can now be shot and edited using just one device: one’s own smart phone. So much so that Nikos Kolovos’ phrase “in an extreme scenario, filmmaking can be an absolutely individual, solitary process” (Kolovos 1988: 115) becomes a palpable reality.

An indicative list of apps for editing video on one’s smart phone includes the following: iSuper8, Vyclone, VidTrim Pro, Lapse It Pro, AndroMedia HD, CinemaFX, iMovie, Viddy, Videolicious (Price 2012). Instances of films that have been entirely or partially shot on a smart phone include Sally Potter’s *Rage* (Potter, 2009) shot in 2009 and made available for download in seven parts; *Uneasy Lives The Mind* (Fosheim, 2014), shot on an iPhone with a total budget of 10,000 dollars; *Tangerine* (Baker, 2015); *I Play With The Phrase Each Other* (Jay Alvarez, 2013); Steven Soderbergh’s *Unsane* (Soderbergh, 2018), also a horror film.

Having a wide number of skills pertaining to the same art form or discipline is not such a rare thing: it’s not so unusual for a musician to be able to play more than one instrument, to sing and also be able to record himself or herself, or even to be able to set

up the PA system during a gig and so on. It is having skills in a variety of disciplines or art forms that is regarded with disbelief by some, as it is supposed to be reserved only for geni, such as Andy Warhol, Jean Cocteau, David Bowie or, during the Renaissance, Leonardo Da Vinci. Da Vinci was of course a man of his time, perhaps the absolute, ideal personification of the Homo Universalis. The Homo Universalis is “the iconic man of Renaissance humanism”, someone who is “able to span all the fields of knowledge with his mind force” and thus “gains access to universality” (Sorin 2011: 63).

Centuries after the Renaissance, in his essay *The Author as Producer* Benjamin urged writers of literature to become accustomed with other art forms and other crafts, such as photography and typography (Benjamin, 1970). This urgency was not expressed as a need to revive the Renaissance ideal of the Homo Universalis, but rather as a call for artists to seize the means of production, in keeping with Benjamin’s Marxist worldview (Benjamin, 1970). In this way, writers can finally gain true, essential control of their own art (Benjamin, 1970). Benjamin’s opinions are also echoed in Ellen Lupton’s similarly titled *The Designer As Producer* (Lupton 1997).

Somehow in accordance with the Renaissance ideal of universality and with theories proposed by Benjamin and Lupton, Yannis N. Kolovos mentions in his Ph.D. thesis, which is an account of the Athens Punk Scene, that many members of said scene, former or current, new ones or “veterans”, acquired a number of skills in the Athenian punk movement, skills that varied from actual musicianship to printing, to editing images, to organizing gigs, to recording, releasing and distributing records (Kolovos 2015). These skills helped them within the punk context and beyond it, and also both within an amateur and within a professional context (Kolovos 2015).

Of course, DIY is a notion that is closely associated with the punk movement. It is both a practical concept, one that has to do with familiarizing oneself with certain techniques, artistic or otherwise, but it is also one that has to do with economical/financial/political aspects of the creation and distribution of art. In terms of music, indie or independent can be viewed as a continuation of the DIY/punk spirit. Indie or independent also pertains to economical/financial/political terms, but as years have gone by, it has become a description of a certain technical and aesthetic style. This is applicable in the film world too. Of course, there are exceptions in both cases.

Independent Filmmaking and the Horror Genre

Independent filmmaking contains the concepts of low budget, micro budget and no budget films. These are terms that are very familiar and also pretty much self-explanatory. Of course, from country to country, from economy to economy, from industry to industry, there is a different scale regarding the estimation and definition of these terms. One industry’s big production might be another one’s low budget film.

One of the most famous independent films of all time also happens to be one of the most important ones in the horror genre: George A. Romero’s *Night of The Living Dead* (Romero, 1968). The film had an initial budget of 6000 dollars, but was completed with a budget of 114,000 dollars, which is still small change by the American film industry’s standards. Of course, it grossed 18 million dollars worldwide during its initial theatrical release, as well as launching Romero’s career and rejuvenating the zombie and the

horror genre in the process. The film was made as response to the film industry's "thirst for the bizarre", according to a George A. Romero interview (Hardman and Eastman, 1997). Romero also performed the editing and co-wrote the screenplay.

Romero's movie never mentions the word zombie, but it is one of the most important ones in the whole relevant filmography, influencing a wide variety of directors worldwide and across the decades. Three of these filmmakers were the brothers Nousias and their collaborator, Claudio Bolivar. This team also chose to make a zombie film out of love for genre (horror) cinema and because it would be cheaper for them to pull it through (Papageorgiou and Ioannides 2009). Contrary to Romero's team, though, Nousias and his collaborators had no hope of actually satisfying the Greek film industry's thirst for the bizarre, or its thirst for genre cinema or its thirst for horror in particular.

Genre films and horror films in particular are still not respected in Greece: not only are they considered contrary to the notion of "Greekness" but they are also not perceived as "serious" or even "commercial" cinema (Kagios 2010). Nousias' film, *Evil (To Kako)* (Nousias, 2005) was the first Greek zombie film to get an actual theatrical release and to be played in international festivals (Papageorgiou and Ioannides 2009). He even got to shoot a sequel, *Evil In The Time of Heroes* (Nousias, 2009), his last feature film to date. Other filmmakers have been less fortunate in that respect.

D.I.Y. Filmmaking In The Digital Age

What, then, could be the solution for someone who wants to make genre cinema in Greece, for someone who wants to realize his or her artistic vision, no matter how immature, silly, gorey, campy, or, simply, of limited interest and commercial potential it might seem to mainstream producers, distributors and media? The digital age offers a variety of tools for overcoming at least some of the practical, technical and financial difficulties.

I spoke earlier of the technological advantages that smart phones and other devices bring along with them. Social media, YouTube channels and official websites are also important tools for advertizing or even distributing one's film. Another benefit to be derived from the advent of the Internet is Crowdfunding. The main forms of crowdfunding (also known as participative financing) are donation crowdfunding, investment crowdfunding and presales crowdfunding. The legal framework in Europe and America has been well established. In Greece it is based on two recent acts of legislation. The first, Law 4351/2015, acknowledges the right of credit Institutions, banks and public sector institutions to run crowdfunding campaigns in order to financially support actions, institutions or persons (Law 4351/2015, in Psalidas 2017). In this case crowdfunding pertains to donations, not the financing of projects such as films. The second one, Law 4416/2016, permits the foundation of crowdfunding platforms/businesses, referred to as Investment Services Providers (Greek: ΑΕΠΙΕΥ) or Alternative Investment Management Companies (Greek: ΑΕΔΟΕΕ) (Law 4416/2016, in Psalidas 2017). These platforms are allowed to publish crowdfunding campaigns by individuals or companies which must not exceed 500,000 Euros, with donations by individual contributors not allowed to exceed 5,000 Euros (Law 4416/2016, in Psalidas 2017).

However, Greek visual artists, writers, musicians and filmmakers do in fact tend to use crowdfunding platforms. A rough research of mine in Indiegogo, Patreon and GoFundMe using keywords such as Greece, Greek, Greek Film, Athens, Salonica, Thessaloniki, brought about an interesting set of results. My May 31st research in Indiegogo brought about 82 results for the keyword “Greek”, 35 results for “Greece”, 35 results for “Greece-related”, 59 results for “Athens”, 23 results for “Salonica”, 61 results for “Thessaloniki”. My research in Patreon, on that same date, brought about 71 creators for the keyword “Greece”, 40 creators for the keyword “Greek”, 31 creators for the keyword “Athens” and 5 creators for “Thessaloniki”. My research in GoFundMe, on the abovementioned date, prompted the following figures: 94 results for “Athens Film”, 151 results for “Greece Film”, 1003 results for “Greek Film”, 5 results for “Thessaloniki Film” and zero results for “Salonica Film”.

Among the Greek projects to be found in such platforms are full-length documentaries like *O Yiorgos tou Kedrou*, or *Me and My Shadow*, about the late, great singer Nikos Papazoglou. Others are closer to the Noussias’ film, like *Legend of The Dragonphoenix V*, a self-released Conan The Barbarian-like comic book that has spawned a series of film adaptations shot by and starring the original creator of the comic.

DIY or low budget films to have come out of Greece in recent years often pertain to genre filmmaking such as horror, sci-fi, crime, fantasy and exploitation/parody. Examples include: *I epithesi tou gigantiaiou moussaka* (Koutras, 1999) a science fiction comedy in the vein of *The Blob* (Yeaworth, 1958) and *Mars Attacks* (Burton, 1996); *Super Dimitrios* (Papaioannou, 2011), a humorous take on the superhero genre, set in Thessaloniki and inspired by the peculiarities of the local community; *Kame Koumando* (Damianakis, 2012), a sci-fi film, involving a warrior from the future deciding to travel to a post-apocalyptic ‘present’; *I Epistrofi ton Katharmaton* (Bogris, 2003), *Ta Remalia* (Bogris, 2003) and *Catharsis* (Bogris, 2009), takes on the crime/revenge genres, the latter one being a film release, while the former two were released on video. Despite their dubious aesthetic or even political elements, for the most part, these films prove not only a true love of their makers for their respective genres but also an uncompromising artistic vision and an unfettered will to make this vision into a reality.

Conclusion

If you will allow me, I will end this paper on a somewhat romantic note, speaking not only as a Ph.D. Candidate but also as an artist, albeit of another kind (a published author of fiction). As with many other aspects of Greek life, arts and the cinema in particular fall victim of a hierarchical mentality, whereby a nomenclature (of publishers, producers, gallery owners, older, better-known writers/artists/filmmakers, along with the mainstream media) decides, in an absurd fashion, what constitutes art and what does not, what constitutes talent and what does not, what constitutes commercial material and what does not. The internet, the advent of new technologies, crowdfunding platforms and all the other means I have described during this presentation, offer younger, less acknowledged artists a platform to work against this mentality, not in the hope of abolishing it but at least in the hope of getting their own artistic vision through.

Or, to return to Camus and the absurd, “To work and create ‘for nothing,’ to sculpture in clay, to know that one’s creation has no future, to see one’s work destroyed in a day while being aware that fundamentally this has no more importance than building for centuries—this is the difficult wisdom that absurd thought sanctions. Performing these two tasks simultaneously, negating on the one hand and magnifying on the other, is the way open to the absurd creator. He must give the void its colors” (Camus 1965: 72-73).

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AUGMENTED REALITY AND VISUAL ARTS

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Abstract

This research explores the use of augmented reality technologies in the field of visual arts, focusing on the way that visitors and artwork interact. The bibliographic research focuses on exploring the definitions of augmented reality and interaction. The historical overview defines the two above-mentioned fields and looks into their connection with art, via exploration of their visual characteristics. We present the implementation methodology for such enhanced artwork and the process of interaction with the observer. Our research extends beyond typical presentation and citation of augmented and interactive visual works as it sets two main objectives a) discuss the way the artistic work which use augmented reality technologies interacts with the visitor, as well as b) present how human senses are stimulated through visual art work when new interactive augmented reality technologies are employed.

Keywords: *Augmented reality, Interaction, Art - Technology, Multisensory Multimedia, New-Media Art.*

Introduction

In recent years there has been a rapid evolution of augmented reality technologies and applications that have found their way in various everyday fields. This has resulted applying those technologies into various fields such as education, medicine, gaming and art. Here with the term art we refer to the visual and interactive arts. Our research focuses on the application of augmented reality technologies to the visual arts.

In an artwork in which augmented reality technologies (AR) are applied, aesthetics and interaction play a key role (Παγουλάτου, Λάζου, & Ντούρμα, 2017). There are many studies that on real-world technologies. These technologies are applied on many areas of everyday life such as gaming (Boulos, Lu, & Guerrero, 2017), theater and performance (Jaewoon, Yeonjin, Myeong-Hyeon, Dongho, & Byeong-Seok, 2015), and education (West, 2012). In recent years, as far as visual arts are concerned, artists have been employing systems, platforms and applications enabling them to realize their artistic creations. Those systems change with time as technologies evolve and reange from the software named “ARART” to end-to-end solutions such as “HP Reveal” (formerly known as Aurasma) (List of augmented reality software, 2019). Our

research questions moves beyond the technical elements of the software to the user-experience sector: 1) How is the interaction between visual art and augmented reality and the visitor implemented? 2) Which of the five senses are stimulated through the artwork? 3) How are those senses stimulated?

Augmented Reality

Augmented Reality AR is a way to link physical items from the environment to virtual content. The main difference between AR and VR lies in the fact that AR integrates the user into the physical environment in real time, offering the possibility of improving all the five senses even if AR applications usually use only the vision, while VR isolates the user from it. Augmented reality was created to enhance the view of the natural world and this is accomplished by using computers, sensors and image processing technologies (Kipper & Rampolla, 2012).

AR techniques appeared in 1962 when Morton Heilig designed a machine which immerse the user in a full range of sensory stimulation while watching short films. This machine – sensorama- is the first known multi sensory technology. Followed in the 1970s, by the establishment of Videoplace by Myron Krueger. Krueger created a virtual reality and interactive art environment in which by using augmented reality, users could interact with virtual objects (Kipper & Rampolla, 2012). These two events are what triggered the revolution in the development of AR technologies and applications. As technologies evolve, in 1994 Julie Martin created a theatrical production called “Dancing In Cyberspace”. During the show and while the dancers performed acrobatics on the stage, virtual objects appeared on them and around them (Dils & Cooper Albright, 2001). Today, such theater and performance productions are common and Projection-based AR techniques are used. In the field of art this technology is called “Projection Mapping” that covers a smaller field than Projection-based AR (Jaewoon et al., 2015). In recent years, researchers managed to develop techniques that these three-dimensional projections could applied not only to fixed objects but also to moving objects, as this technique requires automatic alignment of accurate moving image objects (Jaewoon, et al., 2015).

Interaction and Art

Active participation of the observer in the formation of an artwork and the need for his presence for the development or existence of the artwork itself is an embodiment of interaction. AR clearly enables this to be implemented as it provides a tool to interact with artwork. Of course this concept is not something new, as by researching art history, it emerges that during the period of the Futurism and Dadaism, there was a need from artists to physically and emotionally engage the public in their artwork.

Artists of that period (Futurism and Dadaism) sought the interaction, in other words the reaction of the public towards their artistic action. At this time, the Happenig’s predecessors could be identified along with the first at-

tempt to integrate the visitor into the artistic work. Then follows Allan Kaprow (Χαραλαμπίδης, 1995), the father of Happening, who was the first to engage the visitors actively in his artwork. His idea was born when he noticed in the environments he was creating that each visitor was becoming part of his artwork. Based on this observation, he decided to give to every visitor the opportunity to be actively involved in shaping the project. This was led to Happening. Today, the interaction of a project with the observer can be achieved through the use of technology and can become more complex and multileveled than it could have happened with Happening.

Interaction and AR

For artists, how the observer feels or what he/she experience, is a key factor for their artwork. This goes beyond the logic of comparing one artwork item with the other or in other words “this piece sounds like or looks like”. Specifically, interactive digital art is purely about interactive experience (Edmonds, 2014). The way in which visual art interacts with the public is a critical part of the essence of the artist and his work. The reaction towards the project is the core of it and is more important than any other aspect in an artwork. The creative practice of the artist who chose this path is quite different from that of a painter. In the case of interactive art, the public’s response is the key element that will concern the artist, rather than the color or the perception of perspective. The public’s commitment to the project is based on what the public does, how it interacts with the project, and so forth (Edmonds, 2010). A basic part of the interactive arts is also part of the immersion of the visitor.

In the art of technology, observer’s immersion does not only function as a visual-spatial illusion but also as the sense of conscious immersion in a fake world and/or artistic processes. This is particularly true in the case of interactive art, which requires awareness of the things that are offered through interaction and focuses on the reactions of the observer who is actively involved. Here, the focus is not on escaping from everyday life, but on the emotional and mental intensity of the experience. In interactive art, the way that the participant-observer acts is important for him to perceive the artwork (Kwastek, 2015). The need to study the interaction between art and public has revealed the need to create a study model.

Zafer Bilda in 2011 developed a model for studying the connection of the public with the visual interactive artwork. This was the result of the research he conducted when he examined the interaction of art with the public. He found that, the observer’s engagement with the project shifted from involuntary actions to deliberate actions that led the observer into a sense of control. In some projects observer’s involvement continues through developing levels of exploration and uncertainty. It should be noted that Bilda has recognized four phases of interaction in an interactive visitor system: adaptation, learning, anticipation and deeper understanding (Edmonds, 2014).

Through the above research it is observed that a series of issues concerning the audience experience are important to the interactive artist and the research on these points is an important part for the creative process of an artwork. When creating an interactive visual artwork, artists should take into account the engagement processes and engagement types of the visitors involvement (Edmonds, 2010).

Aside from the above, which mainly concerns the artist and what needs to be taken into account in order to activate and engage the visitor with his interactive digital artwork. The key question remains how the visitor is affected when he/she receives the above information from an interactive artistic work that is connected with some real-time technology. Part of the answer to this question comes from the interactive artwork created by Diaa Ahmed Mohamed Ahmedien (2017) who created a neural interactive work of art in the form of a holographic puzzle in an attempt to expand the functional role of brain activity in interactive artistic processes.

The experiment connects the imaging system of the puzzle pieces with the electrical activities of the participant's brain by the means of an electroencephalography system. This experiment reveals the effect of the functional expansion of the participants' nerve responses and the ability to quantitatively analyze the interactive processes in an operational interpretation of the neural dimension in the interactive arts. If the brain is properly stimulated by the participant then the holographic tiles will appear and the participant can solve the puzzle. As a result, participants recognize how the system works and exercise self-observation and self-control in order to manipulate the holographic pieces of the puzzle. Finally, data from brain signals was summed up in comparative tables to reveal the reciprocal interaction processes between each participant's neurological response and performance. This technique is called "Neurofeedback" and is a technique that affects the nervous system of the brain, in which brain activity is recorded using electrodes and is presented visually so that the person can functionally know the state of his brain nerve signals and their performance.

Comparing Zafer Bilda's method of analyzing the interaction of the visual work and the steps that the visitor should take in order to engage with the interactive work, the way that Diaa Ahmed Mohamed Ahmedien analyzes in his research of the brain activity of each participant from his acquaintance with the system as the solution of the interactive holographic puzzle, we see an analogy of the steps and an increase in brain activity when the brain is in the final stage of solving the puzzle. As the author says, in order to solve the puzzle, the brain should produce Gamma waves that represent the state of hyper-brain activity (Ahmedien, 2017). In this case, intense brain activity is been produced by the person through his interaction with the AR artwork.

AR applications have been applied to language studies, social sciences, the arts and humanities, entertainment and recreation, as well as advertising and marketing. Many studies have found that AR offers visitors interesting, enter-

taining and exciting experiences as well as shocking sensations (Chang et al., 2014). As far as educational applications are concerned, it has been reported that both teachers and students believe that AR not only promotes participation and motivation but also creates a realistic and new learning environment by combining both the real and the virtual (Chang et al., 2014). Studies have shown the effectiveness of using AR in education. The findings seem to suggest that it has contributed to increased academic achievement and promoted positive emotional experiences compared to traditional teaching (Ibáñez, Di Serio, Villaran, & Kloos, 2014).

Artwork

Nowadays, artists in order to make the interaction between the visual work and the observer, make use of various technologies and, above all, AR technologies. A well-known artist working with AR is Masayuki Akamatsu, an example of his work from 2012 is the ‘‘Uroboros Torch’’ (Masayuki, 2012). This exhibition consists of eight paintings in which the augmented reality is achieved by the use of a mobile phone. That is, the visitor has the ability to see through his cell phone parts of the paintings come to life, also the tables are connected with speakers that augment the reality for the visitor through the sound. It is observed that through these technologies the visitor interacts with the project by activating in addition to his vision, touch and hearing.

Artist John Craig Freeman also deals with the visual arts and the combination of augmented and virtual reality unlike Akamatsu though, his works are large-scale outdoor installations One of his recent works is ‘‘Mexico Border Migration Stories’’ 2017 (Freeman, 2017). The artist through AR allows viewers to be in two different worlds simultaneously offering mostly visual stimuli.

Another artist who deals with the political form of art and the use of augmented reality is Patrick Lichty. In his ‘‘Love Bombers’’ (Lichty, 2012) project of 2012 made a visual art political statement against the NATO summit in a Chicago demonstration where, over the protesters mob sing a cell phone the observer could see virtual planes bombing the mob with virtual hearts. This project connects a historical event to a geographical environment (Lichty, 2014). And in this project AR technologies provide visual stimuli to the public. This is not the only artwork of this artist, he has made a series of works linking the natural surroundings of Alaska with the present and the past criticizing industries exploiting the mineral wealth and destroying the environment. As the artist himself mentions in his work ‘‘Into the Wild / Virtual Kenai’’ of 2014, he portray another form of conquest in the Anthropocentric Age (Lichty, 2014). In this way, his work falls within a historical context while still having a critical position. In this work the artist also used a QR-code technology.

Similar political, social and environmental concerns produce the work of Nathan Shafer ‘‘Kenai Tapestry’’ of 2013-14. This artwork consists of a large-sized woolen tapestry that portrays the Kenai Fjords National Park in Alaska

and is connected with real-time augmentation techniques by providing information on the location through the forest site. This artwork reflects the artist's concerns about nature and its destruction (Lichty & Shafer, 2016).

Subsequently, a different form of AR is found in the artwork of Golan Levin and Zachary Lieberman "Footfalls" (Levin & Lieberman, 2006). In this interactive projection the sounds that produced by visitors' feet are detected by microphones under the floor and used to determine the size and number of virtual objects (bubbles) that fall from a height of six meters. The less number of visitors experience the stumbling blocks, the more virtual elements fall from the top by projection. Also, visitors using their silhouettes can "move" the projected bubbles around them. It is noticed that when the visitor joins in (with all his body within the artwork and) his movements and the way he walks, are those elements that influence and shape the artwork. The visitor literally becomes one with this artwork, as he physically becomes part of his evolution, mainly by visual stimuli.

In addition to the image and motion AR is also associated with sound. One such example is the artwork of Mene Savasta Alsina and Hernan Kerllenevich "Ahora" (Alsina & Kerllenevich, 2013) which is an interactive sound installation. This sonic artwork varies according to the movement of each visitor. In other words, the presence of the visitor and his movement in the space modifies each time the composition, in a sense re-writing each time this composition in a different spacetime. This way, the visitor is physically integrated into the artwork and remodels the project through its movement. The stimuli that a visitor receives are mainly acoustic.

Another work worth mentioned is the "water shapes" (Παπαδοπούλου, 2018), which is an audiovisual - visual artwork that deals with the subject of water and creates a visual interactive environment that connects sound, image and augmented reality in order to help the audience interact and immerse. The project is divided into two parts. In the first part, nine photographs are presented in which the use of a mobile phone achieves the augmentation of reality, as the visitor has the opportunity to see via his mobile phone these photos come alive. In the same space (part) there is a video art that enhances the sound. In the second part of the project, as the visitor moves into space, he activates a sensor and a perfume diffusion mechanism. In this way the sense of smell of the visitor is activated. As the visitor enters the second space of the work, light diminishes and the only light sources at this point is a holographic projection which is projected inside an inverted pyramid and an interactive projection with a virtual rain in which when the visitor approaches, he sees himself inside and his body drips up with water drops. The water drops follow the movement of the visitor's body in a rainy environment. Through holographic projection, a stable rain sound is provided in the room. Through five distance sensors connected to an Arduino system, different rain and water sounds are activated depending on the visitor's movement, each time setting up a different sound depending on

the traffic and the crowd of visitors. It is important to notice that through this artwork an effort is made to activate the visual, tactile, acoustic and olfactory senses of the visitor.

The Royal Academy of Art (KABK) and the Delft University of Technology Foundation set up an AR workshop in which two related research projects were developed. The aim of the first was to research and apply the AR technique in the arts, design the technology and dissemination of the technology to the creative industry. The aim of the second project was to combine AR with the interaction and diffusion of technology into public institutes such as museums. Through this collaboration, they have emerged a series of works that combine art AR technologies interaction with the visitor and work (Caarls, Jonker, Kolstee, Rotteveel, & Eck, 2009). This research will only mention a 2007 artwork titled "Out of the Blue", which is an augmented reality audiovisual environment in which the exhibition area was transformed into a blue landscape where elliptical shapes were floating and creating the landscape. As the visitor was moving around, he could see and hear around him a various of flying objects (Caarls, et al., 2009).

Finally, it should be noted that art and AR technologies are not tools exclusively for visual artists. They can be tools of expression and artistic creation for students as well. An example (a prototype one) is the four students of 1st E.E.E.EK. Pilea-Chortiatis (Greek secondary special education school) who they presented at the 10th Student Computer Science Center of Central Macedonia their visual work which was connected with AR technologies (*10ο Μαθητικό Συνέδριο Πληροφορικής*, 2018). The students took their own photos and they edited them using various techniques such as collage, or coloring, and they linked them through AR application to their new artworks. In this way they recreated their natural environment. With the use of a mobile phone, the observer could see these works.

Conclusion

Beyond the purpose and research questions raised in this paper, small-scale historical references were sourced in order to connect the concepts of interaction, AR and the arts. Historically the incorporation of AR technologies into the visual artwork and the need for the artwork to interact with the visitor, a series of artworks have been presented and analyzed. The artists with their artworks attempt to incorporate the observer into them by activating his senses both physically and psychologically.

Through this brief research it is realized that the visitor ceases to be just a simple observer but acquires an active participation role in the project, by formulating through his choices the form of the project he is visiting. It is also observed that artists are trying to activate as much as possible the senses of each visitor and not just his vision.

Most of the aforementioned projects note the need for an observer to use

his/her mobile phone devices so that he/she can read the augmentation of reality in each project. In two of the examples, it is observed that through an interactive projection the observer takes an active part in shaping the project by acting with the projection through the motion of his body. A similar configuration of the artwork, referred to the two examples mentioned was the sound work that was presented using different forms, analogous to the crowd and movement of each observer. Apart from the visual, tactile and sonic stimuli that were reported as offered examples to the visitors, one of the projects offered olfactory instigation.

It is remarkable to see that artwork through AR technologies is also evolving as a tool of social and political criticism by offering artists a basic expression for their positions and the involvement of visitors in the political and visual work. It was also noticed that as technology evolves, art evolves as well. Technology offers solutions and art exploits them. As a natural continuation of this research a larger-scale research should follow that will deal with the collection of visual artworks making use of AR technologies and promote as much as possible the interaction between the visual work and the observer. Through this new research, safer conclusions can be drawn about the use of these technologies in interactive art environment.

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CREATING ALGORITHMIC AUDIOVISUAL NARRATIVES THROUGH THE USE OF AUGMENTED REALITY PRINTS

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Abstract

The paper investigates the hypothesis of creating non linear audiovisual narratives, through an unanticipated use of traditional print based games, enriched with videos, via augmented reality possibilities. A ludic system has been created and presented. Based on a traditional card game, a non linear cinematic narrative occurs. We attempt to examine questions as: In which way can we bring together different forms of visual communication, such as graphic design and video? Can the above forms create a complex narrative whole and what kind of rules will be needed for that? How can we enrich traditional forms of gaming with the potentials of augmented reality (AR)? Gaming itself demands a set of rules. Can these rules play the role of algorithms in the combined universe that we have designed and created? In which way the designer in one hand, and the user on the other hand influence the overall output of the system? What will the user experience be like? The printed card system chosen for that matter is Tarot and more precisely the Great Arcana, which makes use of the 22 fundamental Tarot figures.

Keywords: *augmented reality, database cinema, non - linear narrative, print, Tarot.*

Introduction

Digital interactive art projects are characterized by the potential of multiple choices during navigation, where the user is faced with hypertextual structures, called to act according to the interface and the system's rules, which have been designed and defined by its author. The actions of the spectator-user, based on intuition and having a ludic character, influence the formal and narrative evolution of the piece through the function of feedback.

We have created a system whose hardware is based on a traditional printed Tarot deck as well as a smartphone or a tablet. The physical gaming is connected to digital audiovisual narratives. Thus a dialogue between "hard copy" game and video is being established.

The system contains both an analog collection and a digital database. The analog database comprises paper prints and the digital comprises videos. Using AR technology, we create a unilateral relationship between a print and a video. The emerging experience of interacting with this system is more complicated and richer than the sum of its analog and digital parts.

Video overlaps with graphic design. The device (smart phone/tablet) functions as a window to a personalized narrative, as a secret keeper. At the same time, the notion of voyeurism is provoked, since the one viewer sees what nobody else does. Thus the screen of the phone becomes a «key-hole» to a secret narrative, where audiovisual data overlaps with the target object. The succession of video fragments caused by the successive scanning of target objects, leads to a kind of hypermontage. Interpretation from the part of the user is a key element to the described narrative system. Programming has been realized in and projected via HP Reveal (www.hpreveal.com)

The card system chosen for this research is Tarot and more precisely, the Great Arcana, which makes use of the 22 (out of the 78) Tarot cards. According to the website Tarot.com (<https://www.tarot.com/tarot/cards/major-arcana>),

“The Major Arcana cards are the most recognizable and impactful cards in a Tarot deck. These 22 cards represent situations we all face in the grand scheme of life, with each carrying specific messages of perspective and guidance to help you in times of need... Though each of the Major Arcana cards stands alone with its own deep meanings and influences, linearly speaking, these 22 Tarot cards also tell a story... This storyline is a great description of the accomplishments, setbacks, and lessons we all learn as we go through the trials and tribulations of our lifetime, growing into whole, complete beings by the end of our journey”.

Tarot as a model of card structure for the implementation of the experimental AR system, and the use of montage

The main goal of the experimental AR system created in the context of the research, is the creation of coherent audiovisual narratives, occurring from a card reading system. Moreover, the user herself, through her ability to relate fragmented micro narratives via connotations between personal experiences and facts, will give a meaning to the overall output of the system. Since the content presented over the cards is video fragments, semantic montage interconnects the parts of each card reading series, creating a holistic meaning.

For Eisenstein, if shot A and shot B were to form an entirely new idea, C, then the audience had to become directly involved. It was necessary that they work to understand the inherent meaning of the montage... The real key to the system of film is not the artist's relationship with his raw materials but rather his relationship with his audience... The process of film was far more important than its end, and the filmmaker and observer were engaged in it dynamically (Monaco, 2000:403).

At the AR Tarot reading system, the observer is also the user, thus she is dynamically involved to the narrative, not only due to the interactive nature of the AR system, but also because Tarot proposes personalized readings of its fragmented parts, set in a row. Traditional Tarot is a *personalized story-telling* card system.

Based on the premise that fortune telling is a spontaneous narrative experience, Pulumbo (1979) proposes that the Tarot deck is a marvelously intricate and finely tooled mechanism for generating innumerable, remarkably coherent stories in the archetypal mode. Through the explanation of each card's meaning, he tries to show how the basic elements of narrative -plot, character, setting or situation, style, symbolism, and theme- are all inherent in and arise from the structure of a Tarot meaning.

The AR Tarot reading system

At the AR Tarot reading system, the user has multiple properties, since

- She defines the theme of the narrative/reading, through a personal question,
- She is the main character of the upcoming reading,
- Plot derives from connotations between the cards' readings and the symbolism attributed to them.

The user *asks a question*. This is the initial step of the reading. Hereinafter, everything connects to this question. She takes the deck of cards in her hands and mixes it well. She chooses the cards that are going to be read. There are several ways to throw the cards of the Great Arcana. The simplest is to choose four of them and place them in a row. Thus the reading is made in a linear way (Figure 1).



Figure 1: Card sorting

With the help of a smart device (Tablet, phone), the user scans each card separately and the video fragment corresponding to the card overlaps it (Figure 2).



Figure 2: Card reading - video overlaps the card

The card reading is performed by actress Jasmine Kilaidoni, who has been shot in strict closeups, facing the camera, thus addressing to the observer (Figure 3). Monaco (2000:406) mentions Balázs (2010), who, fascinated by the “secret power” of the closeup to reveal details of fact and emotion, developed a theory of the true province of film as “micro-dramatics,” the subtle shifts of meaning and the quiet interplay of emotions that the closeup is so well equipped to convey. The emotional and narrative power of the closeup enriches the meaning of the reading.

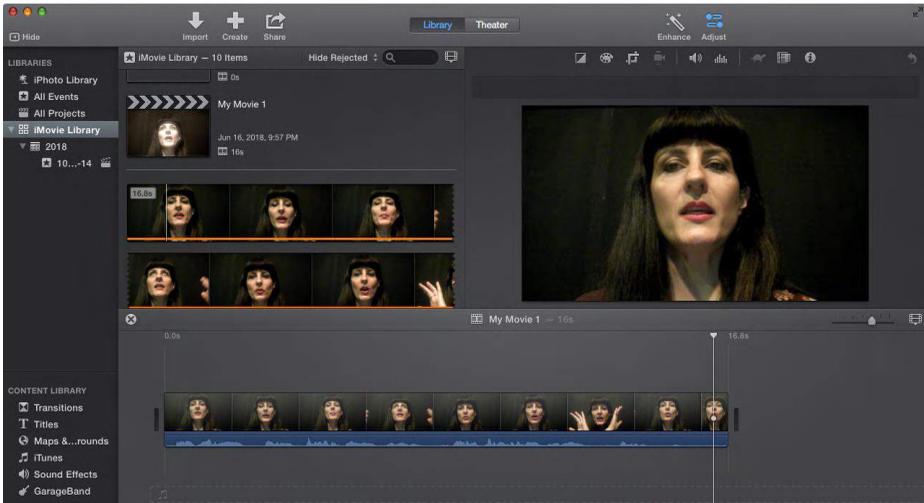


Figure 3: Jasmine Kilaidoni filmed in closeup shots

Murray (1997: 110) claims that when we enter a fictional world we actively *create belief*. Because of our desire to experience immersion, we focus our attention on the enveloping world and we use our intelligence to reinforce rather than to question the reality of the experience. The reading of Tarot itself is based on belief. Medium Marina says “I usually tell my clients that it doesn’t matter how they shuffle the cards; it doesn’t matter from where in the deck the cards will come from

– the ‘right’ cards will come out anyway” (Jung and the Tarot-Part II- Synchronicity, 2018).

One would conclude that belief from the part of the user, “micro-dramatics” and computation form the part of the AR system and interpretation from the part of the user again, are able to lead to personalized non linear narratives of a liminal medium. Wondering about the border between physical and digital media, Janet Murray (1997: 103) wrote:

“Part of the early work in any medium is the exploration of the border between the presentational world and the actual world.... One of our main activities, as creator and audience, involves testing for the boundaries of the liminal world”.

In augmented reality (AR) systems, the border itself, between the presentational

world and the actual world, operates as the intersection which gives the content a narrative and experiential surplus. The liminal space takes the form of an audiovisual and tactile interface.

Conclusion

The interface of the AR Tarot reading system consists of printed Tarot cards and a smart device. The programming has been realized in and projected via HP Reveal (www.hpreveal.com).

A hypermontage arises through the use of the interface. Thus the hypertextual structure is designed by the user herself, who follows the rules proposed by Tarot. A direct connection is being established between still images – printed cards- and cinematic narratives. When this relationship is enriched by the rules that conduct analog Tarot, algorithmic audiovisual narratives emerge, connecting physical and digital content.

System's output is an organized collection, whose parts are put in sequence by the user-observer, in a ludic way. Printed entities trigger cinematic narratives and the succession of the prints define the final montage, therefore the user experience. The succession of the shots, all filmed in closeup shots, are the answer to the user's personal question, asked in the beginning of the procedure. Montage is directed by the user, who chooses four cards among 22, puts them in order and finally targets them with a mobile device. Meaning arises in an intertextual and connotational way.

Future work

We aim to design an original Tarot deck focusing on an experimental use of graphic design and typography. We will also examine the possibility to have more than one video fragments corresponding to each card, in order to offer a richer series of successive readings of the system.

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DIGITAL CULTURE AND EDUCATION I

TEACHING ELECTRONIC MUSIC PRINCIPLES TO KINDERGARTEN-AGE IN THE DIGITAL ERA WITH SYNTH4KIDS WEB-APPLICATION

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Abstract

In today's digital era, the accelerated development of music technology has transformed the way people interact with music. The current digital-cultural environment shapes children's music preferences, forming new types of music literacies. To that point, the incorporation of digital media in music lessons can provide new and extended ways of music teaching and learning. Despite the rapid societal, cultural, and technological changes, music education has not given proper attention to integrating music technology into teaching processes. This is more intense to kindergarten-age, where the traditional music-educational methods, as designed decades ago, do not involve new technologies in their content and tend to focus on musical instruments and genres, absent in the new digital-cultural environment. This article presents an educational proposal for incorporating virtual instruments into music teaching and learning processes at kindergarten-age. For that purpose, music-educational activities will be designed using Synth4kids web-application, an original music-making software oriented to music lessons, in their content. Actions will be developed emphasizing improvisation development, sonic experimentation, experiential learning, kinesthetic experiences, and cooperative teaching, tailored to the musical needs and preferences of children in the current digital environment.

Keywords: *music technology in education, virtual instruments at kindergarten-age, music-educational activities*

Introduction

The rapid development of music technology in the current epoch has transformed the way people interact with music (Webster, 2012). In today's era, children are growing up in a digital and multimodal environment that shapes their music preferences (Kokkidou, 2016). In that context, the incorporation of new technologies and digital media in music lessons can offer new and extended ways of music teaching and learning (Tobias, 2016). However, despite the continuous societal, cultural, and technological changes, music education has not paid the appropriate attention to music technology (Williams, 2014). That phenomenon is more intense to the younger ages, where the traditional music-educational methods do not include new technologies in their content (Mygdanis, 2018).

This article attempts to provide an educational proposal for integrating virtual instruments to kindergarten-age. For that reason, music-educational activities will be designed, embodying Synth4kids web-application as the primary tool in their content. Actions will be composed with emphasis on improvisation development, sonic experimentation, kinesthetic experiences, experiential learning, and cooperative teaching, considering the needs of the current musical, digital, and multimodal literacies of the modern digital environment.

New technologies & digital media in music education

In an environment where communication is widely digital, music teachers should consider students' desires anew, designing musical activities including digital media (Tobias et al., 2015), tailored to the modern society's needs through a variety of new forms of literacies (Miller, 2011). The fast and substantial social and technological changes of the postmodern era have led to the formation of new types of literacies and the transformation of the existing ones (Kokkidou, 2016). Music technology has become an essential ingredient of children's music lives, emerging new meanings of musicality, and forms of experiencing and creating music (Chrysostomou, 2017). To that point, integrating digital technologies in music lessons can provide extended and augmented ways of teaching and learning (Webster, 2012).

Despite the immense social and technological changes of the last years, research on the field has shown that music education has remained unchanged and stable for over the last decades (Gouzouazis & Bakan, 2011), and is deemed insufficient to align with the requirements and needs of today's students (Kratus, 2007). From a historical retrospective, approximately forty years need to be passed for music education to implement the "new," for every era music styles, elements, and instruments into the music lessons (Williams, 2014). In correlation with the fact that technology becomes obsolete with a significantly high speed each year, the need for implementation in music teaching and learning is becoming more critical (Chrysostomou, 2017).

Music education maintains a distance from the new technologies and today's digital era. This is enhanced by music teachers' unwillingness to apply new technologies in their teaching processes due to hesitation, uncertainty, and lack of experience (Bauer, 2013). Common technological issues, as well as students' skills to handle technology more efficiently, are factors that reduce educator's self-confidence (Chrysostomou, 2017). In cases where digital media are implemented, teachers use them to do the same tasks they did in the past, with the same objectives, ignoring the newly formed educational environment (Kokkidou, 2016). In this way, applying music technology is restricted to the theoretical background and knowledge of music, like music theory courses (Riley et al., 2013). In such cases, the only change in the educational process, is the alternation of the methodological tools, through replacing acoustic instruments with software applications, while the pedagogical context remains unchanged and conventional (Mygdanis, 2018).

Regarding young ages, the interaction of new technologies can develop and transform digital and multimodal literacies, as new media consist of a fundamental part of children's everyday lives (Kokkidou, 2016). However, the absence of technology in music teaching and learning is more intense to kindergarten-age, where the traditional music-educational methods (Dalcroze Eurhythmics, Kodály Method, Orff Schulwerk), as designed many decades ago, do not involve digital media and virtual instruments in their content. As a result, they tend to emphasize instruments and music styles, vanished in the new digital-cultural environment, resulting in a vital part of children's music preferences and needs not to be expressed (Mygdanis, 2018; Williams, 2014).

Virtual instruments in music education

Digital media can contribute to the transformation of education through formal and informal types of learning, structuring new meanings, and setting new perspectives in music educational processes (Kokkidou, 2016). In the last decades, virtual instruments, a category of software applications for visual representations of musical instruments, have emerged (Goldberg, 2000).

Implementing virtual instruments in music lessons opens up new horizons in the music teaching and learning process, developing a new pedagogical model significantly different from the conventional one (Williams, 2014), providing possibilities for various new forms of expression, performance, experimentation and music composition (Stewart, 2009), with endless possibilities, restricted only by the capabilities of the individual (Blackwell & Aaron, 2015). Besides, their practical application can have a positive impact on musical skills, and creativity development (Crow, 2006), as well as understanding abstract musical concepts and terms (Riley, 2013), in a more in-depth and meaningful way (Ho, 2007).

Virtual instruments design presents a prominent role in how they can be implemented efficiently in music lessons, as only a few are oriented to music lessons, and their development often follows a traditional design model (Ruismäki et al., 2013). Most emphasizing users' existing behavior in acoustic instruments (Wigdor & Wixon, 2010), restricted to the digital reproduction of pianos, strings, glockenspiels, drums, etc. (Goldberg, 2000), ignoring the distinct and diverse modes of interaction that digital media and new technologies can provide (Mygdanis, 2018).

Synth4kids virtual instrument application

Synth4kids consists of a virtual analog monophonic synthesizer web-application instrument, developed by the writer (Mygdanis, 2018). Supplying cross-platform and mobile browsing compatibility, it can be used on any tablet or computer, along with sensors, like Makey-Makey, eap-Motion, tablet's tilt sensors, or web-cameras, providing rich kinesthetic experiences. Oriented to music lessons, it combines elements from the traditional music-educational methods, such as the use of pentatonic scale layout and movable-do technique. Besides, the music keyboard consists of eight buttons, colored from red to violet starting from the note C, as on Orff instruments and Boomwackers.



Figure 1: *Synth4kids main window*

Synth4kids is also equipped with the fundamental features of an analog synth. Two oscillators are generating the sound signal in four discrete waveforms (sine, square, triangle, sawtooth) represented by children's sketches, along with the detune function and partial configuration controller. In combination with components like the A.D.S.R., filter envelope, E.Q., L.F.O., and sound effects (delay, reverb, chorus, distortion), kids can get in touch with fundamental sound design principles. Furthermore, the module of drum-machine, ribbon layout and the arpeggiator, which automatically plays the notes of a chord in repetition, provides opportunities for further sound experimentation.

All in all, Synth4kids can supply children with the opportunity to get in touch with fundamental sound design and electronic music principles multimodally, offering expanded sound experimentation and improvisation capabilities. This article attempts to present an educational proposal for extending music teaching and learning using Synth4kid virtual instrument to kindergarten-ages, reflecting children's preferences, and providing rich musical experiences.

Music-educational activities

For the purposes of this educational proposal, a set of music-pedagogical activities are developed, using Synth4kids web-application, emphasizing children in the kindergarten-age (4 to 6 years). Based on current trends and approaches to music education, actions focus on the development of children's creativity and critical thinking through experimentation, active listening, and experiential learning, drawing on the methodological tools of cooperative teaching, game, interdisciplinarity, and multimodality, in the context of informal types of learning.

Children are expected to come in contact with new forms of music creation and expression, to perceive the interconnection of technology with the social and cultural context and the position of music in today's environment, as well as understand musical concepts and electronic sound features in-depth. For their practical application, only a laptop or a tablet with an internet connection is required.

We are the robots!

In the role of a "mad" scientist, the music educator attempts to "program" his robots (children) through improvisation in Synth4kids web-application. Children, divided into groups, are trying to represent robots with any robotic movement they desire. Depending on the complexity, restrictions on children's movement may be set (e.g., a specific movement can be agreed for the use of the arpeggiator module or a specific effect). If kids are familiar with handling the application, the activity can be organized by separating children into two groups of "mad" scientists and robots.

- *Methodological tools: Multi-sensory music teaching and learning, exploration, cooperative teaching, role-playing*
- *Music goals: Improvisation and expression development, active listening, experiential music learning, active listening*

Music e-Paint!

The music educator presents to children a painting of abstract or abstract expressionism art and urges them to perform it musically, focusing on elements they find interesting (e.g., lines, color, or shapes). The kids, separated into groups, decode the painting as a graphical music score. The teacher records each attempt, and in the end all the sounding results are heard. With the following discussion, musical concepts such as sound, texture, or tempo may emerge. It is advisable for children to have tried similar actions in the past using acoustic instruments. Composition VIII (1978) by W. Kandinsky, Bleu II (1961) by Joan Miró, or Summertime Number 9A (1948) by Jackson Pollock are representative selections for that activity.

- *Methodological tools: Cooperative teaching, active listening, dialogue, interdisciplinarity, experimentation*
- *Music goals: Creativity and critical thinking development, sound exploration, active listening, collaboration skills development*

Inspector paint decoding!

A group of inspectors is trying to clarify a valuable painting's theft, analyzing witnesses' information. Children are divided into groups of two (witnesses, inspectors). Based on a hidden painting, witnesses start playing on the Synth4kids web-application, interpreting the picture as a graphical music score. Inspectors start drawing what they hear, attempting to decipher it. In the end, each one reveals its painting result. The group that has decoded the painting best is the winner. In the end, a discussion about the similarities and differences is taking place, emphasizing drawing elements like color or shapes (e.g., "Why do you think the A used circles while B did not?").

- *Methodological tools: Development of critical thinking, sound exploration, active listening, development of collaboration skills, creativity development*
- *Music goals: Interdisciplinarity, dialogue, active listening, experimentation, teamwork, role-playing games*

Space music composition!

The music educator shows children a non-dialogue muted video excerpt, up to one minute, emphasizing topics like space, robots, or technology, and encourages them to compose music for this video in groups with Synth4kids web-application. They can use every feature of their choice; however, depending on the children's familiarity with the software, some elements may be delineated. The educator records kid's creations. After completion, composition results are heard, and all together discuss similarities and differences. Emphasis may be placed on musical elements such as timbre, texture, or tempo (e.g., "Why do you think that the group I used that sound effect and group II not?" or "Why did you choose that waveform?"). It is advisable for children to have performed similar activities in the past, using acoustic instruments. Representative selections for that activity could be Pink Panther in "Star Pink" (1978) or Reksio Kosmonauta (1972).

- *Methodological tools: Interdisciplinarity, cooperative learning, active listening, learning through assessment, experimentation, dialogue*
- *Music goals: Creativity and expression development, experiential learning of sound effects, sonic experimentation, critical thinking development, cultivating imagination*

Future Work

The above musical-educational activities are designed to provide expanding ways of music teaching and learning processes at kindergarten-age, attempting to reflect the digital-cultural environment and the current musical and multimodal literacies. As restricted on the use of only a laptop or a tablet, various musical and expression features are not included, like the connection and interaction with distance sensors, midi interfaces, and web-cameras. A future educational proposal could emphasize the implementation of external hardware for richer kinesthetic and multimodal experiences. Furthermore, the activities were restricted to the web-application without the simultaneous use of acoustic instruments or other digital media. Music-educational activities development combining Synth4kids with acoustic and Orff instruments is of the intended plans.

Finally, the ultimate purpose is a practical intervention of the above educational proposal in kids of that age. Future research will shed light on how children at the kindergarten-age react with music technology and virtual instruments, enlightening the aspects for effective incorporation in music teaching and learning, as well as outlining perspectives on educational application design and development.

Conclusion

Music technology has gained a vital role in music life, becoming an essential ingredient of children's music preferences, emerging new meanings of musicality, and ways of experiencing and creating music (Chrysostomou, 2017). To that point, digital media and especially virtual instruments, such as the Synth4kids web-application, can enrich the ways of music teaching and learning, even at the very young ages, tailored to children's musical needs and preferences (Mygdanis, 2018).

In conclusion, the integration of digital media in music lessons is neither an apparent nor a determined process. This procedure is quite obscure and requires small and well-designed steps, as various and unknown conditions, and uncertainties might appear. In that context, every educational change must occur with the view that the main pedagogical goal is not and should not be the integration of technology. Technology is only a tool, and our foremost aim is and must remain the educational process (Kokkidou, 2016).

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ARTISTS: A VIRTUAL REALITY CULTURAL EXPERIENCE PERSONALIZED ARTWORKS SYSTEM: THE “CHILDREN CONCERT” PAINTING CASE STUDY

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Abstract

In recent years, there is a constant tendency in integrating modern technologies into mobile guides and applications in Cultural Heritage (CH) domain, aiming in enriching cultural user experience. Amongst them, Virtual Reality (VR) has widely been used in digital reconstruction or restoration of damaged cultural artifacts and monuments, allowing a deeper perception in their characteristics and unique history. This work presents a VR environment that takes into account the diverse needs and characteristics of visitors and digitally immerses them into paintings, giving them the ability to directly interact with their characteristics with the Leap Motion controller. To test our proposed system, a mobile prototype application has been designed, focused on the famous painting “Children Concert” created by Georgios Iakovidis, which also integrates the User Personas and the different scenarios depending on users’ profile.

Keywords: *Cultural Heritage; Cultural User Experience; Natural Interaction; User personas; Virtual Reality;*

Introduction

In recent years, various works argue about the positive influence that Augmented Reality (AR) and Virtual Reality (VR) could have on the fields of language studies, social sciences, mathematics and physics, medical science, art, entertainment, advertising and marketing (Chang Kuo-En, 2014). According to Chang, Chang, Hou, Sung, Chao, Lee, VR and AR technologies promote art appreciation to museum visitors during a visit. In other words, visitors that used those technologies to guide through a museum learned more about the exhibits comparing to all other visitors that used conventional guides (audio guides) or walked freely without any kind of guidance. A VR guide can boost mental and visual focus on exhibits, achieving a level of flow (Mihaly

Csikszentmihalyi, 1975), which motivates user to seek more knowledge and extend his visit.

Meanwhile, personalization methods in User Experience (UX) and Cultural User Experience (CUX) appear to give a new perspective to mobile guides and applications in Cultural Heritage (CH). Personalization (Antoniou & Lepouras, 2010) is based on the assumption that a computer system can understand the user's needs, while its success relies greatly on the accurate elicitation of the user profile. The main reason for personalization need is simple: Everyone is unique. Matching visitor's experience, knowledge and demands is a highly challenging and demanding task. Capturing special personal characteristics, before or during the visit in a cultural site, has been implemented using several methods, for example using ontologies, methodological approach, statistical approach (Pujol Laia et al., 2012), or indirect approach by taking advantage of social networks like Facebook (Antoniou Angeliki et al., 2016), or finally, according to visitor's age and behavior.

Current work presents a Virtual Reality interface that represents digitally the world of paintings, allowing users to interact with the aspects of the painting in a 3D environment. The presented framework also integrates personalization, user personas (based on the User Personas methodology [Konstantakis Markos et al., 2017]) and context awareness techniques to improve users' experience. In Section 2 we briefly present our ARTISTS framework, the technologies that we used along and how we integrate them to the application, the frameworks' architecture and a use case scenario with our prototype based on and the famous painting "Children Concert" created by Georgios Iakovidis. Finally in Section 3 we discuss our future work.

ARTISTS Framework

Description

ARTISTS is a mobile application that brings to life famous paintings, by digitally construct its aspects in a Virtual Reality environment, where users can interact with its 3D models. Users immerse into the VR world by using their own devices mounted on a VR headset (Google Cardboard), and then interact with the 3D environment using gestures that are captured by the Leap Motion controller, that's attached on the headset. The proposed interface not only puts user inside a painting, allowing them to observe and interact with the 3D models in many angles, but also uses various methodologies (context-awareness, personalization, and gesture-recognition) in order to enhance user's cultural experience.

ARTISTS prototype has been designed based on the famous painting "Children's Concert" by Greek painter George Iakovidis, which can be found in Athens National Gallery – Greece, and in a digital format in "George Iakovidis" digital gallery, in Hidira village – Lesvos. For this painting, seven 3D human models were created, along with their animations and sounds, in accordance with the 7 characters found in the original painting. Painting's surrounding space (a bright room having some furniture) has been digitally reconstructed in a VR environment, taking into consideration the limited resources of mobile devices.

ARTISTS prior version was a mobile application in which users were also able to interact with the 3D version of a painting by just tapping on mobile device's screen, thus without totally immersion to the VR environment. Application settings like sound, running scenarios, animations etc were depending on user's profile and interests, a functionality that still stands in ARTISTS, but with the use of more accurate methodologies.

Technologies used in ARTISTS Context Awareness

In ARTISTS design, we take into consideration parts of the context like the ambient noise level, processing power of the mobile device and screen resolution, trying to improve users' experience regardless of environmental conditions. In particular, in a quite noisy environment (to the noise level of 50dB), sound volume can be increased up to 50%, whilst in extremely noisy conditions (noise level more than 70dB), application audio volume mutes to avoid Lombard effect (Varadarajan Vaishnevi, Hansen John H.L., 2006). In a full scale application of ARTISTS, noise levels would be measured by a sensors network, in accordance with user's position in space. Furthermore, processing power of the portable device in use can be a crucial asset which can deeply affect user experience. Insufficient resources could affect the reproduction of high-resolution 3D animation and graphics needed to construct the VR environment, while also screen resolution could be a negative factor in displaying high resolution graphics. A short benchmark on the background, during application installation can easily adjust applications' settings to the appropriate level based in devices' capabilities before the initialization of the application, thus avoiding malfunctions during users' experience.

Personalized User Experience

In our case, we use the User Personas method, which categorize users based on their profile during a museum visit. User Personas (Morris, Hargreaves and McIntyre, 2004) are not real people but avatars created studying real people's characteristics. We use 4 User Personas with the names "Follower", "Browser", "Searcher" and "Researcher". Followers try to follow any guidance provided by the museum or cultural site, trying also to learn something by it. Browsers won't follow a guide but go anywhere, in every place that looks interesting, and then, they search for information about it. Searchers will search and collect detailed information on specific exhibits or collections whilst Researchers step further on a scientific research about specific exhibits (Konstantakis et al., 2018).

Gesture Recognition and 3D Interaction

Gesture recognition refers to computers' ability to understand gestures involving physical movements of multiple body parts (fingers, arms, hands, head, feet, etc) and execute commands based on the corresponding gesture, thus allowing interaction with the computer environment. Many gesture recognition approaches suggest that gestures used as interaction methods between humans, can also been successfully applied as a natural and intuitive way to interact with machines [Ren et al., 2016][Yeo et al, 2015].

In ARTISTS framework, we use the Leap Motion controller to track users' hands and match their movements with commands in the virtual environment. As users' mobile device is found into a Google Cardboard type VR device, it is impossible to tap on the screen. Leap Motion API gives us the tools to interact with the app interface by using hands. Simple tasks like selecting a character, dragging the volume slider, selecting from menus and pressing on UI buttons can be done with natural hand movements in space, in a quite accurate, intuitive and entertaining way.

User Personas

The design of personas as 'fictional' characters is considered as a very consistent and representative way to define actual users and their goals. However, it is important to clarify the exact number of personas in each occasion in order to focus on the visitor profiles to be examined. On ARTISTS, we take into consideration these UPs and their characteristics and we create more Personas by splitting Followers and Browsers into 3 Levels. Searchers and Researchers are combined and split into 2 Levels. These Levels have a quantitative meaning. For example, Level 2 Researcher has done more research and shows more of the initial Researcher characteristics than Level 1 Researcher.

In order to match each museum (or any other cultural site) visitor to an ARTIST persona, the system collects and process various data about visitors. Data mining is ARTISTS involves no user interference or preparation and it's a 3-stages process:

1. *Face recognition*: Using Microsoft Cognitive Services, user age and emotions are calculated by their face picture taken from the device's front camera that is sent over network. In addition, a database of visitors is created, turning every possible upcoming visit into a more successfully personalized experience.
2. *Social networks data mining*: Using data mining algorithms, visitor's data (profile and prior experience) are extracted from user social profiles (Facebook, Twitter or Instagram). Fully compatible with GDPR rules, algorithms can only use data that users expose as public.
3. *Behavior study*: Sensors embedded into the visiting area monitor visitors' path and behavior into space, providing ARTISTS more personalization data.

System Architecture

ARTISTS is a Client – Server system, as shown in *Image 1*. Core of the system is a server, located either in a museum (or any cultural site) or in a remote position. Server supports communication between database, application and sensors network (installed in museum). Furthermore, more server tasks are responsible for matching visitors to predefined personas, or displaying multimedia for the VR environment.

The mobile application creates the appropriate interface between user and ARTISTS system. Depending on visitors' profile, the system shows a different scenario and service. Server also is responsible for handling sensors' and Smart Objects (SO) input that can alter applications' content.

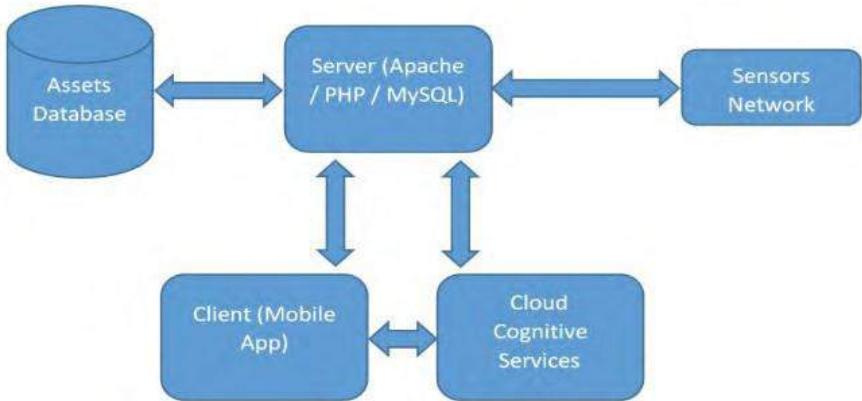


Image 1: System architecture in ARTISTS

General			Interaction				Efficiency / Performance			
User type	Age	Smartphone	Menu	Characters	Sounds	Game	Motion	Sound	Quality	Fidelity
Follower Level 1	Child	No	Basic 2	None	None	Yes	Fun	Medium	Low	Low
	Elder	No	Basic 1	None	None	No	Slow	Low	Low	Low
Follower Level 2	Child	Yes	Basic 2	Basic	Basic	Yes	Fun	Medium	Low	Low
	Adult	Yes	Basic 1	Basic	Basic	No	Slow	Low	Low	Low
Follower Level 3	Elder	Yes	Basic 1	Basic	Basic	No	Slow	Low	Low	Low
	Teenager	Yes	Basic 1	Basic	Basic	No	Medium	Medium	Low	Low
Browser Level 1	Adult	Yes	Basic 1	Basic	Basic	No	Medium	Low	Low	Low
	Child	Yes	Basic 2	Extended	Extended	Yes	Fun	High	Low	Low
Browser Level 2	Teenager	Yes	Full 1	Full	Full	No	Full	High	Low	Low
	Adult	Yes	Basic 1	Extended	Extended	No	Medium	Medium	Low	Low
Browser Level 3	Elder	Yes	Basic 1	Basic	Basic	No	Slow	Low	Low	Low
	Teenager	Yes	Full 1	Extended	Extended	No	Full	High	Low	Low
Researcher Level 1	Adult	Yes	Full 1	Full	Full	No	Full	Medium	Low	Low
	Teenager	Yes	Full 2	Extended	Extended	Yes	Medium	Medium	High	Low
Researcher Level 2	Adult	Yes	Basic 1	Basic	Basic	No	Medium	Medium	High	High
	Adult	Yes	Basic 1	Basic	Basic	No	Slow	Low	High	High

Table 1: Interaction – usage scenarios in ARTISTS.

Use Case Scenario

After getting necessary visitor data and assigning one persona from Table 1, one of the 19 usage scenarios may initiate. These scenarios are 19 in total and matching a visitor to a scenario is a dynamic process. For example, user can start visiting a museum as a Level 3 Follower, but after a while, his behavior can turn him into Level 1 Browser and then Level 2 Browser. This happens because behavior monitoring is an ongoing process that gives feedback data which can eventually change the flow of user experience. Each one of the scenarios in Table 2 is different in functionality, interactivity, display quality and load, audio (Table 2).



Image 2: The VR representation famous painting “Children Concert” created by Georgios Iakovidis

Conclusion - Future work

In this work, we describe the ARTISTS framework, a mobile application that displays a VR reconstructed environment of a painting, and immerses users allowing them to interact with its 3D aspects. We used the Leap Motion controller as a sensor for detecting gestures, alongside with Unity, Microsoft’s Azure Cognitive Services and Android Studio for the implementation of the application and the MySQL database that stores the 3D environment and painting’s data. Our next step includes the ARTISTS evaluation stage, in which we will test our framework to evaluate user’s experience and the efficiency of our integrated technologies.

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ORCHESTRA: AN INTEGRATED ICT PLATFORM FOR CREATING RICH INTERACTIVE CULTURAL EXPERIENCES

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Abstract

Cultural organizations such as Galleries, Museums and Libraries are, traditionally, facing problems of financial sustainability that can be attributed, to a certain degree, to the lack of or difficulty to implement impressive and experiential educational activities for their visitors. Orchestra is a collaborative R&D project that addresses this through the provision of an ICT toolkit and methodologies for rich interactive storytelling deployed in smart spaces. Among the first outcomes of the project is a framework for developing interactive surfaces (e.g., interactive wall or floor).

Keywords: *interactive experiences, interactive multimodal storytelling, smart cultural spaces, interactive surfaces*

Introduction

The Orchestra platform proposes a new type of interactive productions for cultural experiences as well as a new dissemination model for the respective experiences. It adopts an open and horizontal approach to integrating input and output devices in order to better support storytelling. The project designs and develops an orchestration engine that can manage and coordinate all the connected devices in well-defined stories, edited through a visual editor. We intend to support “conventional” sensors and peripherals (e.g., projection systems, audio systems, gesture- interacting systems such as Leap Motion) as well as custom ones, developed by our team. One of latter is an interactive wall system, that can turn a wall, or similar surface, of any size to a multi- touch display.

Overall Concept and Methodology

Orchestra consists of four main components: a) Orchestra Storyteller: a free storytelling editor that enables GLAM (Galleries, Libraries, Archives, Museums) staff to create engaging scenarios without special technical knowledge, b) audiovisual and interaction devices that can transform a room to a smart space (e.g., interactive wall, gesture-interacting systems, proximity/presence sensors, projector, sound system, smart lights), c) Orchestra Appliance: a box coordinating all peripherals and executing the scenarios loaded and d) Orchestra Gallery: an online marketplace where Orchestra scenarios can be published, shared and sold.

The Storyteller allows visual editing of a scenario along a storyline, by setting actions related to user interaction. It also manages multimedia content and associates content items with specific scenario actions. The scenario editors can also easily find, during edit-time, relevant and useful content from integrated sources. The appliance is actually an embedded middleware that handles all issues related to playout of an experience, e.g., DRM (Digital Rights Management), integration with devices and 3rd party applications, playout control.

Special effort is put on special peripherals enabling touch and gesture-based interaction. The first one is an interactive surface system that is implemented with infrared computer based technology and TUIO framework. This system is currently the most developed one and is further described in the following section. The second one is a wrapper framework for Leap Motion, a popular platform for gesture-based interactions. This wrapper framework applies some more advanced data analysis methods to the standard Leap Motion framework.

The project will build upon open and mature technologies in order to provide the aforementioned functionality. Integration of third party applications and devices will be supported by a well- defined application model and open APIs. Special APIs will support integration of Web games, implemented through Phaser.io framework.

The final system will be assessed by real users, mainly school classes visiting the Music Library of Greece, where a reference deployment will be made. A special evaluation methodology will be designed in the course of the project to allow for identifying problems and opportunities for such systems.

Interactive Surfaces in the Context of ORCHESTRA Platform

In the ORCHESTRA platform the basic requirements regarding the interactive surface are i) operation of the system in horizontal and vertical surface, ii) capability of multitouch and iii) scalability in terms of the surface size.

First of all let's clarify what the term "multitouch" means. Multi-touch (or multitouch) denotes a set of interaction techniques which allow computer users to control graphical applications with several fingers. Multi-touch consists of a touch screen (e.g., computer display, table, wall) or touchpad, as well as software that recognizes multiple simultaneous touch points, as opposed to the standard touchscreen (e.g. computer touchpad, ATM), which recognizes only one touch point (Chanda & Acharya, 2016).

There are five major techniques being employed that allow for the creation of a stable multi- touch interactive displays (walls, tables, floor); Frustrated Total Internal Reflection (FTIR) approach, Rear Diffused Illumination (Rear DI), Laser Light Plane (LLP), LED-Light Plane (LED-LP) and Diffused Surface Illumination (DSI) (NUI Group, 2009).

These five techniques all work on the principal of Computer Vision, where inputs are extrapolated in real time by analyzing a video feed/s through single or multiple cameras. The use of computer vision to obtain and extrapolate input data makes these techniques not only cost effective and high resolution, but also makes them very scalable.

In the context of ORCHESTRApatform we adopt the Laser Light Plane Illumination (LLP) technique. This technique allows for the implementation of interactive tables and wall-sized interactive surfaces. We utilize IR lasers (780nm) in order to create a plane just above the surface (e.g. wall). Most setups go with 2-4 lasers, positioned on the corners of the touch surface. Laser modules need to have line lenses on them in order to create the light plane. The most common used lenses are those of 90 or 120 degrees. The necessary hardware parts for the implementation of an interactive surface with the LLP technique are the following:

- Projector
- Infrared Lasers
- Line Generating Lens
- Infrared camera
- Computing unit

In the selected design, an IR camera is placed near the projector and captures the projected area. Actually the camera's optical axis is perpendicular to the interactive surface. The camera can be a simple web camera or a camera that allows only one wavelength to pass (in our case filters out all wavelengths and allows 780nm). In the latter case the accuracy of detection is superior than the simple web camera and additionally this setup is more robust in terms of false blob detection and ambient illumination changes. Figure 1 depicts the schematic setup of the interactive wall on ORCHESTRA platform.

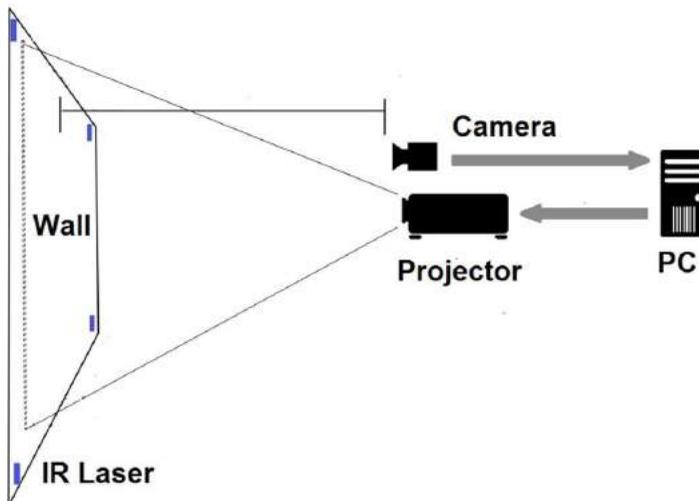


Figure 1

When a finger touches the surface interrupts the light plane and subsequently is illuminated. The infrared camera detects this illumination (see Figure 2).

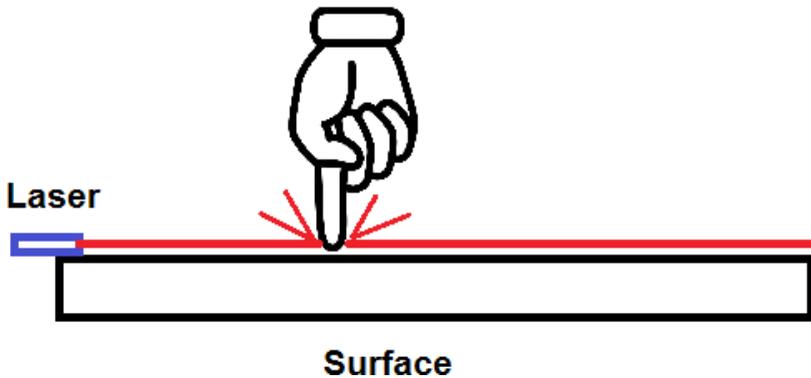


Figure 2

The computer vision software that runs on the computing unit, processes the camera frames and “translates” it as an IR blob. After the calibration procedure is completed (is performed only once in the initial setup phase), the coordinates of the blob are registered and are used for determining (in real time) the coordinates of the finger in the touch surface. The camera captures continuously the surface and the software could process multiple isolated touches (nearly 200).

Conclusions

The present work is still in progress. Until now in terms of “smart peripherals” we have a first prototype of an interactive wall module and a programming framework for controlling smart (WiFi-enabled) light bulbs to control ambient light. In terms of the Orchestra platform architecture we have come to an initial design and are currently running a survey for potential implementation technologies and frameworks. The system prototype will be hosted in the Music Library of Greece “Lilian Voudouri”, which is also a partner in this project, together with Tetragon S.A.

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DIGITAL ARTIFICIAL COMPOSERS: ISSUES OF AESTHETIC VALUE, CULTURAL MEANINGS, CREATIVITY, AND ONTOLOGY

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Abstract

Digital artificial composing is a new field of musical creation. Artificial composers do not mean to replace humans, but are new technological tools that support algorithm-based musical creation. However, many questions arise especially with respect to music creativity, music aesthetics and music education. The aim of the paper is to critically present and discuss the new scene in the field of musical composition regarding the digital artificial composers, taking three case studies: David Cope's creations Emily Howell and EMI, and Mellomics, created by a team from the University of Malaga. Our suggestion is that we cannot conceptualize this new way of music creation without thinking of the aesthetic context of production, issues of intellectual property, creativity, ontology and related cultural meanings and aesthetic values.

Keywords: *artificial composers, creativity, ontology, aesthetic value*

Music is defined as a uniquely human phenomenon, according to the anthropological perspective proposed by Alan Merriam (1964), who defined music as “a product of human behavior in time and space” (p. 7). Moreover, every music form corresponds with structures in society, as music “exists only in terms of social interaction” (p. 27). Yet, in the last decades the new digital affordances have transformed the above conceptions and traditional status of musical creation. Recently, computers offer new possibilities for music creation through advanced softwares, presented as artificial composers, who are able to take on complex musical tasks, such as composing, arranging, orchestrating, transforming a musical piece into various styles, inventing new sounds, and so on. Artificial composers were not created to replace real people, but are new technological tools that change or extend the processes of musical creation. However, many questions arise, especially with respect to musical creativity, music sociology, and music aesthetics. Can artificial music be valued [evaluated] by the same criteria and within the same system that measures the value of human music? Who is the author of such works? Is that kind of music a social product and manifestation of culture? What about the ‘fair use’ of musical data that inform the computer database? What kinds of skills are required to produce such music? What kind of meaning resides in such musical forms?

Our paper attempts to critically present and discuss the new scene in the field of musical creation by artificial composers, and to cover some concerns taking three case studies: David Cope's *Emily Howell* and *EMI*, and *Mellomics*, created by a team at the University of Málaga. Artificial composers create aesthetic, ethical, and philosophical-ontological concerns. It will take considerable time before the symbolic, cultural and musical-aesthetic perspectives associated with these new technologies become fully understood.

Technological evolution and music

One of the most important developments in the history of music was the invention of digital audio production. Since Edison's first recording in 1877 –and the following changes from wax cylinders, vinyl, to compact discs, MIDI files, and mp3– technology has transformed music production, reception, and dissemination (Mueller et al., 2017). Humans are currently interested in building machines that mimic their music abilities and can perform complex music tasks.

The new digital environment has influenced the traditional perception of the definition of the musician. While some believe that musical creation has benefited considerably by digital tools, others reject this idea and continue to use traditional ways in composing their music. Thus it is important to understand how digital media have influenced musical creation and the production-reception- dissemination of music as a whole. Technology is both an agent and a medium in today's musical experiences. Technology creates music, it mediates music, and it allows us to interact with music (van Elferen, 2009, p. 130); it has brought considerable changes to the quality of sound and determines musical experiences. This has led to the formation of 'digital aesthetics', which stands opposed to the 'analog aesthetics' of the previous decades (Moseley, 2016).

The new generation of composers is the first one that creates within the digital revolution. A musician in today's world of music software differs a lot from the musician of the past, as "the dividing lines between the composer, the arranger, the performer, the studio engineer, and even the listener are becoming much less clear-cut" (Hargreaves, Marshall & North, 2003: 149). For digital musicians, acoustic awareness –the ability to listen to music widely and accurately and to understand how the sound behaves in space and time– is becoming increasingly important. Similarly, skills and knowledge about technology, such as sound recording, mixing, remixing, etc. are also crucial. Tasks, which until recently required a group of skilled people with professional knowledge, can now be managed by only one person, in most cases, the music creator. Musicians are now able to have their own personal home studio for sound manipulation and recording. This is a new culture of musical creation.

Artificial music composers

What exactly is an artificial composer? In fact, it is a computer program that composes music based on algorithms, a set of rules and instructions for composition. The program receives input and manipulates it in human-like ways; it analyzes the material using deep neural networks, combines information, and forms a final product. Algorithms

are designed to make decisions. Algorithms, based on probability equations, were used in most works by Iannis Xenakis. It seems that, among other things, technology breaks down the myth that creativity is purely human.

Computers can execute every task formulated in a language their hardware understands. They use a modular language, like the human one. Most works by artificial composers are based on audio input material while the programmer is the one who designates the result. There are softwares, such as Max/MSP/Jitter, that allow users to manage input tones and transform them into new sounds that can be changed further. Namely, according to the artificial composer's programs, one may feed an idea into the computer and get a final output. Then they can manage this material as they want: elaborate it, modify, reverse or expand it, add various effects and so on. Algorithms for artificial synthesis can work in many ways. In one sense, the artificial composer learns almost like a human composer: it 'learns' the rules of composition, the physical constraints of the instruments, the most usual combinations that fit a particular style (Farrell, 2015). At any rate, the question we may ask is: should artificial composers be considered and evaluated as human composers?

Artificial composers, three cases: *Emily Howell*, *EMI*, and *Melomics*

We will discuss some examples of digital artificial composers. *Emily Howell* and *EMI* are two new music composers, or a 'new kind' of composers, two artificial composers, created by David Cope, composer and emeritus professor of music. The idea started in 1990 and was completed in 2003. Cope has created two artificial composers that follow two different algorithmic methods. The first method (used in *EMI*) involves the analysis of musical examples for motifs, rules and similarities, and the use of this data to create new original content in the style of a composer. Similarly, as Farrell (2015) observes, one could analyze Shakespeare's sonnets to identify the similarities in their underlying structures and their content, and then they can use those rules to create a new Shakespearean-style sonnet. The second method (used in *Emily Howell*) uses external association networks that give a 'response' and automatically receive external feedback as to whether or not the result produced is appropriate and acceptable. Cope's creations are some of the most well-known cases of artificial composers, with *Emily Howell* seen as the most successful. Composers' programs have allowed Cope to create hundreds of tracks within few minutes (Muscutt, 2007, p. 12) and choose the best version.

Prior to *Emily Howell*, Cope created *Emmy* following the initials of *EMI* (Experiments in Musical Intelligence), which was less active, based on his first method of analytical approach. *EMI* could imitate famous composers like Bach and Mozart, analyzing thousands of their works and finding similarities within them. In an interview to Keith Muscutt (2007), Cope was asked about how he felt that *EMI*'s music could compete with real composers. Cope responded that it is not an issue about machine-versus-man, but one about a man with pen and paper versus a man with algorithmic rules. He also added that he is a human who creates music using his software tools claiming: "my programs follow my instructions in producing what would have taken me several hundred or even a thousand times longer to create"

(p. 13). Hence, he considers *EMI* not as an autonomous entity but as an extension of his own compositional abilities. It is him who provides the music input for *EMI* in order to create music and customizes the algorithm to have the desired result. It is him who has the final word on whether the result is satisfactory. The result is not what the computer proposes, but what Cope wants.

Emily is scheduled to create music according to feedback received from Cope. Therefore, *Emily*'s compositions follow the associations network model that requires programmer's approval. *Emily*'s music has received positive critique by some reviewers though it has been criticized by others as "bland, chordal sequences [...] like a child with technical skills that tries to copy Beethoven or Bach, or even Michael Nyman on a bad day: it is good for elevator, and not for a concert hall" (Ball, 2014). The radio producer Fred Childs, who heard Howell's compositions, said that if he did not know that this was the result of a computer program, he could think it was the work of someone who might not be a great composer, but with many interesting ideas (Farrell, 2015). While *Emily* is labelled as a 'person', Cope believes that "computers simply obey their programmers' commands. [...] Computers are tools, nothing more, nothing less" (Muscutt, 2007, p. 19). *EMI* and *Emily* are tools that Cope uses for speeding up the process of composition (Farrell, 2015). Although those artificial composers produce and combine sounds, Cope is the one who has control over the starting point and the final result of music.

There are other artificial composers that work with different algorithms. The Melomics program is a compositional algorithm developed by a team at the University of Málaga in Spain, based on a biological evolution approach. According to the designers, for the creation of Melomics, nearly a thousand rules were coded to determine the environment for music creation. As opposed to Cope's algorithms, Melomics does not depend on musical data of other projects, which allows those who use it to create unique works of any kind, as the system is programmed with sufficient data to manage the species without relying on human interaction (Farrell, 2015).

Two artificial composers are using the Melomics: *Iamus* and *Melomics109*. *Iamus* was named after the mythical son of Apollo, who could speak the language of birds. It was activated in September 2010 and composes pieces in the Western art music canon. According to the Melomics algorithm, *Iamus* takes a piece of music, transforms it and checks for changes that are consistent with certain rules. The best products keep changing, allowing the most appropriate pieces to continue to evolve until all conditions are met and complete compositions are created (Ball, 2014). These compositions are not based on human feedback, as in *Emily*. *Iamus* works autonomously to create original music. The only input is what is usually provided by a human composer or by a group, guiding orchestration and duration. The rest is 100% automatic. *Melomics109* is directed towards modern popular music and was activated in November 2013. It is more commercial in the sense that it can produce mainstream music. The head of the Melomics project, Francisco Vico, has said that this project could "democratize the music" as everyone can produce music just like as everyone can shoot great photos. So there will be many more musicians (Farrell, 2015).

All the above seem exciting and promising. However, the idea of an artificial composer is not only a technological challenge, as it has musical and moral dimensions. Concerning music itself, the ‘mathematical correctness’ can be considered as both an advantage and a disadvantage. Surprisingly, today many are trying to create softwares to give a feeling of warmth in digital music. Regarding artificial composers, one can ask whether what we hear is the sound of the machine, and how this machine music challenges the borders of human music as we know it.

Artificial Composers: issues of aesthetic value and cultural meanings

What values are articulated in artificial compositions? What meanings reside in such musical forms? Is it possible to detect the cultural connotations of such music? For Hainge (2016), a piece generated by a non-human agentic force “is music since the sound produced results from a certain aesthetic and thus human disposition [...], even if direct agency over the actual sound produced is surrendered” (p. 215). However, “the use of generative algorithms to produce sound raises different issues since the human agent is involved only in the design of a sound-producing assemblage” (p. 211).

Confusion increases by the fact that human music and machine/artificial music cannot be placed within the same value system and aesthetic continuum, because they come from, and thus represent, different systems of thinking. In the case of human creation the music work is the product. In artificially composed music, the software is the product. This kind of music forces the listener to perceive disembodied sounds, sounds without any origin whose creator seems to be technology itself. For van Elferen (2009), such music works represent the blurring of boundaries between the once clearly designated realms of humans and machines, between human and non-human musical agencies. They are free from the constraints of materiality as they exist as numeric data. Equally significant are the ways artificial composers negotiate the complex musical forms of the past. “Emanating from the field of performance studies, recent debates over the ontology of audiovisual materials and their functions as reenactment of memories of the past have given rise to new formulations of relations between archive and repertoire, text and performance, event and trace” (Moseley, 2016, p.37).

Trying to understand how artificial composers “work”, we tried to examine some new aesthetic dimensions. When we listen to this music, does it create meanings and emotions? Our suggestion is that the knowledge about the ontology of music has aesthetic implications. The process by which music works are created may influence aesthetic evaluation. Although the products of artificial composers and algorithm-based music have certain musical qualities, it is rather hard to determine if those qualities can be considered as music in human terms and have aesthetic value. In short, we claim that if one is not able to recognize the ontological category, which a music piece belongs to, it may be difficult for them to have a fully aesthetic experience. This can be connected to Green’s (1988) theory about the two types of musical meanings: a) inherent meaning (resulting from music syntax or patterns created from the organization of sounds) and b) delineated meanings (extra musical meanings associated with social, cultural, political and personal use of music). In the case

of artificial composers, the connection between inherent and delineated meanings is ambiguous and may result in musical alienation between the listener and the music.

Given that artificial composers are not free to break the rules and overcome the constraints of an aesthetic canon, we cannot conceive their outcomes in terms of reflection, musical skills, and aesthetic awareness. The meaning of such music may lie in our willingness to see issues of creativity, authenticity, ontology, and culture in new ways. Conceiving artificial composers as cultural-musical agents, we may ask whether they formulate the aesthetic protocol of the future.

Artificial composers: issues of creativity

Can only men create music? Can artificial composers be considered as creators? What about the medium? How can we define these creative procedures? Is this kind of music valuable enough to be delivered to the next generations? Thinking about creativity, we usually consider the exploration of new possibilities and the negotiation of materials, media, or ideas in order to make something new, in response to new situations. Creativity emerges when we see the world from a new point of view and it is related to open-mindedness, reasoning, imagination, and intention to reach a desirable end. It has long been seen as an ability to produce original and useful works. Seltzer and Bentley (1999) suggest that creativity is the application of knowledge and skills in new ways to achieve a valued goal.

Within the field of arts and music, creators combine various components, following or breaking certain rules, and using tools, techniques, and materials within an aesthetic tradition. They make aesthetic choices in order to express ideas, emotions, and personal experiences; they use their imagination and reasoning. During creative processes, new possibilities may arise in response to culture. More abstractly, we can think of creativity as a complex encounter of self and the world.

Musical creativity is a concept, which has had various meanings over time as it highly depends on the context. These changes represent shifts in the conception of individual agency, expressiveness, aesthetic values, and meaning. So, what happens to the idea of “creativity” when it has to do with tools, which have been elaborated and extended into softwares? Is it still valid to talk about creativity at all? According to Farrell (2015), those questions are divisive. It is clear that artificial composers, such as *Emily*, *Iamus*, etc., were not created to replace physical composers; they are new technological tools that change or extend the process of musical creation.

Creativity cannot be divorced from the context in which it is displayed. With regard to artificial composers, one option is to consider creativity in relation to both humanistic and technological terms. Obviously, computers do not create anything by themselves. Without human skills to set them in motion, computers accomplish nothing by way of innovative outputs, at least in terms of human creativity. Their operations are always restricted and never get beyond this stage. On the other hand, we must acknowledge the fact that artificial composers’ programs offer a new world of possibilities for creative people who want to explore the secrets of musicalsynthesis.

David Cope (1991) refuses to problematize the term “creativity”, viewing it simply as the utilization of particular patterns. It is convenient for him to avoid other

values, which do not fit in his computational creativity. What was Cope's thinking and motivations for the construction of *Emily* and *EMI*? Cope (2005) responds that: a) machine programs can create, b) the quality of music has nothing to do with who or what created it, and c) the only limit to what machines can do is the limit of what we as humans can do with machines (pp. 370-371).

Yet, Cope seems to ignore that humans do not just solve music problems. They also seek problems; reflect on their compositions, question their ideas, re-think and re-write certain melodic or harmonic passages. Instead of just merely applying compositional rules, they break rules seeking for new techniques and aesthetic principles. The final product incorporates all decisions the artist has made during the creative process. In this context, the computers' creative effectiveness should be questioned, because the music they produce is strictly determined by mathematical laws: the combination of sounds and the musical procedures is totally determined in advance. This aligns with the Pythagorean and Hegelian notion of music in which the relations between the notes in any musical piece are purely abstract –governed by mathematical laws.

In our view, the mechanism and ecology of the system guide the creativity of artificial composers and designate the result. The fact is that the system can only select one object from a closed set of objects. It lacks human capacity for intention and contemplation. The computational logic of music works against the idea of imaginative play resulting in the construction of a fixed meaning. Equally importantly, the constraints of the musical material do not allow the emotive and social coding (as is held to be the case for the human music). Hence, this music seems to be generative without being creative.

Artificial composers: issues of ontology

For many decades, the ontology of musical works has gained attention among philosophers. By ontology we mean the nature of music phenomena, the music practices, and the musical material. Ontology is associated to the function of music procedures and performances in social contexts. The aesthetic-ontological problem about artificial music has to do with its originality and its authorization.

Debates about the ontology of music are parts of broader philosophical discussions. It is useful to remember that music is not only a physical acoustic object but, as Arnold Berleant (2009) articulates, “a social phenomenon involving a community of composers, performers, and listeners and that it has a history of performance practice and of valuing.” (p. 57). These topics are part of a wider discussion about the ontology of musical creation that includes positions such as what is and what is not music. Can music be disembodied and cut off from the social practices and human functions associated with it?

Greg Hainge (2016) poses an interesting question: What happens if we turn to the question of how sounds produced by non-human agents might be perceived by a listener not aware of how the sounds were generated? (p. 214). According to him, the answer depends on whether we are talking about “the ontology of music at the point of production or the point of reception, given that music is a complex ontological substance that is expressed in different modes”. The question that emerges

has as follows: can we make aesthetic judgments in complete ignorance of the ontology of music? Young (2014) proposes that ontological judgments about works of music may have meta-aesthetic implications. “The possibility that ontological judgments have meta-aesthetic consequences remains open. [...] Meta-aesthetic judgments are judgments about what sorts of aesthetic judgments are possible and the form that they take if they are possible. [...] Which aesthetic judgments can be true depends on what sorts of aesthetic properties exist.” (Young, 2014, p. 7).

Many theorists argue that we live in an age of technocultural crisis in which the presence of nonhuman agents has rendered our familiar world uncanny (van Elferen, 2009, p. 124). As with all technological advances, artificial composers seem terrifying to those who believe that artists are threatened by machines. Still, there is a risk that the market will be flooded with non-human works and new aesthetic criteria will be formed regarding the understanding and appreciation of music.

Concluding, the aesthetic and material limits of the artificial composers stand as evidence for their ontological blurriness. In other words, they resist ontological foundation: their existence relies on their being contextualized as such. If we accept the fact that music can only be understood in terms of the culture and society in which it is created, artificial composers’ products should be understood in terms of execution in the context of computation.

Conclusion

Artificial composers are probably a temporary phenomenon that may soon expire. Or, they may further develop if we invent advanced computational tools and techniques by trained programmers and software developers. We do not claim that such endeavors will eventually lose their energy and interest. Yet, the main questions still remain: Could these products meet or even outplay and replace the human music? From the perspective of music education we may ask: Does the use of such music signify practices for certain kinds of social function? Should we prepare students for careers in this field? What can artificial composers teach to music students? Should we support our students to develop skills to design or interact with such programs?

The conflict between artificial and human intelligence arises as these concepts appear in different scientific fields. In the larger picture, this probably indicates one of the several symptoms of a society obsessed with technological changes. In such context, music acquires a symbolic quality to be interpreted in light of modernistic faith of ‘progress’ and ‘innovation’.

Our suggestion is that we cannot conceptualize artificial composers’ music without thinking of the aesthetic and ethical context of production, issues of intellectual property, and their complex and contingent conjunctions. This music is almost liminal regarding notions of human mind, values, and culture. The mathematical rules impose a kind of music that does not allow for playing with sounds imaginatively and emotionally. It seems that artificial composers make us believe that interpreting authenticity and aesthetic values is obsolete. Their compositions wish to function as symbols of digital culture. In our view, the final products are open to critique and things can become political or ethical. Music that could elicit a positive response may as well

not be accepted by the same people if they are aware that a machine produces it. A critical analysis of the terms of music reception and the connotations music bears is the only way to understand its dynamic for the audience. The future might provide a full account for these issues. Time will tell.

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DIGITAL CULTURE AND EDUCATION II

ART DIDACTICS AND CREATIVE TECHNOLOGIES: DIGITAL CULTURE AND NEW FORMS OF STUDENTS' ACTIVATION

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Abstract

This paper deals with the contribution of Art Didactics and Creative Technologies in the adoption of an active attitude to decision making processes on the part of students and their participation in issues both at the level of culture and at the level of knowledge and means. The usage and the study of specific artworks is carried out in a frame of correspondence with the requirements of the multisensory experience of contemporary cultural reality, in a context of synthesis and application, encouraging students in creative processes. Students create virtual societies (through digital games and drawings), where their thinking is presented as a natural action, reaching suggestions. The concept of design is understood as a conflict between form and content. The narrative (students' design suggestions in relation to the city) could be removed from any linear structure due to digital games and Web 2.0 applications, while a possibility is added to reconstruct stories designed by others and do not satisfy them in relation to what is experienced within the city or their own vision.

Keywords: *Art Didactics, Creative Technologies, Citizenship, Creativity*

Introduction

The field of education, criticism of the pre-existing or the evolution of what is considered to be data, the examination of the basic elements which they define or specify, even in the sense of constraint, presupposes knowledge, understanding and application of a new way of viewing, thinking and acting which will redefine boundaries, fields, and correlations. Critical thinking, creative thinking, reflection are necessary skills for understanding issues that affect life inside and outside of school (Biesta, 2017). This "arsenal" is enriched and empowered through Art lessons. The aim of teaching art is to make the educational intention, educational act and multiplicity of approaches, multisensory experience -that are inherent characteristics of the artistic phenomenon (Wesseling, 2011)- to be a way of looking at social challenges, how to deal with and negotiate social needs, in correlation with learning. The artistic act is not

limited to a single perception, so it enhances the possibility of action (Kemp, 2014) and at the same time examines and analyses it. The reshaping of knowledge, in terms and qualities of art commentaries (Gillian, 2016), regulates a way that objectives and results of learning is again an effort to deal with society's challenges.

An inevitable reference to Benjamin's thought (Buck-Morss, 2014) which focuses on the integration of sociological concerns and the theory of artistic form as a means of reflection, as well as Adorno, who defends art because art comments or suggests an alternative view of society, develops the concept of "culture industry" (Adorno, 2001), and his philosophy raises questions about the prospects for a world in which political violence, democratic deficits threaten to make life impossible (Gillian, 2014) and influences many educators in the area of critical pedagogy and media education.

Culture is not a set of works of high art, but a system of communicational relationships, values, practices of life in which cultural products bring meaning and purpose to reality (Borgdorff, 2011). Therefore, the necessity of a new aesthetic approach and, above all, the defence of the new attitude (Schmidt & Cohen, 2014) enters dynamically already in elementary education, where students realise that every aesthetic approach and every aesthetic act has political dimensions (Kossoff, 2015).

The primary educational goal is to provide stimuli in order to enable students to be led to learning under realistic conditions. Using strategies and good judgment requires more than a good information processing system. It is necessary to cultivate interaction behaviours, ways of participation, social competence, so students work effectively in different social contexts, developing problem-solving and manage adversarial situations (Vuorikari & Muñoz, 2016).

The goal is that students understand that a social balance comes as a result of cooperation and simultaneously maintaining their personal utopia. That brings a sense of well-being, personal development, ability to evaluate things in their true dimensions, cultivate positive relationships with other individuals and control environmental influences (Hoskyns, 2014). Cultivating student's invention and creativity as skills, contribute to their empowerment within a multicultural, multilingual, multidimensional society. Students learn how to engage in diverse groups, to negotiate, even in aggravating circumstances, to adopt functional ways of thinking, interpreting life events, invent alternative choices and acquire the ability of rationalising skills.

Studying the important factors in determining the urban structure

The image of the city is made up by every sense, general impression of the place and information given about it, eventually its every mental footprint. According to Batty (Batty, 2008), cities are no longer considered disrupted systems. Behind the apparent chaos and the variety of the physical form, class and standards are distinguished, cities are therefore complex organisms presenting order in many observation views.

Two main axes define, compose and shape the way of teaching, on the one hand, the intangible, virtual space with the main realisation of it, is the internet, that means students study how sensitised political acts for social change with the interference of technology (Crockett & Churches, 2017), which affects politics and justify the correlated aesthetic phenomena and, on the other hand, how citizens live in the city's neighbourhoods, act within the inner neighbourhood, affect from collective consciousness and alter the city's special environment. That means, students discuss the value systems, the citizens' civil practices and in this context their suggestions and works are created. Students'

suggestions act as annotations for the investigation of the nature of relationship between the aesthetic and political choices and the truth of this inevitable, strong relationship (Leavy, 2015).

Focusing on the concept of citizenship as a social obligation, a right and a prerequisite for the quality of students' life, requires the use of active methodological approaches to make them take part. First of all, understanding relationships, associations and interpretations of things, dimensions and processes behind students' experiences with technology, trigger debates (interaction, construction, and evaluation) about the already formed views and attitudes of the students (Ali- Azzawi, 2013).

The described framework (*Ubiquitous Computing*) -many aspects of experience (conversation about 3C, Computer, Communication, Child)), diverse set of definitions, theories (Capra & Luisi, 2014) - requires how experience is related to physical qualities and not only with the abstract qualities of technology, but technology reinforces the processes of constructing an alternative model, highlighting errors and shortcomings in reality, indicating the need for new proposals, new learning paths in relation to the problems identified or those about to present themselves. The devaluation of the current situation requires the usage of knowledge that allows students to function democratically and identify student-city relationships.

Students identify problems, that is, what exactly happens in their neighbourhood and afterwards in their city that may be bothering, as a stage of analysis and on a second level, comprehend that the most important variable to manage problems is contextualised action. Next major variable is defining conflicting elements, where a Gallup poll is proposed. Students ask elderly what they perceive as a conflicting element, to report inconvenient public facilities, failures in social services and what exactly characterise as a political incompetence. Their responses are categorised either by a conventional framework (which has been discussed in the class), or as a novel suggestion (Potter & Novy, 2009), even as a utopian idea. Subsequently, newspaper articles commenting on issues related to the city and associated with cultural topics, eg. the restoration of cultural sites, the creation of new and so on. Students focus on articles with aphorisms, pre-election announcements that have been not delivered, and discuss if these aphorisms provoke only negative impressions, with no suggestion at all or even a clear and complete analysis. The goal is for students to think that such aphorisms don't contribute to any change and ultimately don't help but rather weaken reactions because any attempt seems hopeless. The aim is precisely the opposite, any emancipative attempt could not be accused as utopian and problematic (Ryan, et al., 1997).

The constructivist research example is chosen as a system of beliefs (sometimes referred to as an exemplary example (Guba & Lincoln, 1994) where the investigation should be extended without restrictions and authenticities (Psoinos, 2010).

Students will be given various pictures -snapshots of forms of "entertainment" - such as fans' festivities, overcrowding in entertainment places, pictures from opera, classical music concerts. There will be an evaluation that means students will choose between ratings: boring, limiting, minimal, satisfactory, extremely satisfying. In the discussion of the images about the observation of an opera or watching an artistic performance, concerns may arise about the elitism of culture, and thus a debate on cultural correlation, pluralism and heterogeneity. Questions arise if these forms of art are away from the daily practice of most residents and why.

Cartoon sketches are selected, more focused on postmodern urban planning. The economic exchange as a dominant practice in human transactions transforms the entire society into a system of use-value and exchange-value (Baudrillard, 1981). Reference to the work of Barbara Kruger (Whose Hopes? Whose Fears?) contributes in clarification of the real human necessities. Students study also the work of Okuda San Miguel, a Spanish street artist and his own version of the facade of educational buildings, to transform these places into spectacles and gives a clear essence of urban art.

Students are asked how many shops are in their neighbourhood and if there is a gallery, a theatre, a bookstore, and mention any “core” of gathering experience, knowledge and offers a chance of human interaction. Also, touring their city is suggested for information collection that city provides. The processing of this information (usually posters, advertising panels lead to the conclusion that this is not knowledge of the city but information for commercial reasons with a spread across the city network. Students discuss the project *Sleepwalkers*, the work of Doug Aitken, an American artist that creates an array of site-specific installations and his work ranges from photography, print media, sculpture, architectural interventions, films and live performance.

Art, Design, Creative City to live

Students will learn how to make a functional city, build bridges, roads in *SimCity Buildit*, *Cities: Skylines* intending to enable residents to stay in touch with each other and create junctions with the parts of the city.

Simulation is a training technique for presenting a complex and transmuting reality using rules that players follow and their decisions influence the outcome of the game. Following the simulation process, the teacher and the students discuss about subjects that arised and students prepare themselves as active citizens while they play the simulation.

Particular emphasis will be placed on the creation of cultural centres and easy access to them. A common place is the effort, the way of thinking, the way of reaction. A common place means common targets and ensured synergy. The work of artist JR (*Inside Out, Au Panthéon! Dome, Paris, France*) has to be mentioned.

Thereafter, students are divided into groups and draw, form three-dimensional constructions aiming at the renewal of the cities (Papadopoulou, 2015). The questions that will have to be answered in order to implement their action has to be, how the orientation of the buildings will be chosen, how their neighbourhood will be shaped, whether there will be a square, other social facilities, if care will be taken for the creation of a collective space and areas of cultural events and at last how the city cultivates people’s readiness to undertake particular aesthetic experiences.

Social authorities practically act as guides in the search for good planning (Grosz, 2001). Each group creates its own neighbourhood focusing on a collective space and other city features mentioned above and study artworks (such as monumental photographs by artist JR: *The Wrinkles of the City*, Los Angeles). Art will not be cut off from the public areas and mutilated by the umbilical cord of a society and therefore, artworks have not to be away from schools and concealed only in galleries. The goal is a playful and frequent (everyday) contact with art and through art people make changes in their life. The exhibition of the students’ artworks is a social event and is accepted as their own social work intervention.

Students learn from their adventures and also their leisure time in the city and through the developed knowledge in school, involving teaching techniques and strategies that are consistent with a more compositive and less analytical interpretation of art (Panosfky, 1972/1991, Kleinauer & Slavens, 1982). This approach opens new educational paths.

Students' research is descriptive-diagnostic, reflective, complex and qualitative (Vamvoukas, 2000). Qualitative research is being done progressively, with successive reductions, testing claims, through revisions (DiSalvo, 2012). Students use the method of obtaining bibliographic information on the negotiated concepts, analyse the resources and get used to formulate questions. Finally, their design proposals are based on the conclusions they came to (CityEngine allows students to create and maintain 3D City Scenes).

Conclusion

The basic pursuit of the educational process is preparing a democratic and conscious citizenship, a citizen of the world with understanding of society. The teaching of Art have to support a dynamic education, which interacts with the social reality (Bransford, et al., 2000).

A holistic approach to the use of digital tools (wikis technologies, digital games, design programs and applications) structurally organised, through visual and semantic criteria, allows the interconnection of tools, resources, ideas and knowledge and operates as a catalyst to educational interventions of the concept of citizenship (Kroeger, 2008).

An extended field of collective practice is created, where the synergy of Art and Technology offers important opportunities for learning (Collins & Halverson, 2009).

Art is important in human society, morally and politically (Lebbeus Woods, *High Houses*, from the series *War and Architecture*, 1995-1996). The pluralism in art forces students/citizens to organise information and explanations of how one faces reality, learns and explores (Arnheim, 2005). Starting from visual communication as a social activity (Kenney, 2009), components and directions are given to help students identify their relationships with the city and the importance of these relationships (Becker, et al., 2014). Students should consider the existence of variables and parameters such as temporal and local constraints, mixed in various groups so they provoke addition or removal of cultural elements. Students also have to accomplish the significant task, that is, the recipient of their design suggestions (Bartholomew & Rutherford, 2013) becomes an acute observer (Ranci re, 2009) with intellectual abilities to communicate better with the other inhabitants of the city and improve their surrounding environment.

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TRANSMEDIA STORYTELLING AND CREATIVE WRITING: CAN MEDIA CONVERGENCE CHANGE THE WAY WE CREATIVELY WRITE?

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Abstract

This article traces the history of transmedia storytelling and its evolutionary steps through multidisciplinary fields of media, art, culture and technology and the way it is currently being used and exploited. Transmedia storytelling as a particular narrative structure that expands through both different languages (verbal, iconic, etc.) and media (cinema, comics, television, video games, etc.) has been engaged by professional and non-professional media as an example of media convergence. The current unprecedented access to content, products and media allows— at least in what is deemed the developed and developing world – unlimited control over a person’s experience as he or she can customise, personalise and respond towards a narrative in multiple ways and across multiple platforms. Trying to map this whole narrative universe offers a rather unique experience, especially for a creative writer and potential producer and consumer of this synergy of modes, media, technologies and content. Moreover, it is argued that creative writing can really benefit by introducing its modes and practices into each medium separately and across media at the same time leading into innovative narrative practices.

Keywords: *transmedia storytelling, creative writing, media convergence, narrative structures, interactive storytelling*

In lieu of an introduction

Literature has been steadily unfolding beyond the letters and words on a page. Emerging technologies, new and ever-changing forms of communication, audiovisual designing have all contributed into creating various transformed modes of representation, enhanced with visual, narrative and verbal characteristics, that people interact and connect with: e-books, hypertexts, virtual gaming worlds etc. This unique combination of textual, visual and verbal elements presents an expansive and rather challenging field of representation and interpretation for creators as well as a new way of experiencing and “living through” a story (or multiple stories) for the “readers”. Thus, the written, handheld book becomes a digital copy with images and sounds or a virtual world with narration and dialogues in simultaneity with the action, where the reader-player

becomes the hero (or the villain etc.) and creates his own storyline. In that way, the variability, interactivity and open-endedness of these literary worlds may produce variable instances of place and time, altering several times the initial chronotopy of a literary text.

Digital Literature

Nowadays, people are constantly surrounded by media-rich environments - television, DVDs, MP3s, Touch/iPhones, computers, video games, cell phones, smart toys, 3D goggles are almost ever present in developed countries (Crichter, 2008; Drotner & Livingston, 2008; Hasebrink, Livingstone, Haddon, & Olafsson, 2009; Linebarger & Piotrowski, 2009). The contact with digital worlds is almost an everyday occurrence (Bowman, Donovan, & Burns, 2001; Byron, T. 2010; Druin, 2009; Guernsey, 2007; Marsh, 2004; Marsh & Millard, 2000; Marsh, Brooks, Hughes, Ritchie, Roberts, & Wright, 2005; McPake, Stephen & Plowman, 2007; Pahl & Roswell, 2006; Palfrey & Gasser, 2008; Shuler, 2007; Specht, 2009; Stephen, McPake, Plowman, & Berch-Heyman, 2008). This digitization of form, content and presence has not left literature unaffected. Handheld books went on becoming digitised and wholly digital books were created (Koskimaa, 2000). These trends have also entered the world of Literature leading to multi-layered, nonlinear, non-sequential, interactive and graphic- rich books that bear small to great differences from their handheld counterparts (Dresang, 1997).

As Koskimaa points out, “digital literature is very diffuse and very hard to define” (Koskimaa, 2000). He continues discerning three different instances. Firstly, he presents the digitalisations of print literature, as works which aim at digitalising as comprehensively as possible the old, mostly canonical, literature, with a lot of practical attributes such as conserving old texts physically deteriorating, making rare works available for the larger public, creating useful corpuses for researchers and students and enabling all kinds of statistical style analyses. He considers as a second type the digital publication of original literature, where texts do not employ any hypertextual techniques at all and literature conforms to the established conventions. Here, he argues that digital form is primarily used in the distribution of the texts. Last but not least, comes the literature using new techniques made possible by the digital format, including everything from hypertexts to interactive poetry and multimedia encyclopaedias (Koskimaa, 2000).

Later, Koskimaa goes on creating another categorisation of digital literature. He again distinguishes three different meanings but here he assigns totally different categorisations. First, comes Digital Publishing, which focuses on the production and marketing of literature, and books in general, with the aid of digital technology. It includes eBooks, Print on Demand, Audiobooks made available as MP3 files, etc. He considers it, content-wise, literature in the traditional sense, as digital technology mainly serves for packaging and distribution purposes. As a second category, Scholarly literary hypertext editions for educational and research purposes are presented. This category includes hypertextually annotated literary works, as well as multimedia implementations of literary classics. Due to royalty rights, these are mainly older works. Finally, the third category comprises writing for Digital Media which he considers as programmed

text, text based on computer code. This opens up a limitless field of literary play and experimentation, as texts can be programmed to behave in a more or less dynamic way. This perspective is called ‘cybertextuality’ and the works ‘cybertexts’, in accordance with Espen Aarseth (1997). Cybertextuality is an umbrella term for different types of digital texts, such as hypertexts, kinetic texts, generated texts, texts employing agent technologies, etc. There are also poetic works using interactivity and kinetic techniques. (Koskimaa, 2007). Moreover, there are digital games and its various genres. In addition to the mainstream game genres, such as action, adventure, sports, and puzzle games, the subfields of news games, political games, advergaming, edugames, and such, bring the game approach to cultural fields. These new kinds of works are characterised as ‘cybertexts’ or ‘technotexts’ (Aarseth 1997, Hayles, 2002). And then, an even richer textual – but, at the same time not- experience emerges: digital storytelling.

Digital Storytelling

A transmedia story unfolds across multiple media platforms with each new text making a distinctive and valuable contribution to the whole (Jenkins, 2006). Although each component can be experienced individually, they all clearly exist in relation to each other in the larger transmedia story. The connections between different components mean that experiencing the other media forms will improve the experience as a whole. In the ideal form of transmedia storytelling each medium does what it does best – so that a story might be introduced in a film, expanded through television, novels, and comics, and its world might be explored and experienced through game play (Jenkins, 2006). Jenkins insists on the term convergence, defined “as the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behaviour of media audiences” (Jenkins, 2006).

In parallel to the aforementioned definitions, there are also the characterisations of “media mix” by Ito (2007), the “multisensory stories told across two or more diverse media (film, print literature, web, video games, live performance, recorded music, etc.) (Ruppel, 2005) or differently worded characterisations as “cross media storytelling” (Dena 2004a, 2004b), “synergistic storytelling” (Jenkins, 2004), “intertextual commodity” (Marshall 2004), “transmedial worlds” (Klastrup & Tosca, 2004), “distributed narration” (Walker, 2004), “transmedia practice” (Dena, 2009), and “multimedia storytelling” (Perryman, 2008).

Creative Writing

The term Creative Writing (C.W.) can cause confusion due to its multitude of definitions, functions (Ramet, 2011), purposes and educational roles (Harper, 2015, Donnelly, 2012, Harper and Kroll, 2007). Many identify Creative Writing with literary production, while others believe that Creative Writing is identical to producing an original written composition (or re-composition). Some proponents of the teaching of Creative Writing want it to refer to any writing referred as “creative, e.g. original, unconventional, expressive and seemingly, sometimes, to oppose the official literature” (Dawson, 2005), not only a literary genre. Kotopoulos (2011) regards it as a quest for creativity that deviates from the traditional notion of writing as an elitist, solitary practice. It can

also seem to conceptually refer to a series of meanings: literary activity field, art of literary production, emotive educational method for the teaching of literature and of literary writing through games, a form of mental relief (Donnelly, 2015) and a means of strengthening self-esteem, academic subject knowledge, etc. (Kotopoulos, 2012).

Creative Writing (Harper, 2013) is cross-disciplinary because it is incorporated in the field of literature (as literary writing, the art of writing and as literary theory of reading), in the area of pedagogy (as an educational method of teaching language and literature) and in the field of psychology (as a therapeutic method). At the same time though, it constitutes an independent discipline dealing with the art of writing and its implications. Gianni Rodari describes creativity as a synonym of “divergent thought” that has the ability of “continually breaking the schemes of experience” (Rodari, 1973).

Research on Creative Writing practice in Greece suggests that support of creativity increases exponentially with the implementation of various writing techniques (Kotopoulos, 2011). Creative Writing as an art uses all known writing techniques and experiments with new ones. It is based on dialogue, blending different styles, while leaving free the “subconscious flow” of writing. It also uses both linguistic and emotional elements in order to activate the creative function and support an increase in the brain’s potential (Kallas-Kalogeropoulou, 2006).

Having creativity at its core, Creative Writing is considered to be any fiction or non-fiction writing, whether prose or poetry, that exceeds the limits of standard professional, journalistic or academic writing and, in general, any writing that uses certain speech techniques (Kotopoulos, 2011). In Jacobson’s terms, Creative Writing refers to texts exemplifying the poetic function of language (Kotopoulos, 2011). At the same time, the term Creative Writing represents the art of writing literature. Literary art belongs to the broader category of “the arts”, which includes music, theatre, dance, painting, etc. and it can be taught. It incorporates the ways and means, the tools and the techniques, that are used consciously and unconsciously, intentionally and unintentionally by the authors for the creation of a literary work. The poetics of Creative Writing aim to provide an emotional and aesthetic stimulation for the reader, but also to the expression of the writer. As a term therefore, it refers to an act, to a set of acts but also to the combination of an act and its outcome (Harper and Kroll, 2007).

Combining the two fields

By considering these two seemingly unrelated fields, a common thread can be traced, that of narration. Having at their core the basic element of narrating a story, they provide with an interesting question: could a combination of both digital storytelling and creative writing create an equally interesting and exponentially challenging new product?

In order to attempt answering such a question, Roland Barthes provides the underlying inherent links. In his text *Le Plaisir du Texte* (1973) he sets out some of his ideas for a literary theory, characterising texts as *scriptible*, that is writerly texts that rely heavily upon the audiences to provide any semblance of meaning and *lisible* or readerly texts that require very little work on the part of the audience and afford very little room for individual interpretation. Digital storytelling can be seen as a writerly

text, where the audience follows narratives across multiple platforms. These narratives can be created in ways and modes presented in the field of creative writing.

Moreover, creative writing techniques can make their way and be incorporated into the whole process of creation of a transmedia story. From its initial crafting to the crafting of the whole storytelling universe, from the insertion of references and allusions, that may function as connecting devices through the different media to the creation of ambiguity, suspense and uncertainty with the incorporation of migratory cues, from the creation of a core story to the limitless expansion of new media, creative writing techniques may infuse, enhance, enrich and provide with different alternative throughout the whole construction of a digital storytelling project. A wholly new universe can be created, by letting the text speak for itself. Either the original writer or other participants can creatively construct interconnected stories, bearing different characteristics, elements, modes and tropes, incorporating migratory cues and creating allusions. The final product? A whole new universe as a writerly text.

Conclusion

Even though digital storytelling and creative writing seem to embark from totally different perspectives of the notion of text, they have one common streak: the desire to narrate a story. Thus, by incorporating creative writing techniques, modes and styles into the digital storytelling process, media convergence can propagate itself into the field of literature and vice versa creating a contingent new literary field.

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DEVELOPMENT OF A SCALE FOR MEASURING THE LEARNING EXPERIENCE IN SERIOUS GAMES. PRELIMINARY RESULTS

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Abstract

The study presents the initial stage of the development of a scale for measuring the factors that affect and shape the learning experience when playing serious games. A comprehensive literature review revealed a number of studies on educational games. A draft questionnaire was developed on the basis of their results.

Keywords: *measure learning experience, serious games*

Introduction

The younger generations are surrounded by a multitude of cutting-edge technologies and their main sources of entertainment are games. Game-based learning (GBL) helps students not only to acquire knowledge but also to develop critical thinking and problem-solving skills (Prensky, 2003). According to the literature, games are quite effective because they are entertaining, motivating, and excite students' interest. By not integrating both into the learning process, results in boring and unattractive lessons. Although many studies demonstrated that students perform better when they are engaged in playing serious games, far fewer examined the learning experience, as a whole, when playing them. As there is no global model that simultaneously assesses important factors, it was decided to design an evaluate a scale for measuring the factors that affect and ultimately shape the learning experience when playing serious games. For that matter, a comprehensive literature review was conducted, which revealed a number of factors. Eventually, a scale was developed as presented in the coming sections.

Method

For developing a scale for measuring the factors that affect and ultimately shape the learning experience when playing serious games, one has to determine which factors to include. As already mentioned, the literature review revealed a substantial number of studies regarding games, while fewer examined educational games and even less examined serious games. Moreover, these studies had little in common. That is

because they had different factors as key determinants of the learning experience, they examined different types of applications (e.g., 2D, 3D, web-based, and stand-alone), and the learning subjects were also different. Another problem was that much of the research did not deal with the learning experience as a whole but with a small number of factors that shape it. We decided (a) to take into consideration only the studies which included questionnaires with robust reliability and validity, (b) to merge overlapping factors (e.g., presence, immersion, and flow), and (c) to group the remaining factors into broader categories. As a result of the above process, the following categories emerged:

□ **Games' technical features**

Perceived realism. Although a game's realism is the sum of many technical details, it can also be viewed as a subjective feature, because individuals perceive it differently. Studies indicated that realism plays an important role acting as a facilitator of the learning experience (Dalgarno & Lee 2010; Harrington, 2012).

Perceived ease of use. Perceived ease of use refers to the degree to which a person believes that the use of a tool is free of effort (Davis, Bagozzi, & Warshaw, 1989) and it is included in many studies regarding diverse ICT tools (e.g., Lee, Wong, & Fung, 2010).

Usability. The usability of any system has to be specified considering who are the intended users, the tasks they will perform, and in the context the system in which it will be used (Brooke, 1996).

Perceived audio and visual adequacy.

□ **Comprehensiveness of the learning material**

Perceived narratives' adequacy. The narrative is the story that is told by the game and acted out by the player. Thus, the narrative provides the player a background, motivating him/her to become emotionally involved (Sweetser, 2006).

Perceived feedback's adequacy. Feedback allows the player to determine the gap between the current knowledge level and the knowledge required for completing the task (Jsselsteijn, De Kort, Poels, Jurgelionis, & Bellotti, 2007). The feedback can be direct or indirect (e.g., score, health, and the player's status).

Perceived goals' clarity. Clear goals (overall and intermediate), as well as other factors such as feedback and the player's control over the game, allows the player to concentrate on the game (IJsselsteijn et al., 2007).

Perceived adequacy of the learning material.

□ **State of mind**

Immersion. In short, immersion can be defined as the feeling of submersion in a fictional environment (Qin, Rau, & Salvendy, 2009). Moreover, there is a tendency to use immersion as a synonym of engagement (e.g., Jennett et al., 2008), or presence (e.g., Ermi & Mäyrä, 2005). In this study, we embrace the view of Jennett and colleagues (2008) who asserted that in evaluating the gaming experience, measuring immersion is more important than presence.

Enjoyment. Enjoyment arises when one's capabilities are equal to the opportunities for action that this person is given during the process of performing an intrinsically rewarding activity (Csikszentmihalyi, 1988; Moneta & Csikszentmihalyi, 1996). Enjoyment is considered a key factor when designing and evaluating a game's effectiveness (Sweetser & Wyeth, 2005). Studies have shown that enjoyment and, in general, positive feelings towards a game or application contribute to knowledge acquisition (Faiola, Newlon, Pfaff, & Smyslova, 2013).

Competence. The cognitive evaluation theory (CET) (Ryan & Deci, 2000), proposes that events and conditions that enhance a person's sense of autonomy and competence support intrinsic motivation. Competence is defined as the feeling of being effective in overcoming challenges (Deci, 1975). Thus, it can be enhanced by opportunities to acquire new skills, or by providing positive feedback (Ryan, Rigby, Przybylski, 2006).

□ **Incentives for learning**

Motivation. Motivation is sensitive to the way the content is presented and it is inherently volatile (Linnenbrink & Pintrich, 2002). Research has indicated that motivation and the learning outcomes are closely connected (Benbunan-Fich & Hiltz, 2003; McLellan 2004).

Relevance to personal interests. Engagement refers to a player's level of involvement in a game (Brockmyer, Fox, Curtiss, McBroom, Burkhart, & Pidruzny, 2009). One of the key factors, together with attention and immersion (already included as a factor), that can explain engagement, is relevance to personal interests (Chen, Kolko, Cuddihy, & Medina, 2011). Thus, in this study relevance to personal interests refers to the extent one found the learning material interesting and closely related to his/her interests so that he/she got engaged.

Perceived usefulness. The usefulness of an ICT tool refers to the extent to which a person believes that by using this tool his/her performance will be enhanced. As a result, the person is motivated and the course of the learning process is positively affected (Sun, Tsai, Finger, Chen, & Yeh, 2008).

□ **Impact on knowledge acquisition**

Perceived knowledge improvement. Educational and serious games try to convey knowledge through the gaming experience, therefore their effectiveness of raising knowledge is an important criterion in their evaluation (Fu, Wu, & Ho, 2007).

Questions coming from the above studies contributed to the development of a questionnaire which included seventy-six items examining a total of sixteen factors, presented in a five-point Likert-type scale (worded "Strongly Agree", "Agree", "Neutral", "Disagree" and "Strongly Disagree"). We also decided to include seventeen open-ended questions. Scores were to be obtained by allocating numerical values to responses: "Strongly Agree" scored 5, "Agree" scored 4; "Neutral" scored 3; "Disagree" scored 2 and "Strongly Disagree" scored 1. It has to be noted that some of the original questions were slightly rephrased in order to fit the study's needs. The questionnaire was translated into Greek and completed through google docs. The questionnaire's factors are presented in Table 1, while the questions are presented in the Appendix.

Table 1. The questionnaire's factors

Factor	Items	Source
Perceived realism	4	Fokides, 2017
Perceived ease of use	6	Brooke, 1996; Fokides, 2017; Phan, Keebler, & Chaparro, 2016
Perceived usability	6	Phan et al., 2016
Perceived sound effects' adequacy	4	Phan et al., 2016
Perceived visual effects' adequacy	3	Phan et al., 2016
Perceived narratives' adequacy	5	Phan et al., 2016
Perceived feedback's adequacy	4	Fu, Su, & Yu, 2009; Phan et al., 2016
Perceived goal's clarity	4	Fu et al., 2009
Perceived adequacy of the learning material	5	Keller, 1987
Immersion	6	Brockmyer, Fox, Curtiss, McBroom, Burkhart, & Pidruzny, 2009; Fokides, 2017; Fu et al., 2009; IJsselsteijn, De Kort, & Poels, 2013; Phan et al., 2016
Enjoyment	6	Fokides, 2017; IJsselsteijn et al., 2013; Keller, 1987; Phan et al., 2016
Perceived competence	4	Fu et al., 2009; IJsselsteijn et al., 2013
Motivation	6	Fokides, 2017; Keller, 1987
Perceived relevance to personal interests	4	Keller, 1987
Perceived usefulness	4	Fokides, 2017
Perceived knowledge improvement	5	Fu et al., 2009; Keller, 1987

Sampling

The study's target group was university students studying at the Department of Audio and Visual Arts (AVARTS), Ionian University in Corfu, Greece and at the Department of Primary Education (PRIMEDU), University of the Aegean in Rhodes, Greece. Students coming from the AVARTS department are specialized in ICT, while students from the PRIMEDU are specialized in education. A total of 110 students participated in the study. They were asked to play Triseum's Variant: Limits and ARTé: Mecenas. Triseum is a company that grew out of the LIVE Lab at Texas A&M University. Variant: Limits deals with calculus at high school and college level. ARTé: Mecenas deals with Art history and Art Appreciation. Students played both games for at least an hour (after finishing the tutorial). Immediately after playing each game, they completed the questionnaire (twice if they played both applications). The study was conducted in two phases (1st phase: Fall 2017 and 2nd phase: Spring 2018). At the 1st phase, students played and evaluated the games at their homes and at the 2nd phase they did the same in a lab. This procedure was followed on purpose, as one of our further research objectives is to discover if there are any differences due to the playing conditions (free or controlled). All in all, it was found that both applications scored low in immersion, perceived realism, motivation, and perceived relevance to personal interests (Table 2). On the

other hand, both applications received high scores in perceived audiovisual adequacy, perceived feedback's adequacy, and perceived usability. These results provided a basic understanding on which factors are the influential ones when individuals play serious games. They also provided some ideas on how these factors interplay with each other.

Table 2. Ranking of applications per factor

Factor	ARTeMecenas	VariantLimits
Perceived sound effects' adequacy (max = 20)	high	high
Perceived visual effects' adequacy (max = 15)	high	high
Perceived feedback's adequacy (max = 20)	high	high
Perceived usability (max = 30)	high	high
Perceived ease of use (max = 30)	high	medium
Perceived goals' clarity (max = 20)	high	medium
Enjoyment (max = 30)	high	low
Perceived usefulness (max = 20)	medium	medium
Perceived knowledge improvement (max = 25)	medium	low
Perceived narrative's adequacy (max = 25)	medium	low
Perceived competence (max = 20)	medium	low
Perceived adequacy of the learning material (max = 25)	medium	low
Immersion (max = 30)	low	low
Perceived realism (max = 20)	low	low
Motivation (max = 30)	low	low
Perceived relevance to personal interests (max = 20)	low	low

General Discussion

For examining the user's experience when playing ARTeMecenas and VariantLimits a questionnaire was developed in which sixteen factors were included belonging to five categories. Generally speaking, ARTeMecenas received more positive views than VariantLimits. That is because ARTeMecenas had low scores in four factors, while VariantLimits had in nine. Moreover, ARTeMecenas had medium scores in five factors, while VariantLimits had in three. Finally, ARTeMecenas had high scores in seven factors, while VariantLimits had in four. Both applications scored low in immersion, perceived realism, motivation, and perceived relevance to personal interests. It is almost certain that both groups of students had different personal interests than what the learning material was about in both applications. Thus, it is easy to explain the low scores in this factor. On the other hand, both applications failed to motivate students and immerse them to the games while the applications' realism was also rated low. We support the view that these three factors are closely connected. That is because an application's realism contributes to immersion, which, in turn, has an impact on motivation. Both applications had high scores in perceived audiovisual adequacy, perceived feedback's

adequacy, and perceived usability. These factors reflect either the applications' technical features or their comprehensiveness regarding the learning material. In this respect, these results are encouraging indicating well-designed applications.

Conclusion-Future work

The most commonly used factors in studies which examined the users' learning experience when playing serious games were used for the development of a draft questionnaire. Though the sample was rather small and, consequently, it is not safe to draw definite conclusions, nevertheless, the data analysis provided some useful insights regarding the factors that come into play. The next step is to record students' views on the seventeen open-ended questions in order to form the final questionnaire. A further statistical analysis will reveal which of the questions should remain in the questionnaire as the seventy-six questions are considered a fairly large number and, probably some questions are redundant.

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Appendix

Factor	Item
Immersion	<p>I was deeply concentrated in the application</p> <p>If someone was talking to me, I couldn't hear him</p> <p>I forgot about time passing while using the application</p> <p>I cannot tell that I was getting tired while using the application</p> <p>I feel detached from the outside world while using the application</p> <p>When I used the application, the virtual world was more real than the real world</p>
Enjoyment	<p>I think the application was fun</p> <p>I felt bored while using the application*</p> <p>I enjoy using the application</p> <p>I really enjoyed studying with this application</p> <p>It felt good to successfully complete the tasks in this application</p> <p>I felt frustrated*</p>
Perceived usefulness	<p>I feel that this application can ease the way I learn</p> <p>Applications are a much easier way to learn compared to the usual teaching</p> <p>Why use this application? There are easier ways to learn what I want to learn*</p> <p>The application can make learning more interesting</p>
Perceived knowledge improvement	<p>I felt that the application increased my knowledge</p> <p>I felt that I caught the basic ideas of the knowledge taught</p> <p>I will definitely try to apply the knowledge I learned with this application</p> <p>There were explanations and examples of how to use the knowledge in this application</p> <p>The content and the presentation of the learning material in this application conveyed the impression that its content is worth knowing</p>

Perceived realism	<p>The visual display quality of the application distracted me from doing other things</p> <p>When interacting with the virtual objects, these interactions seemed like real</p> <p>There were times when the virtual objects seemed to be as real as the real ones</p> <p>The virtual objects seemed like the real objects to me</p>
Perceived narratives' adequacy	<p>I was captivated by the application's story from the beginning</p> <p>I enjoyed the fantasy or story provided by the application</p> <p>I was emotionally moved by the events in the application</p> <p>I could clearly understand the application's story</p> <p>I was very interested in seeing how the events in the application will progress</p>
Perceived sound effects' adequacy	<p>I enjoyed the sound effects in the application</p> <p>I think the application's audio fits the mood or style of the application</p> <p>I felt the application's audio (e.g., sound effects, music) enhances my gaming experience</p> <p>I enjoyed the music in the application</p>
Perceived visual effects' adequacy	<p>I enjoyed the application's graphics</p> <p>I think the application is visually appealing</p> <p>I think the graphics of the application fit the mood or style of the application</p>
Perceived goal's clarity	<p>Overall the application's goals were presented in the beginning of the application</p> <p>Overall the application's goals were presented clearly</p> <p>Intermediate goals were presented in the beginning of each scene</p> <p>I always knew how to achieve my goals/objectives in the application</p>
Perceived feedback's adequacy	<p>I received immediate feedback on my actions</p> <p>I was notified of new tasks immediately</p> <p>I received information on my success (or failure) of intermediate goals immediately</p> <p>I felt the application provides me the necessary information to accomplish a goal within the application</p>
Perceived ease of use	<p>I think it is easy to learn how to use the application</p> <p>I found the application unnecessarily complex*</p> <p>I would imagine that most people would learn to use this application very quickly</p> <p>I needed to learn a lot of things before I could get going with this application*</p> <p>I felt that I needed help from someone else to use the application because it was not easy for me to use it*</p> <p>It was easy for me to become skillful at using the application</p>

Perceived usability	I found the controls of the application to be straightforward I found the application's interface to be easy to navigate I do not need to go through a lengthy tutorial or read a manual to use the application I found the application's menus to be user friendly I feel the application trained me well in all of its controls I think the information provided in the application (e.g., onscreen messages, help) is clear
Perceived competence	I felt skillful I felt competent I felt successful I felt a sense of control over the application
Perceived adequacy of the learning material	The learning material was more difficult to understand than I would like for it to be* In some cases, there was so much information that it was hard to remember the important points* The exercises in this application were too difficult* I could not really understand quite a bit of the material in this application* The good organization of the content helped me to be confident that I would learn this material
Motivation	This application did not hold my attention* The application was interesting and got my attention When using the application, I did not have the impulse to learn more about the learning subject* The application did not motivate me to learn* This application had things that stimulated my curiosity The amount of repetition in this application caused me to get bored*
Perceived relevance to personal interests	The content of this material was relevant to my interests The application's content was not relevant to my needs because I already knew most of it* I could relate the content of this application to things I have seen, done, or thought about in my own life It is clear to me how the content of the application is related to things I already know

Note. * = Item for which its scoring was reversed

TECHNOLOGY-MEDIATED PARTICIPATORY AND PERFORMATIVE ARTISTIC EXPRESSIONS AS SOCIAL EDUCATIONAL TOOLS

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Abstract

This paper examines the role of participatory, performative forms of art that incorporate new media technologies as educational tools, in a wider social context. In particular, using paradigms from technology-based artistic performative and participatory expressions, the research underlines the importance of technology in diminishing the passive role of the viewers and focuses in alternative forms of educational experiences and social memory transmission.

Herein the historical continuity of participatory notions is depicted from primitive cultures to the contemporary paradigm of the work of Rafael Lozano Hemmer, and from the Brechtian Epic theatre to the ritual performances of Joseph Beuys. In this context educational theories are presented focusing on the acquisition of knowledge through the notions of interactivity, participation and the experience of social space itself. Furthermore, through Connertons' idea of performance as an act of ritual remembering, these kinds of events that represent artistic expressions are being regarded as ritual acts that interpret and transmit the knowledge of the past and the present.

The paper concludes that participation and performativity, which have emerged through the use of technology, transform these kind of contemporary art forms to *educational rituals*.

Keywords: *participatory art, performative art, technology, education, social memory.*

Introduction

The aim of this paper is to analyse technology-mediated participatory and performative forms of art and their cultural and educational implications underlining some of their features like *immersion*, also resulting in the transmission of collective memory. Even though arts' main purpose is not to instruct the spectator, we assume that these creative expressions engraved into different cultures and civilizations have clear educational implications as they propose to the audiences an aesthetic and critical response to their surroundings and the construction of social narratives and the social space.

“Arts”, according to Bowers (1993), “represent the areas of future human growth and progress” They are inherently participatory since they enforce individuals to connect “with realities symbolically represented by other people”. In the wider context of community their participatory character renders them into “sources of challenge for reflecting on the kinds of experiences that could become the analogues upon which collective experiences are to be based” (Bowers, 1993, pp.173-4). Advances in technology are to challenge artistic and social expressions of humanity furthermore by providing new tools of remembering and connecting.

Participation and performativity: historical continuities

We may assume that the notion of participation is as old as humankind. Discussing the way all arts as a whole serve primitive cultures’ manifestations of collective identity, Bowers analyses how the notion of participation they expressed was rooted to a different form of individuality (Bowers, 1993, pp. 209-210). As Highwater explains, “individualism” expressed through the Arts “does not presuppose autonomy, alienation or isolation” but rather extends the relatedness of the individual to include all things of the world (Highwater, 1981, p.172). Accordingly, participation in arts may be defined as the collective expression of the individual.

At 1920, in Germany Erwin Piscator introduces new media to the stage production with the intention of relating drama to contemporary events. His still images and projected film on screen during stage plays provided an external comment on the play simultaneously with its performance, so that the audience was at once subjectively and objectively involved (Chambers, 2002, p.204). Piscator’s techniques later developed by Bertolt Brecht in the Epic Theatre one of the most significant theatrical forms of the 20th century that according to Benjamin “corresponds to the modern level of technology” (W. Benjamin, 1998, p.6). Brecht used projections and sound recordings to interrupt the flow of the story and alienate spectators from the representation of reality, thus to prevent them from confusing stage events with real life events. He saw this mediated by technology theatre as an educational tool by which he wished to assign audiences an active role and enhance them to think about and cause changes to their own lives (Brockett & Hildy, 2014, p.411). Hence the beginnings of multimedia usage within various aesthetic manifestations served as a mean to provoke and enhance participation, by stimulating arts’ power to elevate and transform individuals’ thought and consciousness. Piscator and Brecht were associated with the Dada movement.

From the avant-garde movements of the 20th century, Dadaists were the first to defy conventional forms of art introducing *performance*, a mix of poetry, music and visual arts (Munoz, 2016). More than any other artistic movement, they have “shaken society’s notion of art and cultural production”. They “questioned the myth of originality, of the artist as genius suggesting instead that everybody should be an artist and that almost anything could be art” (Kuenzli, 2006, p.14-16). In the early 70s, Joseph Beuys expressed the same idea with his concept of social sculpture that also fashions everything into art and proposes that everything should be approached creatively. This idea places his work within a narrative of socially collaborative, participatory, dialogical, and relational art (Rojas, 2010). In his ritual performances Beuys located

human body to the centre of a conscious sensory perception of the world, which is one of the basic ideas of performativity.

Contemporary forms of participation. Relational art

In contemporary visual and performing arts the term *participatory* refers to the active involvement of the viewer or spectator to the production process of the artwork (Almenberg, 2010). Technological advancements in the last decades stimulated new ways and forms of participation of the audiences in the arts and the wider cultural scenery. As digital media have been increasingly incorporated to art practices, those practises came closer to the notion of participation. Bosma (2004) argues that from all media artworks “some only create curiosity and wonder” while “others clearly aim at audience participation or even education” (Bosma, 2004). Within this context, technology becomes a new tool to the construction of immersive interactive environments and the formulation of participatory audiences.

Nicolas Bourriaud places this participatory feature in a new term which he defines as *relational*. In his book *Relational Aesthetics*, Bourriaud describes relational art as a set of artistic practices which take as their theoretical and practical point of departure the whole of human relations and their social context, rather than an independent and private space. The city becomes then a system of intensive encounters which end up producing linked artistic practices with “being together” as their central theme (Bourriaud, 1998, p.14). The artist is no longer the creator of context but he or she becomes the facilitator of social encounters which form the artwork.

One of those artists is the Mexican –Canadian Rafael Lozano Hemmer. Placing his art in the intersection of performance and architecture, Hemmer, uses multimedia technologies in his large-scale installations to provoke participation in an immersive way. The spectators are bodily involved to the creation of the artworks, which outcomes are depended on their interactions. Hemmer incorporates technology to his installations to transform the main narratives of a building or public space and modify the existing behaviours, including the audience’s relationship with the urban environment. This practice defined by Hemmer as *Relational Architecture* is routed to previous methods of ancient civilizations to preserve social memory: Simonides mnemonics, a method of memorization through visualization, or the art of memory in Chinese traditions were architecture was used as a depository of memories (Hemmer, 1999).

Participatory art procedures and educational “schemata”. Hemmers paradigm

In *Under Scan* (2005-2006), in order to modify existing perceptions of reality, Hemmer uses the shadows of the spectators’ bodies as a background to project new information to the spectator’s cognitive patterns. The activation of thousands of video portraits taken in various cities of England within the form of the projected shadows defines a space of encounter, an apocalyptic view of the other, while at the same time establishes a private space inside the public space were the owner of the shadow, the spectator, may reconstruct his or her own reality using a combination of differentiated social and personal narratives.

In his theory of cognitive development, Piaget (1936) describes a process of organizing knowledge occurring through interaction with the environment, in *units* which he defines as *schemas*. These *units* may contain plots, information, knowledge, mental representations, an arrangement of behavioral patterns “which we use both to understand and to respond to situations”. *Schemas* are stored and apply when needed during the process of adaptation (or adjustment) to the world (McLeod, 2018). Reflecting on Hemmers’ work and the example of *Under Scan*, we may recognize the visual representation of *schemas* in the form of the shadow. Here the work of art functions as a tool to the learning process, as it offers a form a *unit* (the *schema*), a visual space to project, understand and adapt new collective perceptions of the world.

Some other educational practices like *social constructivism* and *critical pedagogy* share a common ground with performative participatory interactive artistic procedures. Social constructivism (Lev Vygotsky, 1978) has a primary focus on how learners construct their own meaning from new information, as they interact with reality and with other learners who bring different perspectives. Constructivist learning environments require students to use their prior knowledge and experiences to formulate new, related, or adaptive concepts in learning.

Critical pedagogy as expressed by Paulo Freire (1970) considers education as the means by which, humans deal critically with reality and discover how to participate in the transformation of their own world. “Pedagogy is a moral and political practice that is always implicated in power relations” according to Henry Giroux (2004), one of the latest contributors to this theory. “It offers both a particular version and vision of civic life, the future, and how we might construct representations of ourselves, others, and our physical and social environment” (Giroux, 1985, p.33). Therefore, space may be one of the basic components of educational practice and an effective tool to the organization of meaning.

The educational character of space is also underlined by David Gruenewald (2003) and the concept of *Place-Conscious Education*. “Space is the medium through culture is reproduced” (Gruenewald, p.629), and as such it is considered as inherently pedagogical. Gruenewald, believes that education should increase awareness on the social construction of public space and help individuals to reveal the invested meanings in it, so that they become active participants to its production. This idea recalls Beuys’ concept of social sculpture.

Performativity as a tool for social memory transmissions

According to Maurice Halbwachs (1992) memory is generated and sustained within groups, such as those based on religion, class and kinship. In *La Memoire Collective*, he argues that memory is social, collective and *lived*. For Halbwachs, a distinction between individual and social memory is meaningless, since people acquire or construct memory not as isolated individuals but as members of a society.

In order for social and collective memory to cohere it is crucial to communicate and transmit it across generations. For social anthropologist Paul Connerton (1989), the responsibility lies with the members of a social group, who should not neglect to transmit

the representations to the younger members of the group: “if we are to say that a social group, whose duration exceeds that of the lifespan of any single individual, is able to remember in common, it is not sufficient that the various members who compose that group at any given time should be able to retain the mental representation relating to the past of that group” (Connerton, 1989, p.38). The key here is in commemorative ceremonies that are performative, enacted in ritual and incorporated in the body as a form of *habit memory*.

In particular, according to Paul Connerton, these bodily practices provide a particularly effective system of mnemonics. He argues that memory can be transmitted, not only through textual and cognitive ways, but also through performance and incorporating practices. With this holistic approach Connerton presents performance as an act of ritual remembering and subjects the human body to social forces, shaped by the cultural norms. In this point of view, performative and participatory events that represent artistic expressions can be regarded as ritual acts that interpret and transmit the knowledge of the past and the present enacting social memory through habitual practices (Connerton, 1989). Within the same context, Assmann (2006) describes cultural memory as a type of *working memory* which is continuously constructed and performed by individuals and groups who become involved in various forms of memorial activity, such as commemorative ceremonies, artistic representations etc., and through various media, such as images, places, gestures, rituals etc. Rituals in particular, have a fixed timeline, an organized program of activity, a set of performers, an audience, and a place and occasion of performance. They are also connected with all forms of art, through which a group of people communicate its shared beliefs.

Similarly to rituals, several technology-based artworks are repetitive, performative, participatory and strongly engage their audience in an immersive environment. Specifically, interactive digital installations in public settings result in the collective construction and reconstruction of cultural meaning and knowledge, through the shared experiences that are newly created and the ones that are being replicated.

Conclusion

Technology is so much incorporated to our everyday practices, that it changes our perception of reality. A reality that no longer should be ignored by formal educational systems, but may be used instead as a tool to generate innovative educational practices. Enhanced by the interactivity and the opportunities for co-creation provided by technology, all these notions of performativity, participation and memory transmission may coincide with several *educational demands* for social change and the formation of a critical creative and self-conscious individual.

The usage of multimedia technologies provokes and enhances the participation of spectators in the fields of art and education practice. Simultaneously technology itself becomes a tool of connectivity and communication as well as a repository of social memory. In conclusion, we assume that, due to their participatory and performative character, contemporary technology-based artistic practices generate new knowledge in an experiential multisensory level and accordingly could be regarded as *educational rituals* in the wider social context.

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DIGITAL STORY TELLING

DRAMATIZATION AND DIGITAL TECHNOLOGY IN INTERGENERATIONAL LEARNING

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Abstract

Researchers' interest in finding out the benefits of Information and Communication Technologies (ICT) in elderly people is now growing. Living conditions and communication channels has changed in the digital age and is directly influenced by the rapid development of technology. Lifelong learning provides adults with the skills they need to stay active in society and strengthens their contribution to younger generations. Intergenerational learning is a form of lifelong learning that involves the two-way transfer of knowledge - from one generation to the other. Our goal is to study the utilization of dramatization and the contribution of digital technology to experiential intergenerational communication activities. To answer our research questions, we have used qualitative research tools (*semi-structured interviews, thematic Data Analysis and Observation*) and the Educational Drama as a structured pedagogical process in order to approach and explore new knowledge. In the light of our findings, we may conclude that audiovisual expression techniques and digital technology can be effectively combined as an alternative didactic method to elderly digital literacy in the Information Society.

Keywords: *digital literacy, intergenerational learning, verbatim theatre, educational technology.*

Introduction

We have grown up on stories narrated to us by our grandparents and other elders in the family. Those were the stories that helped us learn some important lessons of our lives. Nowadays, we have seen the spread of portable digital devices such as “smart” phones and tablets that are being used to social networking, entertainment and access to information on the Internet. Mobile devices help the elderly to increase communication, avoid isolation and loneliness. The portability of these digital devices offers opportunities for their use in innovative learning environments that support both personalized and collaborative learning (Dimitracopoulou, 2005). Lifelong learning provides adults with the skills they need to stay active in society and strengthens their contribution to younger

generations. Intergenerational learning is a form of lifelong learning that involves the two-way transfer of knowledge - from one generation to the other. This kind of learning is informal, self-directed and it promotes interaction, mutual exchange of knowledge and respect between generations (Kaplan, 2002). Using digital storytelling in order to achieve intergenerational communication we redefine the concept of lifelong learning. In order to cope with all these changes, it is necessary to develop the skills that will help us adapt to the Information Society through new digital tools and web services.

Theoretical approach

Researchers' interest in finding out the benefits of Information and Communication Technologies (ICT) in elderly people is growing. The way we live, work, communicate and think has changed in the digital era and is directly influenced by the rapid development of technology. What is the contribution of digital technology and audiovisual expression to the cultivation of children's cultural consciousness, especially when they interact with elderly people?

Usually, children like to talk more rather than listen and this behavior is evident especially in classrooms. Storytelling is an interactive activity that enhances children's listening skills and imagination in order to visualize the story. Also, it makes them aware of their rich cultural heritage and promotes children's motivation to learn about history. A big advantage of storytelling is that, listening to stories, enhances children's vocabulary and memory's capacity. They learn new words and always find it easy to explain their meanings in the context of a narrated story (Brooks, 2011). Experts say that storytellers should encourage children to create a short story - with the characters they have been told about - in order to associate images with the story. Storytelling is an experiential communicative act in which the storyteller interacts with the listeners and externalizes his feelings (Herrington & Kervin, 2007).

Our project refers to the educational technology research field and aims to study the effects of dramatization and digital technology on intergenerational communication activities. We chose *Educational Drama* as a structured pedagogical process that adopts techniques and tools of dramatic art as a means of approaching and exploring new knowledge. Our goal was to find ways of using digital media and dramatization to improve the digital literacy of the elderly and to promote the principle of intergenerational solidarity.

We will initially identify the theoretical background of our research through the clarification of the following terms related to our project:

- *Digital storytelling* is an effective educational tool that enables us to create and publish audiovisual stories and narratives from personal experiences and memories using digital media and Web based applications. Digital culture praises storytelling through different means of communication. Movies, the news, advertising, web pages present their content in a storytelling form. Digital storytelling is used in two different meanings, as an interactive experience and also as a combination of a narrated document, images, video and musical soundtrack (Mello, 2001). Educational digital storytelling is offering new ways to communicate ideas and examples of good practices. In that way

digital storytelling works as scaffolding allowing creative interaction between old and new prospects transformed into new meanings and new constructions of knowledge (Coventry, 2008).

- *Digital literacy* is the ability to organize, analyze, evaluate information and construct meanings through the use of digital technology. Digital literacy of the elderly is an indispensable skill of the 21st century and refers to the understanding and exploitation of a hyperlinked world (through new digital tools and web services) that make life easier. Information Technology and mobile devices help this group to increase communication, avoid isolation and loneliness (O'Brien & Scharber 2008).

- *Experiential learning* is based on the active participation of trainees in Collaborative learning activities such as research, observation, interviews, simulations, creative compositions etc. With this process knowledge is built, discovered and transformed by the trainees themselves and can be defined as shared work, on a particular subject, in such a way to promote individual learning through collaborative learning activities (Herrington & Kervin, 2007).

- *Intergenerational learning* is a kind of lifelong learning that involves the two-way transfer of knowledge - from one generation to the other - informal, self-directed and usually without planning through discussions and collaboratives learning activities. Intergenerational learning is an experiential process that takes place through discussions and joint activities to achieve interaction, exchange of knowledge, understanding and respect among generations. Digital literacy provides the elders with the skills they need to stay active in society and strengthens their contribution to younger generations. In digital era older people can greatly benefit from ICT and social networks to interact with young people (VanderVen, 2004).

- *Dramatization* is not the performance of a theatrical work but an educational process where learners use theatre techniques (*role, movement, space*) and drama (*action, plot, conflict*) to transcribe a story into a script. *Verbatim theatre* is a form of documented theatre in which plays are constructed from the precise words spoken by people interviewed about a particular event or topic. This interactive storytelling technique enables any kind of story to be brought alive, even without prior knowledge of the characters or plot (Anderson & Wilkinson, 2007).

- *Reverse mentoring* is the training process in which reversal of roles takes place. The young person uses his knowledge to a particular object like computer applications to educate older people (Baily, 2009; Peterson, 2012).

Research methodology and Experimental approach.

In the second part, we analyzed the implementation stages of our work in order to determine the methodological context of our research. In our project we attempted to answer the following *Research Questions*:

- What is the contribution of digital storytelling and dramatization to the cultivation of children's historical and cultural consciousness?
- What are the benefits of using digital technology in intergenerational learning activities?

The research was conducted with the participation of 25 pupils from Mantouki's Primary School in Corfu and 12 elderly people from the nearby school area. In order to gather research data, the pupils interviewed the group of elderly people about their past (Fig.1). Pupils also collected related photographic material and old-time objects from the elderly in school and created their own scenarios based on their narratives. At a later stage, they attempted to visualize these scenarios in a short film.



Figure 1: Interviews of the Elderly

In our project we apply *Body Theatre* techniques, self-concentration and confidence exercises to join all members in a group. We dealt with *Action Clip - Freeze frames*, a drama strategy suitable to move from images into improvisation, by bringing the scene alive with speech and movement (Anderson et al., 2007). The main goal of the project is to explore ways of exploiting dramatization and digital technology on intergenerational learning.

The axes which analyze the *objectives* of our research process are as follows:

- Familiarization with the use of digital technology.
- Acquaintance with the dramaturgy techniques.
- Improvement of audiovisual production skills
- Developing social skills of intergenerational solidarity.
- Developing critical and creative thinking skills.
- Cultivation of historical and cultural consciousness.

The implementation of our project, in response to the objectives, included the following stages (Fig. 2).

In our project, we chose a *qualitative research method* to describe life experiences of the elderly in order to understand the social phenomena and their subjective meaning. *Research tools* that we have used are semi-structured interviews, on-site participatory observation and thematic data analysis (Flick, Kardoff & Steinke, 2004).

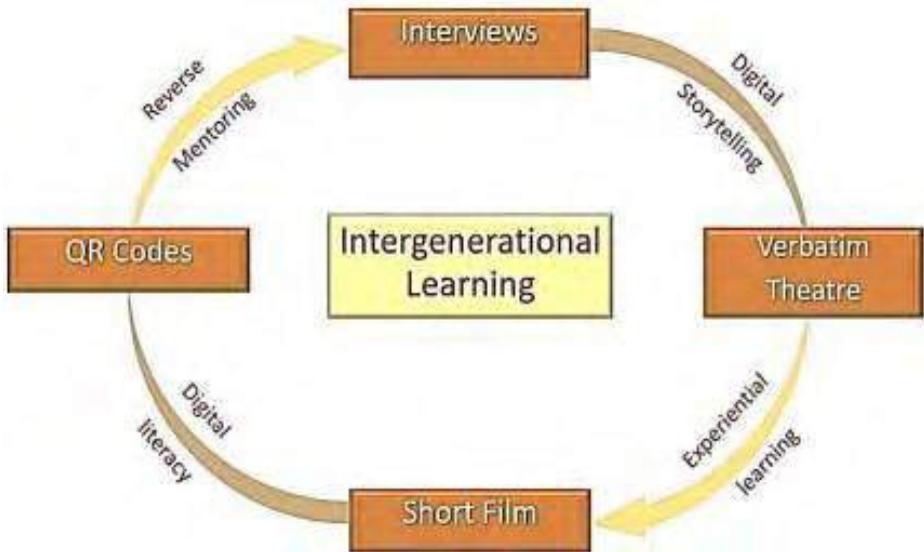


Figure 2: Implementation stages of our project

Here are some of the collaborative activities that we had prepared for the elderly

- They narrated their experiences from their childhood (*school years and 2nd World war*),
- They discussed old-time *living and working conditions*
- They told the children *customs* and the *local history of the region*.
- They showed them *photographic material* from their youth.
- They showed them the *old-time objects* they had in their collection and explained their use.
- They explained them the story of some *old games* of their childhood.

The produced audiovisual material (*interviews, storytelling, photographs etc.*) was digitized and uploaded to a collaborative website (Wiki) in order to carry out Collaborative Digital Literacy Activities with the elderly (Coutinho & Bottentuit, 2007).

Afterwards, offering everyone the opportunity to travel in time, we created an *Interactive Map* of Corfu port (Mantouki) with Hotspots that we created from the previous stages of our research (Fig. 3).



Figure 3: Intergenerational learning WIKI

Reverse Mentoring and QR Codes generation.

The digital literacy approach of the elderly took place in the Computer Science course. We invited the elderly to attend a class with the pupils. We had digitized our research material and then we created QR Codes (Quick Response Codes). At each workstation, two students trained an elder to use the computer in order to create a QR Code from their personal storytelling (Reverse Mentoring). The QR Codes created by the elderly - as part of their training - were placed on old buildings. So, if a smartphone or tablet is available, visitors can decode the information we stored in QR Codes, listen to stories and watch old photos and videos about the history of the area as they walk along Mantouki's narrow streets. Finally, we created a short film from the collective memory of the area, using the QR Codes technology. Our short film "Mantouki... *an Open Museum of Local History*" refers to their experiences from their childhood (school years and second world war), the old-time living and working conditions, customs and the local history of the region

Conclusion

The evaluation of the project was formative throughout its duration. In light of our findings, we can conclude that dramatization combined with digital technology can be effectively used as an alternative method for adults' digital literacy. We found out that dramatization and audiovisual expression techniques can be effectively used as alternative teaching techniques that enhance the students' critical approach, especially in Linguistic and Local History subjects.

Collaborative learning activities gave to the elderly the opportunity to discuss with

young people and to exchange views, while young people develop their sociability and acquire a positive attitude towards old age. Teachers noticed that the participation in our project had a positive impact on pupils' school performance. At the same time, children learned to work effectively together, they made great progress in the way of expression and argumentation, developed their social skills and gain a positive attitude towards old age.

On the other hand, the elderly had beautiful touching moments when they returned to school classes, after many years, and saw their stories visualized on mobile screens. Our project has changed their attitude toward new ICT and has enhanced their motivation to use digital technology, to learn, to remain active, to feel useful in society and less isolated from the new generation. Finally, strengthening intergenerational solidarity has reduced incidents of school violence and bullying. In general, intergenerational programs strengthen the links of learning, cooperation, communication, respect and understanding between generations.

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CO-AUTHORING AND USER INTERACTION IN DIGITAL STORYTELLING. A CASE STUDY

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Abstract

This paper examines two levels of user engagement in digital storytelling: co-authoring during the production of multimedia content and user interaction during the visualization of the narrative. It introduces the case study of Babel, a new media framework consisting of a web platform and an interactive installation. The web platform facilitates the first level of user engagement. It provides an environment that encourages multiple authors to produce and contribute narrative fragments to a shared database. The second level of user engagement is achieved through the interactive installation, which forges interactions between viewers and the available content, allowing the dynamic exploration and articulation of the narrative. During both levels of engagement, the audience is prompted to abandon the role of passive consumer and to become either a producer of digital content or an active viewer that influences the projected narrative. It also discusses cases of multi-author, multi-perspectival and interactive narratives in 'old' media art and the added value of new media in creating new opportunities for more decentralized and non-hierarchical models of storytelling production.

Keywords: *computer vision interface, database, digital storytelling, interactive installation, new media framework, web platform*

1. Babel new media framework

Babel is a new media framework developed to support the production and dynamic visualization of multi-author and multi-perspectival narratives. It forges user engagement in two stages of digital storytelling: during the production of multimedia content and during its visualization. The infrastructure of the framework is modular and extensible. It consists of a web platform and an interactive installation (Figure 1).



Figure 1. Babel's interactive installation

1.1 Web platform

Babel's web platform is an online environment that allows multiple authors to produce and contribute video content. The contributed narrative fragments are different versions of a commonly shared script. The proposed script was based on the text *Serially Killed* written by the writer Kostas Kostakos (2008).

The script was temporally fragmented into scenes and every contributing author created a new version of a chosen scene/character pair.

The web platform provided an interface for uploading multimedia files to a shared database. This user-generated content was annotated with a set of metadata and was attributed with a creative commons license that permitted future reuse and remix.

No restrictions were set to the authors regarding the context of the narrative, the semantics and aesthetics of the videos or the tools and media employed. This way, a wide variety of versions emerged (Figure 2).



Figure 2. Screenshots of some of the contributed videos

The contributed content was visualized through the interactive installation described in the next section.

1.2 Interactive installation

Babel's interactive installation was developed to provide a dynamic visualization of the narrative and allow user interaction. The interface facilitated users to explore the contributed versions, choose some of them and recompose them in real-time. The selected videos were retrieved dynamically from the database, according to the user interaction, and were projected on surfaces distributed around the installation space. Each character of the story was projected on a distinct projection surface. The available versions for every scene/character pair were virtually placed on different layers with augmenting depth, occupying a virtual axis perpendicular to each projection surface. The scenes were successive, and the narrative followed an infinite loop.

The interaction was facilitated through a computer vision interface activated with the light of a torch. By directing the light towards the screen, the user created a virtual window to the next layer. In a circular area around the light, a part of the next version was revealed, while at the rest of the screen the current version was still projected (Figure 3). While the user kept pointing to the screen with the torch, the diameter of the virtual window gradually increased until it occupied the whole screen (Antonopoulou, 2017).

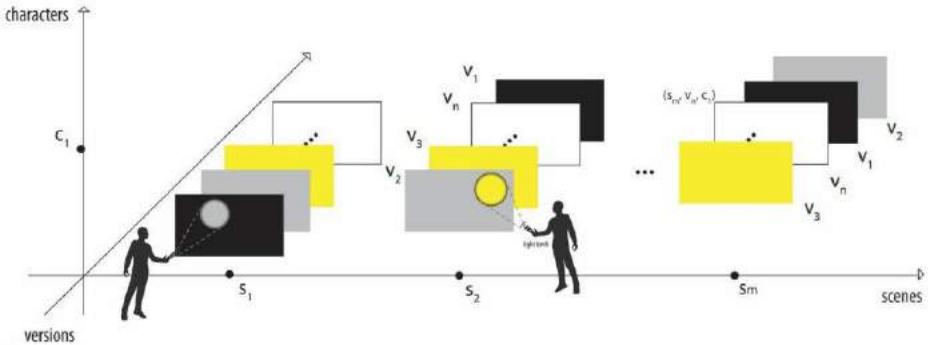


Figure 3. The interactive interface of the installation

2. Multi-author, multi-perspectival narratives

“There are as many versions of Hamlet as there are directors” (Rieser, 2002).

The involvement of multiple agents (authors and viewers) in the articulation of the narrative provides multiple perspectives of the narrated events resulting in a panoramic view of the events. The narration of an event is influenced by parameters related to the narrator and the context of the narration. These parameters include the conscious or unconscious influence of personal experiences, social background, ethics, desires and intentions towards the audience. The narration is also influenced by the media used to transmit the narration (the use of language, the tone and style, the aesthetics of video-narratives). Multi-perspectival narratives provide different viewpoints of the events and shed light on the parameters that affect the narration.

In the context of ‘old’ media art -such as painting, literature, theatre, cinema- various artists explored the parameters that affect a narration and the value of multi-perspectival viewpoints.

Söke Dinkla (2002) underlines the political implication of a single perspective in painting: The central perspective, defined by a vanishing point assumes a unique correct point of view and a unique ideal observer, the monarch. A ‘democratization’ of the observer’s point of view was achieved with the panorama, which abolished the central perspective and could be observed from a variety of perspectives (Dinkla, 2002). Raymond Queneau (1947), member of the Oulipo group, in his work *Exercises in style* recounts ninety-nine times the same inconsequential event, in which a narrator witnesses a minor altercation between two men in a bus. Every version of this narrative is unique

in terms of tone and style. In the film *Rashomon* (1950), Akira Kurosawa explores the proliferation of narratives, deriving from the intentional filtering of an event by several narrators. During the film, a crime and its aftermath are recalled by four narrators, who provide alternative, self-serving and contradictory versions of the incident. Similarly, the classical texts can achieve new meanings when they are narrated through the perspective of secondary characters. For example, in the novel *Rosencrantz and Guildenstern Are Dead* by Tom Stoppard (1967), two minor characters of Shakespeare's *Hamlet*, the courtiers Rosencrantz and Guildenstern, narrate their personal perspective of the original events. Moreover, multiple possibilities emerge when a text is removed from its original context and placed into a new one, such as the narration of a classic, romantic love-story through a feministic perspective (Zizek, 2005). Bertolt Brecht (1950) also discusses the conscious or unconscious alteration of meaning resulting from the social background of the narrator. In his *Street Scene*, the narration of an accident by multiple eye-witnesses serves as a basic model for the epic theater. The theatre of the oppressed, invented by Augusto Boal, takes the Brechtian *Street Scene* analysis a step further. The Forum theatre, more than exploring varying interpretations of an event, it proposes different actions according to each interpretation that alter the unfolding of the narration. Moreover, the varying interpretations and actions are not only suggested by members of the audience but also interpreted by them (Boal, 1985). This way, the theatre of the oppressed can be considered as a precursor of embodied interactive storytelling where viewers affect the outcome of a narrative according to their actions.

3. New media technologies and open practices supporting digital storytelling production

Broad access to multimedia production and distribution means gradually lead to a proliferation of narratives (Lipovetsky & Serroy, 2007). The decreasing cost of recording technologies, together with their embedment into familiar mobile devices, make them affordable to a wider public and extend their use at an everyday basis. Video editing and post-production processes are facilitated by opensource software, which often includes features similar to those of professional tools. Moreover, authors have free access to web platforms, that allow them to upload and distribute their work, offering the opportunity to reach a huge audience in short time (Lipovetsky & Serroy, 2007). These changes in the conditions of cultural production create a shift of the vertical model of media communication towards a decentralized, horizontal model, where a considerable amount of content is generated and diffused beyond the traditional centers of information control (Benkler, 2006; Lipovetsky & Serroy, 2007). Simultaneously, a new generation of users emerges, who are no longer passive consumers of content generated by multimedia experts, but they participate in the production of such content. This emancipated generation of *prosumers* (producers/consumers) are users that generate their own content and programs, exchange them amongst themselves and distribute them freely online (Weibel, 2006; Toffler, 1981; Lipovetsky & Serroy, 2007). The legal infrastructure of commons-oriented licenses further forges reuse and modification of resources.

On the other hand, embedded interaction and ubiquitous computing allow the distribution of computation functionality into common, everyday objects and the environment. The functionality of the objects is augmented while their user interface remains unaltered. Thus, users with limited technical skills can interact naturally and transparently with sophisticated computational systems. Finally, the reappropriation of everyday objects through a DIY (Do-It- Yourself)/DIWO (Do-It-With-Others) approach, together with the expansion of Free/Libre and Open Source Software (FLOSS)/Open Source Hardware (OSHW) render the artistic creation affordable and accessible to larger audiences.

Conclusions

This paper presented Babel as a case study of a framework for co-authoring and user interaction in the field of digital storytelling. The infrastructure of the framework included a web platform and an interactive installation, both forging users to abandon the role of passive consumers and to become either video prosumers (producers/consumers) or active viewers (interactors).

It was also argued that user involvement in interactive storytelling transforms the narrative experience. Multi-perspectival narratives reveal the parameters that deliberately, or not, grant new meanings to the narration and allow viewers to articulate a more panoramic and democratized viewpoint of the narrated events. The contribution of multiple authors to the production of the audiovisual material questions the conventional role of the director (as in the *cinema d'auteur*) and proposes a more decentralized model of collective direction. In this model, the dynamic unfolding of the narrative is a result of a dialogue between the authors and the viewers, where every agent contributes to the semantics and aesthetics of the work, but no one can dominate and predetermine them.

Although multi-author and interactive narratives exist in 'old' media art, new media technologies create new opportunities for user participation and interaction in the field of storytelling. With the advance of interactive technologies, the implicit participation of the viewer becomes explicit. New media create interactive story spaces where users explore and establish links between a number of related narratives, experience a single narrative from various viewpoints (Weinbren, 2003), or articulate custom trajectories by selecting and combining elements from a database (Manovich, 2001).

The challenge of the employment of new media lays at the construction of open infrastructures that support decentralized and democratized models of production and presentation of digital narratives. These infrastructures contribute to the creation of the conditions that forge the active involvement of an increasing number of users at all stages of the creative process. They are apparatuses that lead consumers to production, in short, that are capable of making "co-workers out of readers or spectators" (Benjamin, 1970).

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THE ARTIST AS FACILITATOR - SELECTED ASPECTS OF MEDIA AESTHETIC EDUCATION

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Abstract

It is well known that every new technology alters not only the individual person, but also our cultural values in private and social life. This is what media theorist Marshall McLuhan called the *real revolution*. Digital natives are constantly conflicting with older educational modes and values, which are not fitting in their environment. It then becomes necessary to approach schools with concepts to bring awareness of the existing digital culture. The negative attitude towards the digital environment by adults as a result of rushing to one's judgement have caused devastating consequences for nowadays adolescents. Although the educational system deals with media literacy, this term is lacking of references to culture and art. Therefore, methodologies must be found to complement the educational system. This system involves the cooperation with artists, museums, and other cultural institutions. To understand *media* we have to know how media enters our minds and shapes our consciousness. This cannot be communicated and understood by only *teaching* media literacy nor the ability to understand simplistic media grammar. Workshops at schools organized by artists gives students the space to discover media and its environment from an experimental point of view. Media Aesthetic Education encourages students how to use digital media in order to interpret the reality through their senses and aesthetic experiences of the environment (and daily lives) rather than simply depicting it.

Keywords: *Digital Natives, Education, Media Aesthetic, Media Culture*

Media as Environment

The term *Digital Culture* seemed misleading in the way that we understand it as an autarkic sphere with its own functions in which we humans can freely step in and step out anytime. *Digital Culture*, rather, coins the environment that surrounds us.

Speaking of environment; according to media theorist Neil Postman we are living in two different kinds of environments. One is the natural environment and the other is the media environment, which consists of language, numbers, images, holograms, and all of the other symbols, techniques, and machinery that shapes the individual and the paradigm of society (Postman, 2000). By this, media is no longer understood as a vehicle transporting informations from A to B, but as environments. Marshall McLuhan concluded that every new invented technology alters the ratio of our senses, the social pattern and cultural values (McLuhan, 1967, p. 8). From the oral culture to writing culture, industrial revolution and electronic revolution, he explained the close

connection between the medium and human perception. McLuhan died in 1980, so he had not encountered the digital transition. Nevertheless, his thoughts and the approaches of Media Ecology can be certainly adapt into the present situation.

It is a call for the society, a call for the educational system to recognize that there is a digital environment, a new age which forms a culture.

Education

Why do I point to the educational institutions? McLuhan noticed that schools educate children to become part of a *rear-view-mirror* society (McLuhan, 1967, p. 74f). In other words, students encounter digital media technology from an obsolete point of view where they cannot find any relations to their world. The artists, as McLuhan stated, has been the one, who realizes that the future is the present and uses their work to prepare the grounds for it (McLuhan, 1967, p. 68).

I might be harsh when I say that schools are killing children's most powerful drive, which is *curiosity*. It is lacking of total involvement and spaces for creative work. This vast field of possibilities, the depth and the beauty of the digital field, stays unexplored. It is time that the method of education shifts from instructions to discovery, exploration, critical thinking and reflection.

Media Literacy as we encounter mostly in the educational scheme do not facilitate a clear understanding of *media* and even less the artistic and cultural implications.

The result is a *tunnel view* towards art when its meaning is addressed only to an object.

Culture and Art

Culture and art are more or less designated in the frame of a high culture. In other words, we exclude ourselves from those topics. But it is the comparison of daily life, countries, lifestyles, customs and traditions that estimates the meaning of culture.

The aesthetic experience, as the interplay of sensual perception, is the result of an emotional or physical reaction towards an action or object.

Art is rather a tool to enhance the accessibility of creative work, the interpersonal skills as a listener and collaborator, abstract and analytical thinking. Furthermore, Media Aesthetic Education builds upon the thoughts of avant-garde art. We encourage students to break out of the conventional and to nourish their drive to experiment in the whole field of media.

In fact, this emphasize the concept of *the social sculpture*. A term coined by German artist Joseph Beuys containing his famous statement that every human is an artist. He did not mean that in every person there is a Vincent van Gogh or a sculptor, rather he meant that as an ability of universal creativity in life. The conscious act is crucial for implementing art into the daily life of society. It encompasses all elements of action: thoughts, ideas, decisions, and steps of progress and creation.

7000 Eichen exemplified the idea of the social sculpture by the participatory and interdisciplinary intervention of art and ecology within the Documenta 7 in 1982.

Media Aesthetic Education

Media Aesthetic Education is the comprehension about the links between art and media, the creative development of the individual, the understanding of beauty, the development of interpersonal skills and aesthetic experience. The major goals of Media Aesthetic Education are in short:

Reflecting media, art and culture without confusion. Raising students' curiosity and encouraging them to think critically and reflectively. Avoiding a *tunnel view* towards media, art and technology in cooperation with artists.

Projects

1 Aleksandar Vejnovic: Im Einklang mit den Flüssen Ilz, Donau, Inn - Die Drei Flüsse Installation (In harmony with Ilz, Danube, Inn - The three rivers installation, 2017)

Students of three schools (age: 9 - 15 years) were encouraged to explore their acoustic environment of their hometown with portable recording devices. They recorded sounds above and under the rivers. The sounds were composed into experimental short pieces which were afterwards mixed into a sound sculpture where the sounds of the three rivers of the south German city Passau interacted in one space. This installation was exhibited for public to facilitate context, site, and the environment. The visitors could discover the fascinating sounds of their home.

2 Fadia Elgharib and Aleksandar Vejnovic: An Encounter with Sound (2017)

Students recorded with their smartphones the acoustic environment and created soundscape compositions. The project's goal was to create an awareness of the accessibility for creative work with a daily device and to encourage students to listen to the soundscape with an open ear.

3 Niklas Brehm: Radiokulturarbeit an Schulen (Radio cultural work in schools, 2018)

The focus of his work was the medium Radio, but not in the sense of a handcraft only to transfer sound, but rather the effect of this medium. In other words to point to the listening habits, the aesthetic of the word and sound. In addition to the artistic approach, Brehm focused also on the social competence between students.

Acoustic Ecology

It is to say that the educational and facilitation concepts are the basis of Acoustic Ecology. In the time of the digital age we aim to sensitize the auditory perception and apperception as well as sustain an auditory culture in general. Those projects arouse an awareness for the soundscape concept with a critical faculty, ingenuity, and sustainability. By this we can say that Acoustic Ecology is a model for Media Aesthetic Education. Also to mention here is how the relationship between students and teachers changed. Instead of a hierarchically communication the projects facilitate a creative space of mixed perspectives.

Conclusion

We have to find methods to implement artistic projects into the curriculum as a fixed part, not only as workshops on irregular occasions. Methods in practice, like STEAM or creative spaces in full day schools and day nurseries are one of several options to work on. By this we have to be aware that we are stepping into a political sphere.

In my opinion, it is for the sake of art and its ambiguity to collaborate more with artists, art and cultural institutions as well as to prevent a tunnel view and a philistine attitude of future generations. It is much doubtful that forcing students to reproduce the original by depicting reality is the right way to prepare future generations for the society within which they grow. Workshops at schools organized by artists gives students the space to discover media and its environment from an experimental point of view.

What does *facilitating* mean for artists? The German artist Joseph Beuys elucidated his experience as a lecturer at the Kunstakademie Düsseldorf, teaching like if it were a work of art (Bischof, 2012, p. 243).

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LOCATING POETIC OBJECTS: EXPERIENCING POETRY INTO SITE THROUGH WALKING, SOUND AND INTERACTION

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Abstract

Spatial thinking has constituted an area of growing interest – mostly known as ‘spatial turn’ – among contemporary art, academia and society, yet such a fascination does not constitute an ephemeral trend. Humans tend to think spatially; something apparent through the use of metaphors, conceptual diagrams and most importantly our own body and in-situ experience. The concepts of place and space have been central not only at the core of geographical thought but also at the fruitful intersections of arts and humanities revealing (geo)poetic elements in various expressive modes (i.e. *poetry, installation, performance, film or locative media*). Such a mingling of space/place, body, senses, art practice, technological extensions and poetic imagination can be encountered in the emerging field of ‘artistic geohumanities’. The current paper explores the ways space and place have impacted on the fields of performance art, installation art and site-specific/related practices; often mediated and extended through walking, audiovisual means and creative technologies (i.e. interaction). In particular, it reflects on the fruitful intersections of concepts such as location, site and site-specific art practices towards new conceptualizations and mediated sensory experiences of ‘poetics into site’ (i.e. *site-oriented walking, site-specific installation, expanded sculpture*).

Keywords: *site specific art, place, geohumanities, walking, audiovisual.*

Introduction

The current article has a starting platform the postdoctoral research (2017- 2019 – IKY Greek State Foundation Scholarship) the author conducts at the Department of Audio and Visual Arts, Ionian University; exploring the intermedia and interdisciplinary impact of site-specific art and walking performance in the field of Geohumanities. In particular, it explores the ways the integration of an object in site-specific performance can act performative, sensory and semiotic extension by revealing creative conceptualizations of place, body and technology. Such an interest often falls into what others have termed as *geohumanities*; an emerging interdisciplinary field which ‘signal[s] the growing interdisciplinary engagement between geography, arts and humanities’ (Centre for the GeoHumanities website). Therefore, such research can be identified as one on the fruitful intersections of contemporary art practice and urban/cultural studies; and in particular one which brings together performance, semiotics, body, place and audiovisual media

into a dynamic entanglement towards new conceptualizations and experience of in-situ poetics. In particular, the current paper is interested on what it means to walk ‘with’ an object (material, technological) ‘into’ site (city, periphery). For the purposes of this text, the linguistic prepositions ‘with’ and ‘into’ are used as cognitive devices for critical reflection on aesthetic site-specific practices at the intersections of walking performance and installation art; often mediated by audiovisual or other means. Thus, in the wider emerging framework of creative geohumanities, the paper aims to explore how such practices of performing and/or locating the object into site can create various spatial poetics and situated atmospheres; consisted of human and non- human actors.

The experience of place and space: On a geohumanistic approach

The concepts of space and place have been central not only at the core of geographical thinking but also on the intersections of arts, humanities and social sciences; revealing what recent intellectual voices have described as geohumanistic approach (GeoHumanities). Their origins stem from an array of classical Greek philosophers; particularly Aristotle and Plato. For Aristotle, place ‘takes precedence over all other things’ (Casey, 1997, p. 71), yet as a concept is understood in terms of time change, what he called locomotion. Place is closely interrelated to our existence. We move into physical space – often perceived as eternal, geometric, abstract – but we live in place – often described as bounded, local and inhabited. Place constitutes a result of our embodied experience, senses, emotions, memories and socio-cultural interactions. It is therefore what Tim Cresswell has argued that ‘places are practiced [...] they are continuously enacted by people’ (Cresswell, 2009, p. 170). People live and interact into place, it is the very word of where that their existence takes place. Therefore, in order to exist, the subject or object has to belong to a place; ‘it has to be located’, to echo Cresswell’s (2009, p. 170) reflection on Aristotle. Moving into what it means to locate our experience into place, Martin Heidegger on his *Being and Time* (1927) was particularly significant on the evolution of humanistic and spatial thought. Following Aristotle’s intellectual insights, he developed the notion of ‘dasein’ (being), meaning the process of dwelling, of being specifically *there* (Heidegger, 1993) and in particular a dwelling which refers to the ways people render the surrounding world meaningful.

The decade of 1960’s gave a quantitative revolution and a rational turn even in humanities. This entailed a turn to statistical analyses, quantified and scientific conceptualizations of space as a surface for measuring or mapping locations, distances and wealth. It was a space associated with the Cartesian view; reflecting wider scientific and economic transformations of the world. In this rational view; space became more of a cognitive surface of justification, objectivism and of knowledge rather than of philosophical concerns or rich experience. In other words, to echo Lefebvrian thought, space can be considered as abstract; meaning its ‘formal’ character which is defined by logical functions ‘homogenization and commodification’ (Lefebvre, 1991, p. 49). On the other hand, it has been argued that place can be also considered through behavioral and psychological lenses (Tuan, 1977). Indeed, place does not form a vague concept, yet it is a rich result of our sensory and felt experience in relation to all the environmental, material and cultural qualities. Jeff Malpas argues that place

is ubiquitous – it is not only associated with our existence and experience but also with our ‘thinking about existence and experience’ (Malpas, 2015, p. 1). Place is a multilayered notion of spatial, bodily, topographic, social and cultural threads. Objects, subjects, spaces, ideas, concepts are all situated in place in ways that we think, move or interact with them and into them – to echo what has been already argued as conceptual backbone of the current text. To restate, while the debate between space and place has been a longstanding and multiparametric one, humanities (inspired by phenomenology and philosophy) argue that while space can be grasped as blank, abstract and eternal; place is always associated with our sensory and emotional experience. In the words of Tuan (1977, p.6) ‘what begins as undifferentiated space becomes place as we get to [...] endow it with value’. Other prominent voices of the field have identified a ‘conceptual complexity’ (Cresswell, 2009, p. 169) in the idea of place, which often contradicts with the everyday common use of it.

Having briefly defined space and place, it is also interesting how a constellation of related concepts such as the ones of location, sense of place, landscape and site are associated with an emerging geohumanistic experience of place. In particular, to talk about (geo)location is to refer to a specific set of coordinates in space, a resulting located point – what was firstly conceived by Eratosthenes as latitude and longitude and has been further used in contemporary GIS and audiovisual devices. Following this, the concept of sense of place (also *genius loci*) refers to the intangible aspects of a place; often associated with feelings, emotions, memories. Sense of place refers to the atmospheres, qualities and ambiances of a particular place; what I could call as a stratified time-based patina of atmospheres. Phenomenologically speaking, others have described sense of place as the interweaved result of physical and symbolic spaces of place; the merging ‘of the earth’s surface, the cosmological light conditions, buildings and the symbolic and existential meanings in the cultural landscape’ (Jivén & Larkham, 2003, p. 70). The material character of a place is often seen as locale; meaning all the architectural tangible aspects where social relations take place in it. Therefore, this leads also to a social perspective of place and space, one which was based on Lefebvre’s (1991) seminal insights during the 1970s on social space not only as a concrete, objective and material product but also as a dynamic milieu of subjective lived experience and ideology. Echoing a Lefebvrian perspective, ‘bodies themselves generate spaces’ (Lefebvre, 1991, p. 216) and most importantly it is the body itself a starting place which enacts the wider social construction and conceptualization of space.

Up to this point, I have argued that the (geo)humanistic understanding of place is deeply rooted to the notion of experience. This has reverberated in various ways during past decades; making possible various transdisciplinary approaches between art, performance, cultural geography, architecture, sociology among others; often mediated and extended by various audiovisual and other technological extensions. Such a wider spatial turn echoes historically the Foucauldian thought of 19th century as the era defined by a ‘great obsession (with) history’ in contrast with the 20th century, which is ‘above all the epoch of space’ (Foucault, 1986, p. 22). The dramatic technological shifts and the emerging global condition of recent decades have also shift the concept of our experience into place. Computers, mobile telecommunications, digital devices,

electronic media and screens have been attached not only on our surrounding world but they have been also embodied. Thus, our experience can be often seen as screen-based or extended by various sensors. Yet, while our bodies sense in the local, our digital identities are able to communicate with the outer global. We are here and elsewhere and thus our experience becomes fused, often described as ‘glocal’, to echo Meyrowitz (2005). The new sense of place has been extended into a state of living, socializing and sensing between hybrid constellations of materiality and electronic bits. Having presented a brief trajectory of the very main key-points of place and space that set the foundations for the nowadays geohumanistic turn - the next section explores how such aesthetic conceptualizations of place and experience are articulated in contemporary artworks of site-specific art, walking performance and audiovisual technologies.

Performing site, locating the poetic: Walking and thinking on the intersections

Geohumanities does not constitute a newborn term. As others in the field have recently argued; it is not ‘a new field or discipline’ but an conceptual umbrella for the ‘growing zone of interaction between geography and humanities’ (Richardson et al., 2011, p. 3-4). The interest of the current text falls into the need of geohumanities for artistic practices in the intersections of aesthetic performance, place and various technologies (i.e. video, sound, locative media). Walking has been an action in space and through time with huge cultural and historical background, while various intellectual voices and endeavors have underlined the aesthetic, performative, cultural, poetic and political potential of it. Following a historical thread of cultural and conceptual walking practices; significant “knot-moments” include the 19th century flaneur as the romanticized observer of the emerging urban modernity, later 20th century spatial practices of Dada excursions (1910s), Surrealists oneiric wanderings (1920-1930), Situationists International (1957) radical method of psychogeography as well as the rise of Performance art (1960s-1970s), related site-specific art practices and creative writing (1980-1990) and finally a series of contemporary artists who have integrated aesthetic walking and various audiovisual or locative media technologies in their interdisciplinary endeavors (mid 1990’s- nowadays). Therefore, due to text limitations, it is without doubt that walking has strongly impacted on the histories and imaginaries of place, body and mind. It has become a practice of a ‘symbolic transformation of the territory’ (Careri, 2002, p.134) both in urban and rural settings.

What I would like to focus here is the poetic aspect of walking; a flourishing combination of verbal and non-verbal elements into place. An indicative example is Richard Long; a key figure since in late 1960’s radical consideration of walking as an aesthetic practice. His work ‘A Line Made By Walking’ (1967) forms one of his early performative pieces which makes apparent the need to draw a line as I have argued elsewhere (Psarras, 2018, p. 3) The artist walked repetitively back and forth out in a grass field flattening its surface; shaping a line. Such a sculpted line was photographed; a documentation of his ephemeral intermedia intervention into place. Here, I use the word intermedia to describe its fused character, one made of both sculpture (line) and walking performance (action); with further geopoetic implications. Long’s performance into site considers walking as method, a sensory

and meditative tool which inscribes mind and body upon the surface. This acts as a reminder of walking itself as the meeting point of art and architecture, to echo Careri (2002, p. 148-149). In many examples of Land art, artists were pretty much interested in the combination of body, line, surface, site and materials. Their site-related or site-specific artworks and expanded sculptures can be seen as performative investigations *into* site and *with* materials; ranging from ephemeral to bounded results. This opened up a perspective of experimenting with place and space through what Stiles described as ‘an amplification of the process over the product’ (Stiles, 1996, p. 679) – a shift from the representational object to further modes of action / presentation of experience. Such a change can also indicate semiotic shift in the performative intersections of body, language, object and site. What can be argued here is an underlying interconnectedness between semiotics, language and walking. Rendell (2006) reminds us an interesting thread between de Saussure’s insight on *langue* (rules) and *parole* (speech) and de Certeau’s description of walking as the process which turns ‘space into a practiced place’. Keeping in line with the latter, an indicative conceptual work on the intersections of the performance, site and (expanded) poetry is the works of Yoko Ono ‘Map Piece’ (1962) and ‘Walking Piece’ (1964). Ono presented texts which can be considered both as poetry and conceptual instructions (also connections to Moholy-Nagy paintings through telephone) for potential open-ended performances into different places. The language and the enunciation of words becomes a foundation for further performative conceptualizations of place. They initiate as words; almost ready to be performed as footsteps as many times as the walker wants; creating both an imaginary and actual path of subjective experience even within the preplanned roads of the public space of the city. On the latter distinction, I draw to what others (Ingold, 2010, p. 127) describe for the path as ‘a cumulative trace not so much engineered in advance as generated in the course of movement itself’. Smithson – pioneer of Land Art – probably set the foundations for expanding our understanding of the intangible poetics which stem from dynamic and performative constellations between bodies, places, objects, weather conditions, various media among others. In his ‘Spiral Jetty’ (1970), an earthwork sculpture (an territorial prosthetic), the artist used mud, basalt rock, salt crystals, water with people working with bulldozers and other construction vehicles, to create a half-kilometer counterclockwise path. The path gradually circles around itself creating a meditative experience; a performing of place with an inevitable locating of geopoetics. The work draws connections to the idea of a situated object into the empty territory; the prehistoric menhir.

Menhirs constituted markers upon territory with symbolic value; in other words abstract, yet direct objects and materialities which made apparent of a new system of relations (and ambulatory experiences) into the vast landscape. Such artistic methods and practices into site with objects created new conceptualizations of place which often shifted the overall consideration of art – to art as experience; art as an intervening idea into place. In contemporary context, the meaning of intervention and walking exists both in material and virtual levels through the nowadays use of locative media (GPS, digital mapping, sensors); revealing a media stratification in terms of our experience. Teri Rueb’s site-specific interactive sound installation ‘Drift’ constituted a site work at

Watten Sea coast, where walkers wandered among layered currents of sand, sea and implanted interactive sounds which often drift with the repetitive tides. The semiotics of such a walking experience into an open and symbolic territory (in front of the eternal sea) are tempting. In particular, the experience of wandering through invisible sounds seems to be sensory heightened through interaction; rendering sonic landmarks as resembling menhirs of sonic experience. The idea of the object as mediator of experience in such artworks and which functions both in physical and virtual levels, can be often founded in various locative media performances (i.e. Jeremy Wood's GPS drawings, Christian Nold's *Bio Mapping*, *Gordan Savicic Constraint City*). What this shows us is that the performing of places and locating of poetics that the current paper explores is also extended by various situated (in site) or wearable (body) technologies. Such performative – hybrid artworks can contribute with critical and aesthetic accounts on wider geohumanities by bringing together walking, poetry, semiotics, land art and locative media GIS technologies into a hybrid kind of geopoetics.

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