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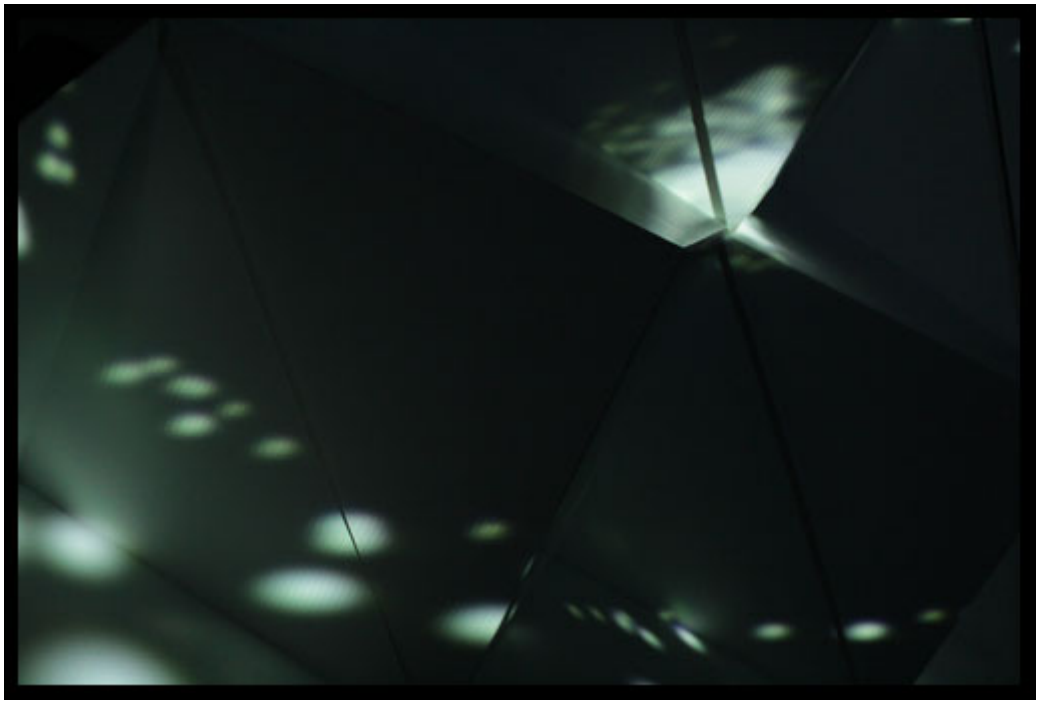
Interaction, narration and environment creation

the case of an interactive installation



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abstract

This project treats the creation of an interactive multimedia installation. This installation, presented under the title *TimeCube,* is an effort to combine different emerging technologies into the form of a real time interactive projection mapping. Therefore, such an effort borrows elements from the field of art, of cinema, of architecture, of gaming. This project attempts to approach some concepts around the creation of the meaning, through interaction and the construction of an interactive narrative, as well as the notions around the real and the virtual space and how they can be combined in order to construct a communicational environment between the installation, the creator and the viewer. Finally, this project treats some subjects concerning the development and realization of *TimeCube*.

abstrait

Ce mémoire traite de la création d'une installation multimédia interactive. Cette installation, présentée sous le titre *TimeCube,* est un effort de combiner quelques technologies émergentes et techniques sous la forme d'un mapping interactif en temps réel. Par conséquent, un tel effort nécessairement emprunte des éléments par le domaine de l'art, du cinéma, de l'architecture, du gaming. Ce mémoire tente à approcher quelques concepts autour la création artistique et la création du sens, au travers de l'interaction et la construction de la narration interactive, mais aussi autour les notions de l'espace réel et virtuel et comment peuvent-ils se combiner afin de construire an environnement de communication entre l'œuvre, le créateur et le spectateur. Finalement, ce mémoire traite quelques sujets concernant le développement et la réalisation du *TimeCube*.

Introduction

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Art and in general cultural practices have always been related to the tools and mediums provided. Nowadays, new ways of using existing technology, as well as new technological advances, come to offer new tools and new media in the disposition of artists and creators, in order to create and produce meaning and communicate with the world in alternative ways. Thus, the public gets involved in processes that provide cultural meaning and new experiences.

With the arrival of the digital era and the computers, the borders between different forms of art merge. The image becomes more modulable and easy to manipulate and transform, sometime even more abstract, challenging anew the notions of time and space and putting the viewer / spectator in the center of action, minimizing the distance between subject and object. Contemporary digital and electronic art has different forms, from digital image, to net art, multimedia applications, digital multimedia installations, virtual reality. As the technological tools in our disposal continue to evolve, so as the borders between different forms of expression become more blurry.

The subjects treated in this project emerged as axis of research that followed the creation of a digital real-time interactive installation. The installation consists a project created along with three colleagues, Nefeli Georgakopoulou, Sofia Kourkoulakou and Eleni-Ino Theodorou. The above mentioned installation consists of a work that tries to combine different new and exciting technologies, such as real time 3d creation and interaction, projection mapping, real time interactive audio synthesis and interaction through tactile interfaces. As a consequent, this installation is balancing between the world of art as an installation, of video games as real time 3d interaction and of cinema, as a projection. It is mainly an experiment in some of the possible relationships between these emerging technologies, as well as the possibilities they offer as a creative and communicational tool.

The installation was presented under the title “Time Cube” in two expositions, the “Semaine des arts”, 24-28 March 2014, organized by University Paris 8, and “Laval Virtual”, 9-13 April 2014, an international institution around virtual technologies and its uses, in the student’s demo project category. These two exhibitions provided us with the very important possibility to observe users in action, to indicate behaviors and take very precious feedback.

One of the most striking observations, was the fact that even nowadays, that almost everyone is accustomed to practices around interaction and interfaces, through

computers and smartphones, many where intimidated by the presence of an unknown object. Others did not spend much time searching for the appropriate ways to explore the suggested environment. Much of this event is constantly related to the notion of interaction. Because interactivity depends on the execution of code, and because code is invisible, users can never be completely sure that the system truly listens to their input.

Did the interactive environment offer a satisfying experience; was this experience communicated to everyone? How is interactivity expressed? What can we do, with and on the digital image, with the use of a tactile object? How can we relate, now only the look, but also other senses and the body of the spectator to the body of the work and the existing or projected objects? These points became the basic motivation and inspiration around this research.

Interactive art is above all art that conceives the work as open in various manipulations by the visitor / spectator, and in a certain way, an interactive work of art is proposed as unfinished by its creator. In the action of every spectator, the work maybe becomes phenomenologicaly different for everyone, and so does the experience, a fact that inevitably poses certain questions, such as the limits of the work or the role of interactivity and the role of the artist himself.

I would like to thank
Our professors in both institutions. Throughout these two years, you have given us a great and priceless opportunity in education and life. For your trust, your support, your valuable contributions.
Especially, a great thanks to all our professors in ATI, for your hospitality and your understanding of all the difficulties, which were surpassed with your effort to assimilate us in your own academic family.
My friends, and above all,
My family, for your undivided and continuous support in all the stages of my life, for your strength and your courage to be present and support me, so that I can keep creating and dreaming

Art mais aussi les pratiques culturelles en général ont été toujours liées avec les dispositifs et medias. Actuellement, de nouvelles façons à utiliser la technologie existant, ou même les avancées de la technologie, offrent nouveaux outils et medias à la disposition des artistes et créateurs, afin qu'ils puissent créer et produire sens, et communiquer avec le monde en manières alternatives. Comme cela, le public s'implique dans des processus que fournissent sens culturel et nouvelles expériences.

A l'arrivée de l'époque du numérique et des ordinateurs, les limites entre les formes différentes de l'art tentent à fusionner. L'image devient plus modulable et plus facile a manipuler et transformer, quelques fois même plus abstraite, provoquant de nouveau les notions du temps et de l'espace, et mettant le spectateur au centre d'action, en diminuant la distance entre sujet et objet. L'art numérique et électronique contemporaine a des formes variées, de l'image numérique, a net-art, applications multimédia, installations multimédias numériques, réalité virtuelle. Comme les outils technologiques à notre disposition continuent à évoluer, tellement les limites entres les formes différentes d'expression devient plus fusionnées.

Les sujets traités dans cette mémoire ont émergés comme axes de recherche résultant par la création d'une installation interactive numérique en temps réel. L'installation est le produit de la collaboration avec mes collègues Nefeli Georgakopoulou, Sofia Kourkoulakou and Eleni-Ino Theodorou. Cette installation est en effet le travail sur un effort de combiner technologies nouvelles et différentes, comme la création et interaction avec un contenu 3d en temps réel, projection mapping, synthèse interactive du son en temps réel et interaction avec l'utilisation des objets/interfaces tactiles. Par conséquent, cette installation balance entre le monde de l'art comme une installation, le monde de jeux vidéo comme interaction 3d en temps réel, et le monde du cinéma comme projection. Il s'agit d'une expérimentation sur quelques relations possibles entre ces technologies émergentes, mais aussi sur les possibilités qu'elles ont à offrir comme un outil de création et communication.

L'installation était présentée sous le titre "Time Cube" a deux expositions, la "Semaine des arts", 24-28 Mars 2014, organisé par l'Université Paris 8, et "Laval Virtual", 9-13 April 2014, une institution internationale de réalité virtuelle et ses usages et applications, à la catégorie démo projet étudiant. Ces deux expositions nous ont fournis de la très importante possibilité d'observer les participants/spectateur en action, d'indiquer les comportements et de prendre des informations en retour très précieuses.

Une observation de plus étonnantes était le fait que actuellement, même que presque tout le monde est habitue à l'utilisation de quelques technologies et quelques pratiques autour l'interaction et les interfaces, à travers l'ordinateur et le smartphone, plusieurs ont été intimides par la présence d'un objet inconnu sous la forme d'interface. Autres n'ont pas passé beaucoup du temps pour configurer la manière appropriée de naviguer et explorer l'environnement proposé par l'installation. Quelques de ces observations sont constamment liées à la notion de l'interactivité. Puisque l'interactivité dépend sur l'exécution du code, et puisque ce code est invisible, les utilisateurs ne peuvent jamais être sûrs que le system a vraiment agi sur l'entrée de données.

L'environnement interactif a-t-il offert une expérience satisfaisante? Cette expérience était-elle bien communiqué à tous ? Comment l'interactivité est exprimée ? Qu'est-ce qu'on peut faire, comment agir avec et sur l'image numérique, avec l'usage d'un objet tactile ? Comment est-ce qu'on peut lier, pas seulement le regard, mais aussi les autres sens et le corps du spectateur au corps et aux objets présents ou projetés ? Ces points ont constitués la motivation et inspiration principale autour de cette recherche.

L'art interactif est d'abord une forme d'art que conçoit l'œuvre comme ouverte aux manipulations variées du spectateur/visiteur, et d'une certaine façon proposée comme inachevée par son créateur. A l'action de chaque spectateur, l'œuvre devient phénoménologiquement différente pour chacun, et comme cela aussi devient l'expérience, ce qui n'est évidemment pas sans poser des questions, sur les limites de l'œuvre ou le rôle de l'interaction et le rôle même de l'artiste.

Je voudrais remercier

Les équipes pédagogiques de toutes les deux institutions. Pendant ces deux années, vous nous avez donné une opportunité sur l'éducation et la vie très précieuse. Pour la confiance, le soutien et vos contributions précieuses.

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Mes amis, et bien sûr,

Ma famille, pour leur soutien continu dans tous les étapes de ma vie, pour leur force et leur courage a être toujours présents et me supporter, pour que je puisse créer et rêver.

1. Onto digital art and interaction

Nowadays, we refer to the artistic creation as mediated. By that, we mean the usage of new technologies that became available throughout a series of inventions during the twentieth century. But what we call new media, is actually the one medium, the digital one, whose forms are numerous and varying from virtual reality, internet, videogames, multimedia interactive installations. The notion of interaction is rather inherent in the same notion of the digital medium and is of crucial importance. Interaction, especially in the environment of an interactive installation, which consists of an open space to the participant and which presupposes external intervention, is the basic tool for the formation of the meaning and the construction of the narrative by the participant. The various ways artists proposes interaction – or even the lack of interaction – with the participant make us think over the role of the artist as well as the role of the user himself not only inside the work of art but generally in modern world.

De nos jours, on se réfère sur la création artistique comme médiatisée et informatisée. Par cela, on signifie l'utilisation extensive de nouvelles technologies qu' elles sont devenus disponibles tout au long d'une série des inventions pendant le vingtième siècle. Mais ce qu'on tend à nommer comme nouveau media est, en effet, un seul medium, le medium du numérique, qui prend de formes variables, de la réalité virtuelle, à l'internet, les jeux vidéo, les installations interactives. La notion de l'interaction est plutôt inhérente a la même notion du numérique et elle est d'une importance critique. L'interaction, spécialement dans l'environnement d'une installation interactive, que consiste un espace ouvert aux participants et que présuppose une intervention externe, est le dispositif principal pour la formation du sens et la construction de la narration par le participant. Les manières variées par lesquelles les artistes proposent l'interaction – ou même l'absence de l'interaction – avec le spectateur, nous fait réfléchir sur le rôle de l'artiste et sur le rôle du spectateur lui-même, pas seulement dans les limites de l'œuvre, mais aussi sur notre position dans le monde moderne.

1.1 brief history

1.1.1 towards hypertext and interaction

In the last decades of the 20th century, technological innovations in different research areas have developed new interdisciplinary interests between art, design, science and technology. From the 1950's, Computer Art is a term used to define artistic electronic date processes for creating new aesthetics. In the same period, the mathematician Norbert Wiener in his essay "Cybernetics and Society" (1950) presented Cybernetics which refer to the general analysis of control systems and communication in lining organisms and machines.

From the 60's, researchers within the field of new technologies created new research areas in art and sciences. In that period, important transdisciplinary studies were developed by artists such as Andy Warhol or John Cage. The artistic, creative process is modified with new technologies, generating new methodologies and different disciplinary areas in Digital Art. Interaction is a key aspect towards the creation of new media art, or digital art. As a notion, interaction can be seen as native in the nature of new media and computers. And one might claim that one of the most important forms of interaction came with the invention of hypertext. Towards the creation of the notion of hypertext, hypermedia, or generally what nowadays is described by interaction, there are several important breakthroughs throughout the history of the twentieth century, made by artists as well as by scientists.

The same period, over the 60's, a very particular group of artists in the field of literature was created. The OULIPO (OUvroir de LItterature POtentielle), founded by Raymond Quenneau and Francois Le Lionnais, transformed the process of literature into a procedural effort that produces a tangible textile, or in this case textual, outcome. As François Le Lionnais wrote in the group's first manifesto, an ordinary literary work is the result of rigorous constraints in areas such as vocabulary and syntax, novelistic or dramatic convention, poetic meter and form. The idea of potential literature is to both analyze and synthesize constraints. As described in "Computer and Writer: The Centre Pompidou Experiment", the Oulipians realized that such a system of writing had the potential to define a new type of computer-mediated textuality, producing custom poems in ways that give the reader an enhanced role in the process of literary creation that never

entered the literary mainstream[1]. As up to nowadays, the works of the Oulipians consist an inspiration, mostly for computer and algorithmic creation.

Long before the Oulipo, in 1941, Jorge Luis Borges wrote "The garden of Forking Pahts", a story considered by many an essential multiform structure revealing the about to come hypertextual structure. In this story, the pivotal moment is a seemingly meaningless act of murder. The narrator, Dr Yu Tsun, is a German spy during World War I. When he is on the verge of getting caught, he finds from the phone book a man named Steven Albert, who by coincidence, has devoted his life to studying an incoherent novel written by an ancestor of Yu Tsun and is also called The Garden of Forking Paths. The narrator, proceeds to murdering the unsuspecting Albert as a way to send a message alerting the Germans to attack a city named Albert, by causing his own name to appear linked with the name of his victim in the newspapers.

The story of the forking paths is really a labyrinth because it is based on a radical reconception of time. "In all fictional works, each time a man is confronted with alternatives, he chooses one and eliminates the others. In the fiction of Ts'ui Pen, he chooses – simultaneously – all of them. He creates, in this way, diverse futures, diverse times which themselves also proliferate and fork".[2] Time in this story, is not absolute and uniform line, but more of an infinite web of possibilities.

The concept Borges described in "The Garden of Forking Paths"—in several layers of the story, but most directly in the combination book and maze of Ts'ui Pen—is that of a novel that can be read in multiple ways, a hypertext novel. Borges not only "invented" the multiform story, the hypertext novel but also went on to describe a theory of the universe based the theories of conception underlined through this novel. He sketched out, in the actions of Dr Yu Tsun, one particular existential philosophy which motivates action within this universe, a universe in which everything that is possible does indeed occur in some branch of reality.

Digital media have been developed to perform tasks that were too difficult for humans to do without them. Hypertext and simulations, the two first most promising formats for digital media and interaction, were both invented after World War II as a way of mastering the complexity of an expanding knowledge base. The mathematician

[1] Wardrip-Fruin, N., Montfort, N. , "Six Selections by the Oulipo", in Wardrip-Fruin, N., Montfort, N. (eds), *The new media reader*, The MIT press, Cambridge Massachusetts, 2003

[2] Boges, Jorge Luis, "The Garden of Forking Pahts", 1941, in Wardrip-Fruin, N., Montfort, N. (eds), *The new media reader*, The MIT press, Cambridge Massachusetts, 2003

Vannevar Bush, in his article "As we may think", put it this way: "The simulation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as that used in the days of square-rigged ships"[3].

This article had a revolutionary role for the history of communications. Bush described a machine called Memex that had a form of a desk with a translucent plane, where the user could read his documentations. The Memex's content was full of books, journals and images translated to microfilms in a readable format. The Memex is considered to be an archetype of all hypertextual systems, though it was essentially an analogical machine. During the 40's, Wiener's cybernetic theories served as a base for researches on "symbiosis" between human and machines, concept which would be largely explored later on by many multimedia artists.

In Bush's view, the infinite web of human knowledge is a solvable maze, open to rational organization. By contrast, Ted Nelson, who coined the term hypertext in the 1960's, has been more in love with the unsolvable labyrinth[4]. Nelson developed basic notions of hypertext and hypermedia which indicate a space of reading and writing text, image and sound electronically doubled with the possibility of connection to a universe of documents. Nelson's hypertext isn't linear but layered and it allowed to its readers/writers personal information paths. He sees associational organization as a model of his own creative and distractible consciousness, which he describes as a form of "hummingbird mind". Nelson has spent most of his professional life in the effort to create the perfect hypertext system, which he has appropriately named Xanadu.

The allure of computer simulations comes from a similar attempt to represent complexity. Three years after Bush's suggestion of Memex machine, Norbert Wiener founded the discipline of system dynamics with his book Cybernetics. Wiener observed that all systems, whether biological or engineered, have certain characteristics in common, such as the intertwining of multiple causes and effect relationships and the creation of feedback loops for self-regulation[5]. For example, a home thermostat maintains a set temperature, much in the same way a human body keeps a constant internal temperature by instituting changes – like sweating – and monitoring their effects.

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[3] Bush, Vannevar, "As we may think", 1945, in Wardrip-Fruin, N., Montfort, N. (eds), *The new media reader*, The MIT press, Cambridge Massachusetts, 2003

[4] Murray, Janet H., *Hamlet on the Holodeck. The future of narrative in Cyberspace*, The MIT Press, Cambridge Massachusetts, 1997

[5] Mura, Gianluca, "Virtual Metaplasticity (Ars Metaplastica)", in Mura, Gianluca (ed.), *Metaplasticity in Virtual Worls. Aesthetics and Semantic Concepts*, Hershey, Information Science Reference, New York, 2011 p 1-26

Over the past decades, systems thinking has been applied to almost everything. The computer has developed during this time into a versatile tool for modeling systems that reflect our ideas about how the world is organized. In the late 1970's computer system design reached an intriguing milestone with a simple but elegantly conceived program that seemed to simulate life itself, "The Game of Life". Though The Game of Life system does not require a computer, computer simulations like this are great tools for thinking about the larger puzzles of our existence and life itself. After all, Conway inspired thousands of artists and scientists and gave ground to the future development of generative algorithms and generative art.

Borges and Bush gave birth to the same ideas of the same midcentury frame of mind. They are both almost viscerally aware of the increased complexity of human consciousness and the failure of linear media to capture the structures of our thought. Bush is not thinking about the "computer" – and neither is Borges. Instead they are inventing fantasy information structures—a book-garden-maze, a desk-library machine that reflect, not a new technology, but the changes of the era that provoked changes in the way humanity thinks.

1.1.2 New media / digital art

The discovery of the technique of photography made clearer than before that art, culture and communication have in their disposition the new technological advances and mediums invented. Today, we tend to talk about "new media" , usually referring to a group of technological advances, a rather vague notion, that nonetheless provide certain attributes and characteristics. These characteristics can be groups into five basic categories.[6] As such, the new media are new because they have the property of:

- Numerical representations. Any product in digital form, can either be produced from scratch with the use of a computer, or either be subjected in the process of digitization. In either case, a digital product is composed of numerical code, the language of the machine.
- Modularity. This concept refers to the fact that every digital product, whether text, graphic, sound, 3d, is consisted of a smaller, basic information unit – pixel, character, quad. Every item can also be combined

[6] Manovich, Lev, *The language of New Media*, Leonardo, MIT Press, 2001

with others in order to create a new whole, such as a hypermedia application.

- Automation. The above two attributes was as a consequent the automation of various machine functions in the process of creation, manipulation, access and distribution.
- Variability. A product of the new media can actually not be stable in terms of its form and structure. In the contrary, it can exist in various and virtually infinite versions.
- Transcoding. Finally, as a consequent from all of the above, every new media product can actually exist in two distinct forms, one that is understood by humans – the representation of the information – and the other that is understood by the machine and its proper language.

From all of the above attributes we can derive all of the more or less known characteristics of the new media, such as hypertextuality, interaction and so on. But although we are referred to new media in general, actually, we are most probably talking about the emergence of a single medium, the digital medium, whose forms are myriad - virtual reality CAVEs, the Internet, "enhanced" television, videogames. But the term "new media" is a sign of our current confusion about where these efforts are leading and our breathlessness at the pace of change.[7]

During the 20th century there was a rather intense challenging of traditional methods as the main medium for expression and representation. The various movements in art of modernism saw the world with new eyes. A very important transformation in artistic expression that was brought, among others, by the 20th century, was the embrace of the technological advances. The technological revolution, something for sure out and beyond the limits of art and culture, through photography and cinema, will lead to the art based in technology, which in turn leads to various practices, from video art and digital photography and cinema, to performance, multimedia applications, digital installations, net art, virtual reality.[8]

For instance, the discovery of the technology of video in the middle of the past century consists one of the most important steps, as video art emerged as a rather important convergence of technology towards cinema and television, and created a tool in the dispose of the artist for personal use and expression. Video art made some of its most important steps through the movement of Fluxus. Fluxus happenings can rather be

[7] Janet H. Muray, "Inventing the Medium", in Wardrip-Fruin, N., Montfort, N. (eds), *The new media reader*, The MIT press, Cambridge Massachusetts, 2003, p3-11

[8] Rush, M., *New Media in late 20th-Century Art*, London, Thames and Hudson, 1999

classified as conceptual art and experimentation. Through this ideological background and with the aesthetical forms provided by this new tool, very important artists will arise, such as Bill Viola, Nam June Paik, Bruce Nauman, and many others. The same period, various artists , including Alan Kaprow, Georges Mathieu, Yves Klein, Gunther Brus, Joseph Beuys and many more, will experiment and attempt artistic expression through alternative forms in art that combine multiple forms of expression, introducing that way performances, happening and events.

With the arrival of the digital era and the computers, the borders between different forms of art blur even more. The image becomes more modulable and easy to manipulate and transform, sometime even more abstract, challenging anew the notions of time and space and putting the viewer / spectator in the center of action, minimizing the distance between subject and object. Contemporary digital and electronic art has different forms, from digital image – graphics, photography etc – to net art, multimedia applications, digital multimedia installations, virtual reality. As the technological tools in our disposal continue to evolve, so as the borders between different forms of expression become more blurry.[9]

1.1.3 Interactive installations

Interactive digital multimedia installations are a form of expression in art which tries to embrace the visitor / spectator, involve him and make him participate in the events, make him interact with its body and spirit. The position, but also the way body operates, which in many forms of artistic expression are often neglected or not of importance – are of primary meaning in the evolution of the narrative of the work. Interactive installations try to bring into the foreground the body and the senses, in an era where vision probably preoccupies our other senses.

Multimedia installations, that involve projection, catalyze processes of transformation created by a fusion of video projection and objects. A virtual dialogue erupts as the projection residing in objects, precipitates a virtual realm with a material encasement. Video projection creates a virtual architecture that immerses the viewer in visual narrative and sound. In this architecture, video constructs space like that created by the flickering of firelight in a fireplace, injecting narrative. A costume is imposed on the

[9] Manovich, Lev, *The language of New Media*, Leonardo, MIT Press, 2001

object causing the social context of the object to become elastic, fluctuating in its meaning. The light and shadow of the projection or video activates the spirit of the environment, while the narrative activates the object. This juxtaposition of video with object is provocative as the narrative of the video is conflictive with the inherent meaning of the object.[10]

Many artists aim in the creation of environments that propose different degrees of immersion, from projects that aim to absorb the public in a projected environment to virtual reality projects that aim for an immersion into a complete universe. Immersion has a long history constantly in relation with art, architecture and symbolic systems. For example, medieval churches are closed places who's meaning in modifies under the eyes of the visitor, by a process of combination of the architectural elements, lightning, and symbolism.[11] Digital installations are more often modulable and can be adopted and hosted in different spaces and environments. This relation to the space induces an underlying presence of a spatial and architectural composite more or less important in the constitution of the installation itself. In many ways, the possible relations between the physical and the virtual raises a great interest. What differs these works is the way in which these two universes are balanced and the methods employed in order to convert the real into virtual and vice versa.

Material precipitates dimension – in both the virtual and physical realms. Parallels in architecture are dialogues established between architecture and its occupants. A narrative erupts with the materials. In this instance there is a contrast between human and architectural scale, which reflects in the relationship between the physical and virtual realms. They seem counter to one another – in scale and materiality. And yet it is this confrontation, these factors working against one another – the immaterial and the physical that precipitates the constructing of an extraordinary world.

An interactive installation as a work of art consists an open work, concept rather inherent to the interactivity, since the work presupposes the intervention of an external element – whether it's a spectator or another event. In the digital era, the work, enriched by new media and technologies, allows the codification of no matter which type of information – image, text, sounds, actions – that offer the artist the possibility to construct a certain grammar of the interaction and to use this grammar as a means to manage media. A digital interactive work can also be conceived as a dynamic or autonomous system. Thus, it becomes often possible to create works that possess a certain form of

[10] Gianluca, Mura, "Virtual Metaplasticity (Ars Metaplastica)", in Gianluca Mura (ed.), *Metaplasticity in Virtual Worls. Aesthetics and Semantic Concepts*, Hershey, Information Science Reference, New York, 2011, p. 1-26

[11] Paul, Christian, *L' art numerique*, Thames & Hudson, Paris, 2004, p. 71

evolution independent to their creator and, that way, to put forward another new and exciting form of dialogue between the work and the participant.

1.2 interactivity / narration

1.2.1 Interaction as way to produce meaning / narration in a digital interactive environment

Installation is a hybrid form of art. Oscillating between object, space and event, an installation puts in relations communicational forms as well as artistic practices usually considered as heterogenic. By opening its space to public participation and by using digital media in order to achieve this, the installation becomes an open interactive space. But we shouldn't consider that interactivity as a term is sufficient by itself to describe the such various forms of participation as the available tools to achieve it – mouse, joystick, sensors, cameras among others – which allow the communication between the interactor and the work of art but also reveal the remarks made in the work of art by the role of the interactivity[12].

The installation is not an object, it consists more of a tool, an assemblage of elements proposed as a work of art by the artist. Its use of space, its inscription of elements inside this space, and the importance of the organization of these elements are very important parts of the definition and the creation of the experience inside an interactive installation. Therefore, an installation is structurally close to digital technologies that use the notion of process. An installation exists only by the participant/user that reveals or triggers the relations that constitute a certain arrangement as an installation and not as separate objects. Here, we find that a computational system operates, whose memory becomes "alive" from the moment it is triggered by a user. An interactive installation using digital technologies reveals a very strong relationship between the notion of the system composed by the elements and their varying organization according to the interactor. The presence of the interactor not only is essential as a link between the elements that constitute the installation, but also because his actions set off an exchange of information between those elements.

[12] Baboni-Schilingi, Anne-Gaelle, "Installations et interactivite numerique" , in Balpe, Jean-Pierre (ed.), *L art et le numerique*, Les cahiers du numerique , volume 1, Hermes, Paris, 2000, p. 167-178

According to Murray[13], we can identify four principal properties, which separately and collectively make the digital environments a powerful vehicle for creation. Digital environments are procedural and participatory, two properties that form what is vaguely named as interactive, but also are spatial and encyclopedic, two notions somehow open and as extensive as the actual world, which also make up of what we name as immersive.

Procedural is the ability of the machine to execute a series of rules. Programmed environments and computers are designed to embody complex, contingent behaviors. The computer then becomes a compelling medium for storytelling, if we can write rules for it that are recognizable as an interpretation of the world we are creating. Procedural environments are appealing not just because they evoke a rule-generated behavior, but because we can induce the behavior by acting and having the engine response to an input. The primary representational property of the computer is the codified rendering of responsive behaviors, otherwise known as interaction.

A digital environment is also characterized by its power to represent a navigable space, a representation with its own geography in which we experience navigation and change of space and time as a visit to a distant or virtual world. Finally, encyclopedic is the characteristic that describes the ability and efficiency of the machine and the virtual environment to represent and retrieve vast amount of information, far beyond any possibility before. We extend human memory by moving to global databases and other structures which make information accessible and navigable through computers. The encyclopedic capacity of the computer and the encyclopedic expectation it arouses make it a compelling medium for the creation of narratives. The capacity to represent enormous quantities of information in digital form translates into an artist's potential to offer a wealth of detail, to represent the world with both scope and particularity. Thus, it offers artists the possibility to invent and explore simple or complex combination of information, allowing them to create stories form multiple vantage points.

1.2.2 modes of interactive narrative in digital media

Interactivity is an umbrella category that covers a wide variety of relations between a user and an application/creation. Ryan[14] proposes the distinction of four

[13] Murray, Janet H., *Hamlet on the Holodeck. The future of narrative in Cyberspace*, The MIT Press, Cambridge Massachusetts, 1997, p. 71-83
[14] Ryan, Marie-Laure, *Avatars of Story*, University of Minnesota Press, Minneapolis, 2006, p.107-122

strategic forms of interactivity based on two binary pairs: internal/external and exploratory/ontological. These two pairs are adapted from Espen Aarseth's typology of user functions and perspectives in cybertexts, which is itself part of a broader cybertext typology, but in these pairs Ryan uses different labels in order to shift the emphasis toward the user's relation to the virtual world.

In the internal mode, users project themselves as members of the virtual world in a way they can feel part of this virtual world, as being inside it, which can be accomplished either by identifying with an avatar (third-person), either with a first person view of the world. In the external mode, users are situated outside the virtual world. They either play the role of a "god" who controls the virtual world, or they conceptualize their own activity. In the exploratory mode, users navigate the virtual world, but this activity does not make any fictional history nor does it alter of affects the plot, users have no live impact. In the ontological mode, on the other hand, the decisions of the user have an actual effect on the plot which develops through nodes or paths created and chosen by the user himself. These decisions are ontological in the sense that they determine the possibility.

In the external-exploratory interactivity mode, the user is external to both the time and space of the virtual world and user's actions are not limited by time nor do they stimulate the behavior inside the virtual world. Therefore, external-exploratory interactivity is better suited for self-referential creations that do not hold the user for the sake of the events inside them.

Internal-exploratory interactivity is a form of narration that transports the user into either into a virtual body inside the virtual world by projecting him as a character, either by displaying the virtual world from a point of view that gives the user the impression he is part of it (first-person), reflecting the point of view as such of one of its members. The role of the user in this case is rather limited to actions that have no bearing on the evolution of the virtual world, nor the personal destiny of the participant inside the virtual space, actions as travelling and exploring the virtual space. To make exploration more interesting, usually in this category a virtual world is structured as a diversified architecture of either contiguous or embedded subspaces, and to make exploration even more challenging, the passage between these subspaces should be difficult to find. Interactive exploratory participation is particularly well suited inside virtual worlds where the user won't be presented to danger and can go around at a leisurely pace within the time of the virtual world. This is probably the case of most interactive installations or other multimedia applications.

In the external-ontological interactivity mode the user is the dominant figure of the virtual space, holding the strings of the action and the population inside the world, but

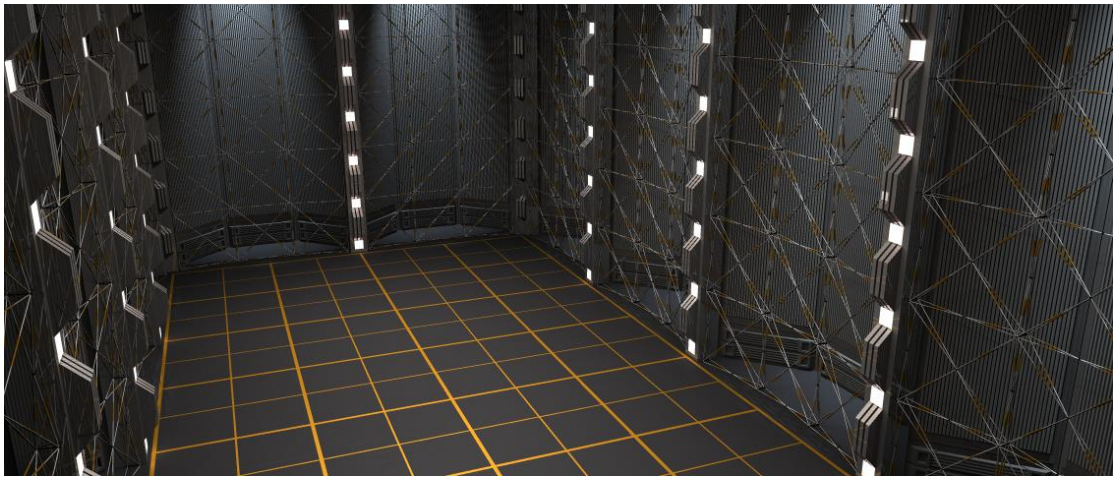
without identifying with any of the characters within. In this structure, the user can specify the properties of the world, make decisions for the characters within it, alter the environment, launch various processes and create events that affect the global evolution of the virtual world. An example of this category is simulation games, such as The Sims. The possibilities of action evolve during the run of the program, and since affordances are determined by the global state of the system, as well as by the nature of the objects, the user's choices will always produce a coherent narrative development.

Internal-ontological interactivity defines the case in which the user is a character situated in both the time and space of the virtual world. His actions determine the fate of his representation, and by extension, the fate of the virtual world. The internal-ontological interactivity is the most fitted description for the majority of the most popular contemporary video games, such as Doom, Quake and Half-life. Every run of the system produces a new life, and consequently a new life story for the participant. Computer games of this type are mainly played for the sake of solving problems and defeating opponents, of refining strategic skills, and of participating in online communities, and not for the purpose of creating a trace that reads as a story, which means that interactivity in this case in not really a feature that facilitates the construction of narrative meaning. This is also indicated by the fact that from time to time it is necessary to temporarily remove control from the user in order to establish the narrative frame, which usually occurs in the form of an animation or a video.

In most cases though, since fate-deciding decisions require a knowledge of the world, which is acquired bit by bit through exploration, both types of interactivity are present. In general terms though we could state that the ontological scheme best describes the majority of games, since participation and action is of crucial meaning in the evolution of the story, while the exploratory scheme would best describe the majority of interactive cinema works or interactive works of art belonging to the categories of interactive installations, virtual art and game art. In these cases, though user participation is imperative for the interaction, usually participation is less meaningful for the evolution of the work, where the artist has already set the basic background of the storytelling.

1.2.3 Case. Projection mapping and the Holodeck

The mythical Holodeck of the TV series Star Trek might be the best possible example of implementation of internal-ontological interactivity. The Holodeck is a kind of VR cave, used for the relaxation and entertainment of the crewmembers of the starship Voyager. In this cave, a computer runs a three-dimensional simulation of a fictional world, and the interactor becomes in make-believe a character in a digital novel. The plot of this novel is generated live, through the interaction between the human participant and the computer-created virtual characters. As Janet Murray writes: "The result is an illusory world that can be stopped, started, or turned off at will but that looks and behaves like the actual world […] The Star Trek Holodeck is a universal fantasy machine, open to individual programming: a vision of the computer as a kind of storytelling genie in the lamp". It enables crewmembers to "enter richly detailed worlds […] in order to participate in stories that change around them in response to their actions".[15]



The Holodeck of the starship Voyager, Star Trek

Similar to the Holodeck, from the 90's and on, researchers have developed various immersive projection systems, among which CAVE is probably the most famous.[16] Students and researchers at the University of Illinois - Chicago developed what many VR specialists feel is the most immersive display system for VR environments. It's called the CAVE system, which stands for Cave Automatic Virtual Environment. A CAVE is a small room or cubicle where at least three walls (and sometimes the floor and ceiling) act as giant monitors. The display gives the user a very wide field of view - something that most head-mounted displays can't do. Users can also move around in a CAVE system without

[15] Murray, Janet H., *Hamlet on the Holodeck. The future of narrative in Cyberspace*, The MIT Press, Cambridge Massachusetts, 1997, p. 15
[16] The CAVE : A Virtual Reality Theater, electronic visualization laboratory, university of Illinois, Chicago, Issue 2, http://www.evl.uic.edu/pape/CAVE/oldCAVE/CAVE.html (last visited: May 2014)

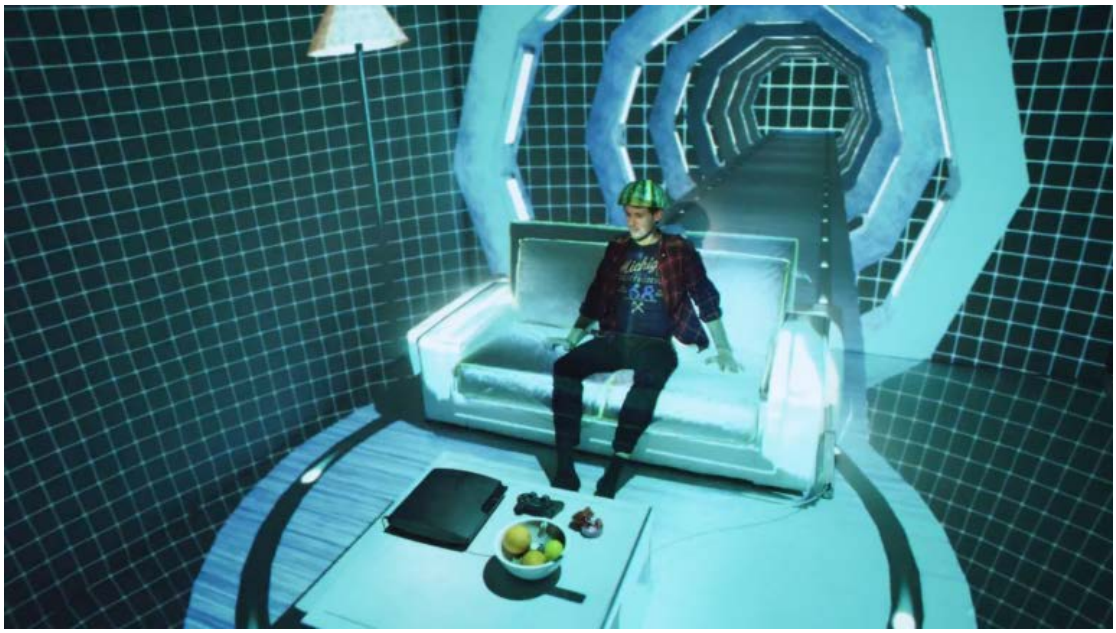
being tethered to a computer, though they still must wear a pair of goggles that are similar to 3-D glasses.

The active walls are actually rear-projection screens. A computer provides the images projected on each screen, creating a cohesive virtual environment. The projected images are in a stereoscopic format and are projected in a fast alternating pattern. The lenses in the user's goggles have shutters that open and shut in synchronization with the alternating images, providing the user with the illusion of depth. Tracking devices attached to the glasses tell the computer how to adjust the projected images as you walk around the environment. Users normally carry a controller wand in order to interact with virtual objects or navigate through parts of the environment. More than one user can be in a CAVE at the same time, though only the user wearing the tracking device will be able to adjust the point of view -- all other users will be passive observers. Much as the Holodeck, Cave system has been used to implement various narrative forms, from simple explorations of virtual spaces to more complex interactions. It has been used by major museum and cultural centers as well as by artists experimenting with virtual reality.

Manthos Santorinaios, Helicopter House Project, An interactive narrative VR project specifically designed for CAVE installations, 2002

More recently, in 2011, when Sony wanted to highlight the immersiveness of movies available on the PlayStation Store, they turned to UK-based agencies Studio

Output and Marshmallow Laser Feast to create a series of shorts around the theme "great films fill rooms." Using the PlayStation Move, the production team shot a handful of scenes depicting an ordinary man going from his couch to flying above skyscrapers as a robot and fighting sea monsters. What is really amazing about this production is the fact that it's all produced in one shot, without any further editing, with real time effects. Set pieces vanish and reappear from the walls seemingly out of thin air, while the actor on screen appears to take one fantastic journey after another without leaving his couch. At a certain point, it becomes difficult to tell what is an actual physical object in the shot and what isn't. The technique of projection mapping has always been limited by the effect only being visible as it is meant to be from a single, static point. The production team found a way around this using Sony's Playstation Move. To create the short videos, the team connected a Steadicam to several Playstation Move controllers that were synced up with EyeToy cameras situated around the set. These devices tracked the movement of the camera to adjust the angle of the background visuals on the fly, giving the scenes a more realistic handheld look. The rest of the action is filled in by creative props and some on-screen manipulation by extras. The films certainly prove the concept that projection mapping can bring us one step closer to the infamous Holodecks from Star Trek.



Sony, great films fill rooms, real-time projection mapping in a room, 2011

1.3 thoughts

1.3.1 On interactive narration and interaction

As far as it concerns interactive multimedia, and especially video games, we can acknowledge on their stories not only a psychological resonance, but also some modes of function similar to the spirit.[17] This approach seems more realistic actually that the narrative forms, measured in the era of the interactivity and information media are the object of new transformations. Characterized less by the structural elements of the story than the evoking competences and actions implemented by the spectator, during the act of performing, these emerging narrative activities/practices generate new artistic researches.

The meeting of narratology and cognitive sciences becomes more natural by the current processes of mediation and informatisation of certain activities, either cognitive or narrative. Though the comprehension of the narrative forms sometimes seems for many as an automatic and natural process, in reality involves the accomplishment of some complex linguistic and cognitive operations. This hybrid approach of narration tends to explore the process involved in the production of meaning: the meaning of stories, as well as the multiple means engaged for the activity of the narration, since they are constantly related to particular mediated tools, reveals as the primary process of the semiotic production.

In front of an interactive work, the viewer/spectator, who is often lost in an environment of images, sounds, words, engages some known activities, like the skills acquired from other more familiar practices around media and technology, such as the navigation on the internet or the usage of various applications on the computer or the smartphone. Along with these skills he may engage some conventions as understood related in the participation and experience of video games or other tools of mediated and interactive fiction.

Like any other form of interactive narrative, the story doesn't really reveal itself, cause the intrigue or better the logic of the actions and the continuity of the events takes its form by the intervention of the spectator/user. In interactive creations, actually, the definition of the scale, the position, the trajectory or the behavior of the graphic elements displayed or projected, determine and define not only the information, the content, but also the modalities of the exchange of such information in the interior of the mediated communicational space.[18] In other terms, the representational space formed by the

[17] Di Crosta, Marida, *Entre cinéma et jeux vidéo : l'interface –film. Métanarration et interactivité,* De Boeck, Bruxelles, 2009, p. 106

[18] Ibid, p. 125

projection is also the representational space proposed by the interactive relation: many levels of content as well as different types of interface are interlaced in the same time, sings towards the chain of actions-reactions made by or on this content, as well as the applications and the machine that supports the whole system.

Like usually the case in most digital works of art, words, images, sound, altogether co-exist in the same space, which becomes the space of the production of meaning and the production of heterogenic communicational forms, testifying the many operations of remediation and hybridation that accomplish the communicational practices and the mediated/computational expression.

The production of computer mediated narrative is reaching out for a redefinition of the temporality between events in the past and the present. While the projected representation inside an interactive installation is not by itself necessarily a reconstruction of the past – what we actually in the present see on the projection is actually something that was constructed in the past, in the case of an animation for example – interactivity revives this process of narration. In the contrary of actable images, the pre-registered audiovisual content lacks exactly of this essential quality derived from our empirical world, the experimentation on the actual.[19] In this way, the time of the narration is prior of the time of the narrative activity produced from the gestures and manipulation of the interface. The spectator / user is an integral part involved in the actualization of the aesthetic and communicational experience, which perfectly illustrates the function of the narrative.

But in the case of virtual reality, for example, it's most common that the majority of the population have read full descriptions on virtual reality technology and what that would mean to our lives and for art, long before VR became reality – if it still has become. This advance theorizing of digital narrative provoked some myths. It is usually believed that a successful work of virtual art, in terms of narrative, becomes more pleasurable and aesthetically valuable the more choices the user is provided. In the domain of interaction, an overabundance of choices is more likely to lead to confusion, frustration, and obsession with the missed opportunities, or it might lead to inconsistent sequences of events, rather than providing the user a sense of freedom and empowerment.[20] It might be better to place limits on the agency of the user, either by interchanging periods of user activity and periods of system control, either, in the case of constant interactivity, by narrowing down the choices the participant has.

[19] Weissberg, Jean-Louis, "Corps a corps – A propos de La morsure", in Barboza, P. et Weissberg, J.-L., (eds), *L'image actee*, Paris, L'Harmattan, 2006, p. 51
[20] Ryan, Marie-Laure, *Avatars of Story*, University of Minnesota Press, Minneapolis, 2006, p. 123

Moreover, usually, we define as interactive a work because of the execution of some code that happens behind the eyes of the spectator. Code is invisible to the viewer, and because it is invisible, one can never be sure of its execution. In other words, in an interactive work, the viewer can never be sure whether an action was planned or happened as an interaction to his input.

The question of interactivity and the role of the spectator in interactive multimedia installations has been the issue for many artists. As an example, we will refer here Bill Viola, Thierry Kuntzel and Bill Vorn.

In “The Tree of Knowledge” (1997), the viewer enters a long, narrow corridor that ends with a wall-size projection screen on which a sapling tree can be seen. As the viewer progresses towards the screen, the changes in the tree become increasingly dramatic. Every step along the corridor is directly related to a moment temporally fusing the diurnal, annual and biological life cycle of a tree that is symbolic rather representative of a particular species. At any point in their linear but reversible path, visitors can stop in their tracks and freeze-frame a moment in the tree's development. The tree, with a design that incorporates all seasonal markers, symbolizes the various stages of life. The corridor functions as a metaphor for the constraints and obligations for the human path through life.

Bill Viola, The Tree of Knowledge, 1997

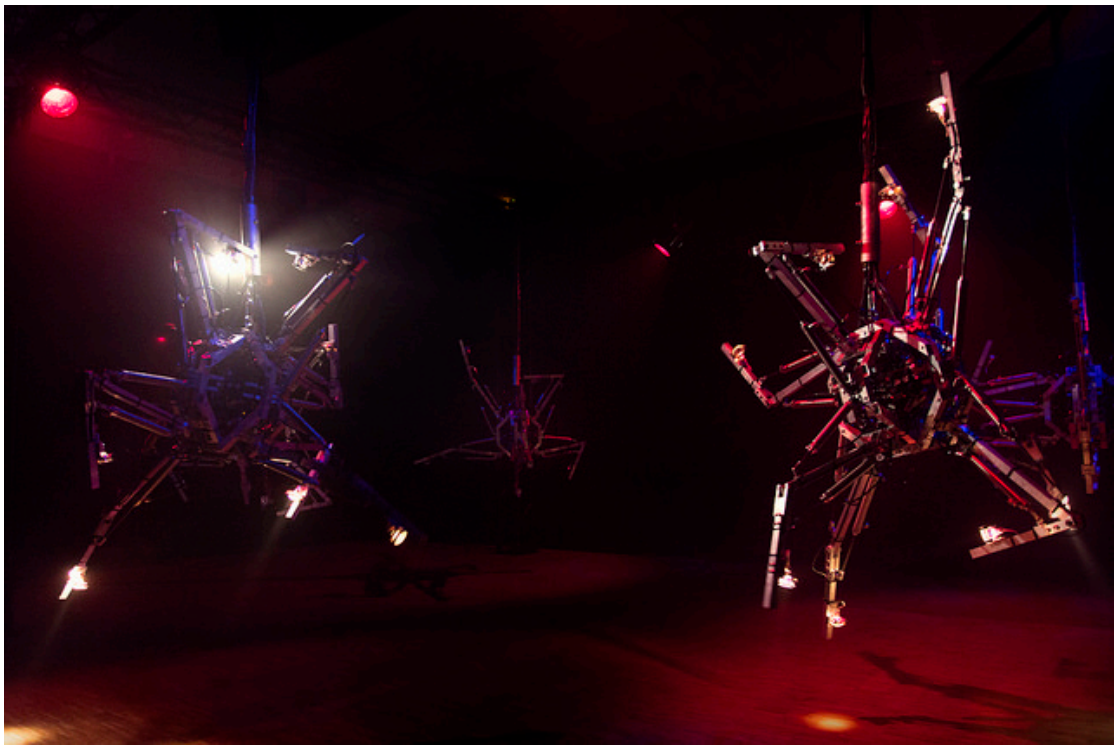
In this installation, Bill Viola, inspired by the tree of knowledge, treats the subject of desire and temptation, a comment rather reinforced by the power

provided by interactivity. Should the participant be the master of the work? Viola inverts the idea of interaction as a form of construction of narration and meaning. As the participant/viewer approaches the image, the form of the tree decays and fades away by a touch on the screen. Interactivity here, for Viola, signifies subtraction and disapperance of elements, signifying thus our position in a world controlled by our desires.

Treating the same subject in quiet a similar way, Thierry Kuntzel, in his interactive installation “The Waves” (2003), forces the viewer to think over his power and effect over the world. Viewers, facing a screen on which a wave is shown surging forward and breaking, enter a corridor and walk towards the image, irresistibly drawn towards the swelling sea. Yet the closer they approach, the clearer it becomes that their own movement affects both the speed of the wave and the volume of the sound for the swell slows until it freezes into a black-and-white image while the sound fades to silence. Backing away, viewers then create the opposite effect.

Thierry Kuntzel, The Waves, 2003

Bill Vorn, a Canadian artist of automation and robotics, takes interactivity into another level and explores the projection of the spectator on the machines, proposing other ways to examine behavior and desire. In his exposition “Soft Metal”, he presents works such as “Hysterical Machines” or “DSM-VI”, machines that are psychotic or autistic. With his work, Vorn provokes empathy towards the world of the machines, of these existences that are nothing more than articulated metallic structures. He proposes as such the machine not as virtuous automates that mimic human behavior, even looks, in the case of “DSM-VI”. In this way, the artist creates a universe, independent, out of reach of our actions, where human is sometimes considered to be an intrusion.



Bill Vorn, Soft Metal, 2014

2. Space and installation

The notion of space is very vague. By space, one might mean a certain structure, in architectural terms. But also, a space can be a place, where people meet and socialize, exchange ideas and emotions. The word space can describe an actual or a virtual space, a personal or community space. The structure and morphology of a space defines its use and provides certain routes for us to move and organize inside them. Nowadays, technology provides us with many tools in order to construct real as well as virtual spaces and environments which derive from our memories and fantasy, spaces and environments that serve many cultural and social purposes. Art, especially in the form of installation, includes the notion of space in its very definition. The art of installation invites the user to participate with all his senses, his body and spirit, inside a space – real, virtual, or hybrid – to communicate and create meaning in the provided world.

La notion de l'espace est vraiment vague. En utilisant le mot « espace», quelqu' un peut signifier une structure certaine, en termes d'architecture. En plus, espace peut signifier un lieu, un endroit où les êtres humains peuvent se rencontrer et socialiser, échanger des idées et émotions. Le mot espace peut être utilisé pour décrire un environnement actuel, mais aussi un environnement virtuel, un espace personnel ou un espace public et communautaire. La structure et la morphologie d'un espace peuvent définir son propre usage et nous fournissent de routes certains pour qu' on puisse organiser la vie et se déplacer à leur intérieur. Actuellement, la technologie nous offre plusieurs dispositifs enfin de construire et créer autant espaces ou environnements réels que virtuels, qui sont dérivés de nos mémoires ou le monde de l'imaginaire, espaces et environnements qui servent plusieurs buts culturels et sociaux. En art, spécialement sous la forme de l'installation, la notion de l'espace est déjà inclue dans sa propre définition. L'art de l'installation invite le spectateur à participer avec tous ses sensations, son corps et son esprit, dans un espace – réel, virtuel ou hybride – afin de communiquer et créer du sens dans le monde fourni.

2.1 space

2.1.1 Space and environment

Human perception about the limits or his identity are bonded with the idea of spatial organization of the material world around him, as well as the position any one chooses in terms of physical but also conceptual level. This space is the field of offering and acceptance of energy and information, emotions and prospects, the field where any kind of interaction with the environment takes place. Through space and inside it, one can specify the quality and limits in his personal and inter-personal relations, his social contacts, thus defining his self-disposition for communication and expression. The body itself needs a certain space for its existence and thus defines space and non-space.

In its literal meaning, space consists of a structural organization of a three dimensional environment. Space is defined by certain limits or borders, and contains material objects in relative position and orientation between them and between them and the form of this space, as a means to provoke action. Inside the limits of a space are gathered matter and spirit who come in contact and interact, creating stories and events. In this way, a special structure is defined with the characteristics of relational orientation and reciprocity, proximity and action, partitioning, presence and awareness[21].

The structure and morphology of a space define certain possible routes for movement and action inside it. In the same time, objects included in this space, because of their three-dimensional form, redefine themselves the borders, and influence the course of observation of the viewer, by defining the points of focus and attention, and points of interaction, such as is the case of a space where works of art are exhibited, or the space of an installation. This property of space, to encourage with its form and structure different and various courses in order to bring in contact and, by contact and interaction, the understanding of the whole of this structure and everything included in it, defines the way we approach the environmental space around us with both our body and spirit.

[21] Harrison, S., Dourish, P., "Re-Place-ing Space: The roles of Place and Space in Collaborative Systems", Computer Supported Cooperative Work 11: 299-316, 1996

2.1.2 Space and place

Every space is connected with a history and memories. People that lived or passed by any space have left their mark, each one in his own way. The presence, action and interaction throughout a space define a certain functionality and create a narration, a story about what happened there. The lived experience is itself the proof that a certain space existed and contributed with a specific way in the creation of this experience, of memories and stories. The familiarization with the characteristics and specifications of a space develops a special kind of orientation and movement, and a contact which preserves in our memory the relative position and relations of space and entities that met and interacted inside it.

The notion of place becomes different from the notion of space, meaning that a place is also invested with understandings of behavioral appropriateness and cultural expectations[22]. Thus, we live in a space but we act in a place. Space is formed by its position and the position and orientation of the material inside it, offering the field for action, while place in connected with the existence of human and action in the space, the formation of social interaction. People define the essence of the spatial dimension of reality based on the potential of a space. A very helpful example of this is the difference between a building and home, the first being a structural construction while the second is a defined space invested with certain emotions and functions. This difference between space and place makes as say that a certain event may be out of place, rather than say it is out of space. The personality and the needs convert an empty space into a world formed in a way to provide freedom of movement, functionality and specificity. Through appropriation and adaptation of a space we are able define the place.

According to this definition, space is signified by its spatial dimension and orientation while place by its social and functional dimension. Place can be a space where a certain role is given, where certain actions and emotions are involved and invested. It is defined by a dynamic which balances between connectedness and distinctiveness of the individual elements that consist a space and are able to be harmonically adopted in their environment. It is about the degree to which certain characteristics and the content of a place can co-exist and combine with the correspondent space, thus forming a unified structural and conceptual whole.

[22] Harrison, S., Dourish, P., "Re-Place-ing Space: The roles of Place and Space in Collaborative Systems", Computer Supported Cooperative Work 11: 299-316, 1996

2.1.3 Real and virtual space

Because of the technological advances, it has been some time we are able to construct and navigate into environments beyond the sphere of reality and the rules that condition the experience in reality. Thus, we have now the tools and motivations to portray and construct spaces and sceneries created out of thinking and ideas from our inner world and fantasy. A world so personal and unique as the personality and the character of its creator. In this world, the participation of reality is present with references to images and stimulus that are instinctively present throughout the process of creation.

Virtual worlds allow us to travel beyond the limitations imposed by space and time and into a reality re-constructed as a new world, based on an actual or imaginary place. The designing and rendering of a certain atmosphere of a space, describing a certain ideas and philosophy, requires in any case the balancing of the aspects involved on the process of creation. On the one hand, there is the need to reform a world inspired by a past memory, an experience, a story, or by simply our fantasy with the most possible fidelity to its point of inspiration. On the other hand, the character and skills of the creator or the group of creators contribute to form a certain aesthetic and interpretative environment, one which responds to the needs and expectations.

Focusing a little bit more on this aspect of creation, we should try to distinct the notions of real and virtual. According to Pierre Levy, the virtual state is not at all the opposite of the real state. The term virtual means the one which is an opportunity, a potentiality that tends to be actualized[23]. We relate the process of virtualization as similar to the process of inventive creation. It goes beyond the sphere of reality and included a new form of dynamic configurations of forces and goals. The virtual is a mode of being that is fertile and powerful, and thus is distinct from the potential, which is already in the state of becoming real. The actualization of the virtual consists of a creative process in which we define the desirable combination of solutions out of a much bigger total in order to accomplish the goals needed or expected, in order to transform the energy and idea[24]. The reverse process, the virtualization, involves the transformation of the actual into a state of creative relaunch. This particular possibility of transformation towards a world outside the realm of natural and actual consists of the most important attribute of the virtual world. The detachment of here and now reflects the human need to escape everyday life and be able to stand out and above of thing, in order to dream, to think, to create ideas.

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[23] Levy, P., Virtual Reality: the philosophy of civilization and cyberspace, Kritiki, Athens, 2001, p. 21-23

[24] Reyes-Garcia, E., "Pervasive Virtual Worlds", in Gianluca Mura (ed.), Metaplasticity in Virtual Worls. Aesthetics and Semantic Concepts, Hershey, Information Science Reference, New York, 2011, p. 80-81

In the process of creation of virtual environments, new media and computers have opened new fields and possibilities of creation and expression. The virtual space of a computer offers on the one hand a unity of time without the unity of space and on the other hand a continuity of action in spite of the discontinuous duration. The transmission of information is even possible in a world wide scale thanks to the possibility to receive this information independently of the time it was transmitted, regardless the transmitter and the receiver are actually or not synchronized in real time. In this way, communication is facilitated in a great extent, beyond any limitations imposed by space and time. We pass through the sphere of reality and into the sphere of virtual without always taking notice of it.

The process of perception includes, among other things, the awareness for the space inside which the body takes action and feels. Navigation inside a virtual space resembles the orientation and kinetics of someone in the real environment. Much of this is because of an intuitive, but also acquired movement control, as this particular acquired ability evolves as the user becomes more and more familiar with the use and navigation of virtual environments. In that way, as the user gathers experience of virtual environments, the virtual world becomes a tool that enhances our spatial perception by constantly investigating new methods of adaptation and simulation of various characteristics from the real world. Having as a target the offering of various stimuli in a multimodal and multidimensional way, a virtual space provokes the participation of our senses and creates the sense of presence, immersion or action for the participant.

Keeping in mind the previous distinction between space and place, its rather appropriate to support the aspect that the digital world is mostly consisted by virtual spaces. The placeless of these spaces is then a particular characteristic which cannot be constructed and designed as the space and its specifications can. Essentially, the configuration of a place is the result of more integrated, complex and spherical procedure which takes into account some defining parameters[25]:

- Spaces are not places. Places reflect cultural and social understandings. A space offers the material out of which places can be built.
- Places, not spaces, frame appropriate behavior. The usage of a space is also part of the process that defines a place. It is not the structure of the space which frames behavior, but the place where people find themselves inside this space.
- Places have social meaning. This meaning is rooted in the practices and understanding, always evolving and transformed through contact and interaction.

[25] Harrison, S., Dourish, P., "Re-Place-ing Space: The roles of Place and Space in Collaborative Systems", Computer Supported Cooperative Work 11: 299-316, 1996

As a result, different people have different understanding of a similar place and similar concept.

- Different media have different spatial properties. The various media used in order to create a virtual environment – 3d, sound, graphics, text – have different attributes and properties. As a result, each media has its own influence according to its specific characteristics, embodied by its nature and usage.

According to Edmont Couchot and other theorists, the digital form proposes a representation of spatial parameters that differ from these of other medias. In reality, virtual space, which consists of information and data, is exclusively symbolic. In his essay "Anthropic Cyberspace", the architect Peter Anders confirms that what we perceive as space is in reality a product of complex mental processes and that cybersphere is an extension of conscience. In that way, the border between the real and the virtual blend even more, and the virtual space can only be conceived not only as a representation or simulation of the real, but also as an extension of perception and cognition.[26]

The creation of the illusion of space within a computer mediated environment, which can be achieved even with only a text-based display, is the result of the capacity of the medium to accept navigational rules through commands from us and to respond according to the programming in a consistent manner that reinforces our notion of space. We can program the responses of the computer to simulate any space we can imagine appropriately so that the participating user will be able to immerse in this space and create a mental map of the symbolically represented environment27. But even though this "spatial" property is derivative of the procedural and participatory properties, it is so fundamental to the way we experience the world, and so desirable a means of representing the world, that we have to think about it as a property in itself.

[26] Paul, Christian, *L' art numerique*, Thames & Hudson, Paris, 2004, p. 94-95
[27] Muray, Janet H., "Inventing the medium", in Wardrip-Fruin, N., Montfort, N. (eds), *The new media reader*, *The MIT press*, Cambridge Massachusetts, 2003, p. 3-11

2.2 space in/of art

2.2.1 The spatiality of an installation

Art in the only human activity which tries to link the imaginary and the real without the exclusion of the one or the other, art evolves in a rather elevated sphere, this of an idea of conciliation of contraries. The question of real for an immersive installation is not the question of the truth of this reality but this of a belief in this reality. More than just any work of art, the installation consists of a micro world that implies and invests the body and spirit of the spectator. Neither simply architecture nor sculpture, neither spectacle, an installation imprints and borrows from all this fields in order to create a sensible abstract reality in the heart of the imaginary. With the art of the installation, the fusion between the work and the life inside its space is fed by the spectator and the time of his passage. The artist builds the space of his work around the virtual time which becomes actual through the presence of the visitor.

In the art of the 20th century we already find the idea of a spectator who consists a physical element, a part of the work itself, central to the existence of the work. For example, this was the case for the first “happening” or “performances”. The happening exists as a form of improvised spectacle, and as such, it is ephemeral. A happening can take place inside an enclosed space like a gallery, as well as in the open, in the streets. The spectator holds a role of a witness, but also keeps the memory of the event, deformed by his own perception, which is consequently subjective, and by the time. He holds the trace of the work of art while it is already gone from the moment the event is finished. The spectator as such, becomes himself the vessel from which the work of art had existed.

On the same time, the aesthetic of the minimal art tends to provoke an aesthetic experience for the spectator by making him focus his attention to the direct perception of the primary elements. The work itself is not more important than the object, but it is conceived in order to stimulate a reaction in a given space. The minimalist work of art explores the surrounding space and plays with the points of view of the spectator. The installation encompasses, from its origins, the concepts[28] developed all along the 20th century: the fusion of art into life, the positioning of the spectator in the center of the creation process, the definition of the work of art as a space of action.

The minimalist work of art is not, per se, neither a sculpture, neither a painting. But it inaugurates a new type of three-dimensional work of art, which is interested in the

[28] Alberganti, Alain, De l’art de l’installation. La spatialité immersive, L’Harmattan, Paris, 2013, p. 67

perception of objects and their relation to the space. It wants to become a revelator of the environment space by materializing it or by evoking it. With the minimalist works of art, the artist installs in the space one or more geometrical objects, which then become inseparable from their environment. More than a creator of an object, he is the designer of a complexity which engulfs the surrounding space and brings in contact art and reality.

"The installation allows artists to stage the different elements of a representation. The term indicates a kind of creation that refuses to concentrate on one object in order to address the relations among multiple elements. By establishing spatial links between the object and the architectural setting, the installation makes viewers more aware of their integration into the situation created. The viewer's experience of the work is crucial. The work is a process to be perceived in the course of a displacement. The viewer, drawn into a spatial sequence or other mechanism, participates in the work's mobility. The mechanism designates the way in which the material presentation of a work, the way it is displayed, is part of a systematic design. The mechanism creates the illusion; it is its own reality. Since the end of the 1950s, viewers have inhabited works of art in the same way that they inhabit the world. The work of art was thus elaborated as an "environment," in three dimensions, as a theatrical transposition of the painting to reality. Early on, such works came to involve viewer's physical participation, which became one of its elements. New technologies have given this participation even broader scope--the artist creates "interactive" situations in which the work reacts to the viewer/user's action. The relative reciprocity emerging between the user and a "smart" system is accentuated by artists who use computer interactivity to create multimedia environments associating image, text, and sound."[29]

We could also define the installation like a living space project, like a replica of a space in 1/1 scale, like a projection of the conception – the space of the thinking – into the perception – sensible space. This point of view, a conceptual one, takes into account the relation of installation with the conceptual art, which takes the source of the thinking in order to question the nature of art. There is an abstraction in this kind of art, which is not of the same nature as this of the abstract painters who translate the interior movement into forms or lines or colors. The conceptual in this case has as a horizon the language, whether it's being used or not. The sensible part is secondary in relation to the presented idea. As such, an installation in an artistic process which borrows from the abstract of the conceptual art (the concept of the space) as well as from the abstraction of the minimalist art (the sensible space).

[29] Encyclopedie Nouveaux Medias, http://www.newmedia-art.org/english/glossaire.htm, definition de l' installation, (last visited : May 2014)

Art, since always, had the need to establish a limit between its own space and the real space[30]. This limit between the sphere of the imaginary and the sphere of the real is more or less conceived in a material way. The installations convoke various forms of artistic expression – videos, paintings, music, sound, sculpture, architecture – in order to construct a frontier between art and reality. As a result new spatialities emerge which take the immersion and transform it to the aesthetic relation between contemporary man and space, and through this space, in time. The ideal of not being into the real world but to immerge into another one become possible the moment which man was able to construct an artificial world which will suit him and liberate him from the natural world. New technologies make this possibility even closer to realization. The work of art in no longer a simple screen in front of which we understand or realize, in proper or symbolic meaning, the natural world. This screen had now become a world itself, an artificial and virtual world in which we can immerge and dream.

The installation refuses to conceive a fixed space of reception where the place of the spectator and the postures are fixed or becoming fixed in a way to influence the perception, to make the spectator see or perceive a world, more precisely the relations to a world, from a specific angle. The installation has the ambition to conceive an open space in which the spectator is brought in front of choices considering his place in it. The spectator becomes free to rediscover, invent, explore, experiment.

The philosopher Charles S. Peirce proposed the division of all the sings into three categories: indexes, icons and symbols. The indexes are the sensible traces of a phenomenon, they operate through contiguity of space and time with the objects they evoke. A sing in this level is actually affected by something. It is the case of shadow of a man, of the smoke of a fire. The icon breaks the contact. The sign no longer is part or what it represents and it doesn't maintain more relation with that than with the relation of similarity. The icon takes its distance from the real and implies a selection and reconstruction of the sign from some of its most relevant elements. If the index deducted from the world, the icon adds itself. It is an artifact which substitutes reality. The symbol radicalizes there rupture with the real. The contiguity and the analogy disappear in order to leave a place for the convention of the meaning of the symbol[31].

Every image in that way can be seen through these three dimensions, as an index, icon or symbol. In reality, an image occupies an uncertain space between an index and a symbol, by its force to maintain itself between presentation and representation, between content and form, between color and design, between form and depth, between representation and non-representation. An installation as a work in this point of vue takes

[30] Alberganti, Alain, De l'art de l'installation. La spatialité immersive, L'Harmattan, Paris, 2013, p. 87
[31] Alberganti, Alain, De l'art de l'installation. La spatialité immersive, L'Harmattan, Paris, 2013, p. 74-75

into account the impossibility of conceiving other than the mediated reality, whose space, without any defined limitations, stays between the spectator and the work in the surrounding space.

2.2.1 The theatricality of an installation

The will to contact the real space is accompanied in a natural way with the work around the time of the exposition or the presentation of an installation. The inclusion of the real time inside a work, the time of the spectator the moment of his experience of the installation, is also in the center of the work. The inclusion of the notion of the event in the presentation ties with the presence of the work with the time of the spectator. The presentation of a work as such is not much more different than a creation in a studio which is then presented in an exposition. In the case of an installation there is a mixing of these two moments in one single and unique event which can never be identically reproduced. In this notion, installation borrows the necessary tools of this new aesthetic from the theatre.

The installation, like in theatre, in order to exist, is in need of a public, a spectator, and creates a relation between the spectator and the work[32]. Bodily expression or action on the scene, the theatricality is a difficult notion to conceive and implement, because it consists of a metaphor of certain of the mechanisms of thinking. The act of getting in front of oneself, to objectify, gives us the opportunity to think and take into awareness. By getting in front of us, on the scene of our spirit and thinking, is what detaches us from the whole of the reality. On the other hand there exist also moment where these confrontations don't take place and there in not a distance between what I live and what I think in a specific moment. In reality, we are continuously in a flux between these two forms of thinking and perception, in front and inside the things.

The theatricality is the motor of a creation of a place where art and life meet, in a metaphorical way. The foundations of this meeting are implemented since the first half of the twentieth century from the futurist artists, the artists of Bauhaus, the artists of the Fluxus group, the conceptual artists, who define the physical and philosophical limits of art and become the protagonists of a construction of this frontier between art and life.

[32] Ibid, p. 80

The art of the installation can be conceived like a theatre without theatre, or better, like a space of plastic art which integrated theatricality. The spatial experience becomes possible by this theatricality which gives space a form in the present, which morphs the immersive space. The objects of this space are like the actors who move towards the spectators or they make them move towards them. The presence of these guide-actors attracts the visitor in the space of the installation.

2.3 inside the space of an installation

2.3.1 Personal space and perception through the body

Interaction with either the real or the virtual environment becomes possible through body, with its use and coordination of expressions, movements, speech. The response of the environment is then by a means of an effect towards the emotional and mental level throughout the five basic senses. More specifically, vision, hearing and contact are the basic tools for the perception of material as well as spiritual world and the creation of interpersonal relations. Actions and evolution are both realized within a certain field around each person. Around this field any human being can approximate and understand, create bonds with the environment.

Personal space consists of this field around the human body, in which a human can have conscious communication and contact with the world. Through communication processes, we can observe extension or shrinking of this limits, modifications according to the quality of the contact evolved. The processing and intimacy that may result, gradually reduces the distance between the content and the persons with whom there is an interaction.

The realization of reality is thus unique to each human being. The stimulations provoked by the external environment and the relations concluded inside this environment, as well as the uniqueness of its character trigger an interpretive process which is in constant evolution. His meeting with the world stimulates his senses and his way of thinking, consists of the main factor for the formation of his personality.

The process of perception is in constant and co-dependent relationship with the body and the spirit. A relationship concluded by the embodied self and the thinking being

with the world. The body is not just a simple instrument, but it's our own expression to the world, the visible form of our intentions, is the place in which the spirit takes its shape, a means to understand the external world.

This consideration of Merleau-Ponty[33] of the way the processes of understanding and realization for human existence can actually happen, introduces the notion of an embodied notion and conscience. As he states, when we think on the notion of subjectivity, we find it inextricably connected to the body and the world, and this is happening because our existence as subjectivity is almost one with our existence as body and with the existence of the world, and because this subject we are is inseparable from this body and this world.

For Merlau-Ponty the body cannot be separated from the self, neither the self from the other. The consciousness starts to move from the thought towards a consciousness which exists inside the body we live in this world, and understands the inter-relationship of the subject with the object, the viewer with the one being viewed. The analysis of a mechanical habit as extension of our existence leads to an analysis of the perceptive process as a habit in order to understand the world. In contrary, every perceptive habit remains a mechanical habit, and here the process of perception of meaning is performed by our body[34].

Perception can also be a process that operates in a subliminal level, a process which defines the identity and determines the participation of the body and the spirit inside the dimensions and specifications of the world[35]. It doesn't simply consist of an internal representation of the outside environment, but more of a contact and constant interaction in a natural and spiritual level. The human figures continuously tell their story, act according to their consciousness as life flows and they become available to the personal perception of themselves and others. The experience forms the understanding and determines the qualities that intrigue interest and touch other persons.

A merely personal reality is created because of our perception. The world stays unique for each human being, besides any objectivity there can be about undisputable facts or the resemblance of the image that ends being captured by our vision. The encounter with this world consists of a unique experience, an experience which gives birth to the need to communicate, through everyday life, but mostly, through art, the emotions and the perspective that is formed.

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[33] Merleau-Ponty, Maurice , Phenomenology of perception, Routledge, London,1962, p.408
[34] Merleau-Ponty, Maurice , Phenomenology of perception, Routledge, London,1962, p.153
[35] Robertson, T., "The public availability of actions and artefacts", Computer Supported Cooperative Work 11: 299-316, 2002

2.3.2 Installation and body participation

The interactive work of art can be described as an open invitation to the viewer to participate, by minimizing the distance between object-subject and viewer-work of art. In contrary, it emphasizes more on the procedure of creation throughout interactivity rather than the final result. The interactive work of art is also occupied by the way it interacts with the viewer/ participant, it operates according his participation and his emotional and physical involvement[36].

Current art tends more to travel in a plastic space which isn't neither representation, neither real as a place. This space is the one which is situated on the limit between the work and the spectator, in other words, the space of perception of the work as such as an aesthetic object which is an expression, an opening to the sentiment of a possible world. According to Dufrenne[37] , « this space isn't anymore a space inside art, and much less a space for art, it's exactly the space of art, a space generated by the expressivity of the aesthetic object. […] closing the eyes in order to sense: it's inside the body – where resides furthermore the secret of schematisme – where we need to open towards this opening ». In a way, the art of installation ambitions to associate the interior space of a work with the external space which hosts the work and to merge the possible with the real, but also to merge, in another and new way, the real into the possible.

The installation creates the conditions inside a space, immersive and engulfing, which radically changes the relation between the spectator and the work of art: the spectator is no longer situated in front of a work, inside a neutral and passive space, he is inside an active space which surrounds the interactive objects. The limit between the space of the exposition and the work blurs. The spectator becomes a visitor, and, from a distant observer he used to be, he is invited to immerse into the situation and to inhabit the space[38]. If the traditional art exposition with its cadres functions as a machine to grasp and absorb the spectator, an installation functions like a machine to inhabit the space.

To propose to be situated in the place of the interactor inside a digital installation forces us to interrogate over the real significance of space and what this significance implies in the relation with the work[39]. In order to refer to the place and

[36] Lash, Scott, Sociology of Postmodernism, London, Routledge, 1990, p. 175

[37] Dufrenne, Mikel, Esthétique et philosophie, Tome 3, "L' espace dans l'art", Klincksieck, Paris, 1981, p.161

[38] Alberganti, Alain, De l'art de l'installation. La spatialité immersive, L'Harmattan, Paris, 2013, p. 123

[39] Baboni Schilingi, Anne-Gaelle, L'interacteur: paramètre ou maître à bord? La place de l'interacteur dans les installations artistiques numériques, Université Paris 8, Ecole Doctorale SIIC, 2003, p.19

space, it is implied that we have to examine also the embodied relations and the cognition of the spectator who is included in the work and engaged in its very concept: the spectator through his body occupies a topological position, one we can designate by the name of physical place, defined in the relation to the material aspects of a work, either to the material aspect in its original conception, either to the one presented in the time and space of the presentation of the installation. In the same way, other works of art, such some paints, are conceived to be exhibited and viewed in a few centimeters distance, while others demand maybe meters away. This place, assigned to the spectator, this constraints imposed over the body of the spectator aren't indifferent, since they motivate a rather not at all insignificant part of the very conception of the work.

But the spectator occupies also another place inside the installation, which is of another nature, but always incorporated inside the conception of the work itself: the work of art is a message, emitted towards a recipient, but in order to achieve this concept such a work should rather adopt a certain communicational model in order to communicate with the recipient and by this assign him a rather conceptual place inside it. Nevertheless, this separation takes place only in order to comprehend the duality of this notion. The physical and the conceptual place of the spectator are constantly joined on many points. From one part, the physical place may be solidly determined from the analysis of the disposition or exhibition of the installation. On the other part, the conceptual place, evokes furthermore of a study over the intentions of the author/ creator, but also on the cognitive models which more or less are applied, and so, the cultural conceptions valid either on the moment of the conception of the work either on the moment of its presentation. The notion of the place as such implies an evaluation of the personal physical relation to the work, as well as an evaluation of the physical, conceptual and intellectual aspects. In front of the work, actually, the spectator is on the same time alone and member of a cultural group : the work of art is based on the same time on the singularities of its "perception" as well as these of its "reception", based over its subjectivity and its inter-subjectivity.

As our body becomes familiar with these practices, it's also acquires new habits and abilities, and so, the world around us as we conceive it changes. As we evolve from amateurs to experts, in no matter which activity, the amplitude of acts and performances increases. Thus, the body is not just a surface where culture is inscribed, nor just the representation of ideas around beauty, aesthetics or sexual desire. It has been converted in a channel of cultural expression. As it is enters the sphere of virtual, it is no longer possible to locate the boundaries between inside and outside, surface and depth, aura and projection. The technological deconstruction of the body suggests a new perception of the body and the notion of embodiment in installations and virtual reality works of art.

3. the installation and other experimentation

This chapter treats subjects related to conception, development and realization of our interactive installation, *TimeCube*. As in many installations, this work proposes a way in which the real and the virtual can co-exist and balance inside an environment created by the installation. The period between a concept and its realization is a long and very interesting procedure, throughout which experimentation on aesthetics and techniques create a very fruitful dialogue between the creator and the work.

Ce chapitre traite les sujets concernant la conception, le développement et la réalisation de notre installation interactive, sous-titré *TimeCube*. Comme le cas a plusieurs installations, cette œuvre propose une manière certaine par laquelle le réel et le virtuel peuvent coexister et balancer dans l'environnement créé par l'installation. La période entre la conception et la réalisation de l'œuvre est en effet un processus vraiment intéressant, pendant lequel l'expérimentation sur l'esthétique et les techniques différentes constituent des outils qui apportent un dialogue fructueux entre le créateur et l'œuvre.

3.1 concept

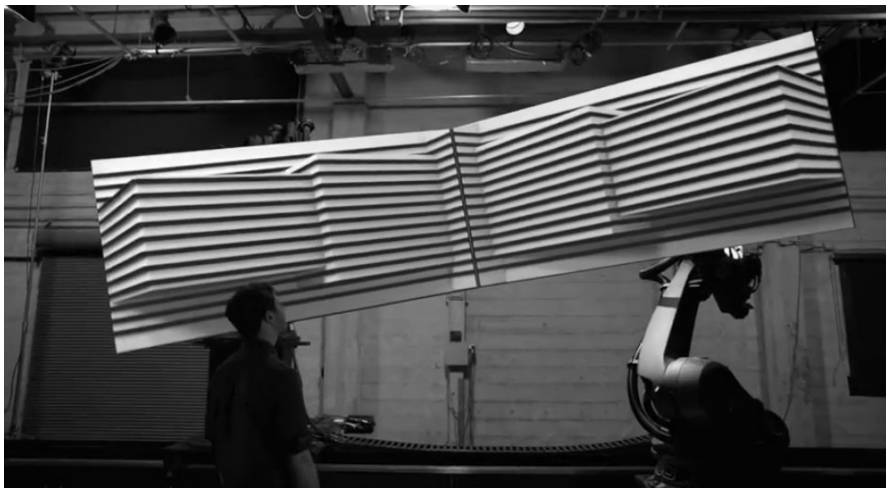
Interactive digital multimedia installations are a form of expression in art which tries to embrace the visitor / spectator, involve him and make him participate in the events, make him interact with its body and spirit. Moreover, installations that involve projection, catalyze processes of transformation created by a fusion of video projection and objects. A virtual dialogue erupts as the projection residing in objects, precipitates a virtual realm with a material encasement. Video projection creates a virtual architecture that immerses the viewer in visual narrative and sound. A costume is imposed on the surrounding environment and the object causing the social context to become elastic, fluctuating in its meaning. The light and shadow of the projection or video activates the spirit of the environment, while the narrative activates the object.

In some installations, as is the case for this one, the participation of the viewers are mandatory. The expressive forms used in the creation, design solutions suggested, actions and the continuity of the events take their form by the intervention of the spectator/user. In interactive creations, actually, the definition of the scale, the position, the trajectory or the behavior of the graphic elements displayed or projected, determine and define not only the information, the content, but also the modalities of the exchange of such information in the interior of the mediated communicational space.

In the creation of this installation, we tried to embrace the knowledge acquired throughout the two years of the master. During long meetings and discussions, we ended up realizing that a combination of some of the emerging technologies we have been taught would be of a great interest for all of us. Our installation tries to combine technologies such as game art and projection mapping. It consists of a work exploring the borders between these forms of creation, and moreover, the blurring of the border or the meeting that can happen between them.

Projection mapping, for a long time, has been used for commercial purposes or in the form of vj-ing. Artists also have been using this technique with very interesting results, and lately there are some implementations of this technique into other forms of expression, such as performance, resulting in an immersive experience.

SkullMapping, Fiere Margriet, presented in Leuven in Scene, Leuven, 2012 and Thinking out of the Box, presented in Festival van de creativiteit, Turnhout



Bot & Dolly, Box

A

A dandypunk, The Alchemy of Light

This chapter evokes subjects related to the realization of this interactive installation. It is also occupied with the design decisions and how these decisions along with programming contribute in the realization of a digital interactive installation, and how these procedures evoke the characteristics of the actual and the virtual.

TimeCube, the name by which we presented the installation, is a real time interactive installation, that uses the technology of projection mapping onto a three dimensional structure created specifically as the intermediate object between the real and the virtual. The interaction in *TimeCube* is achieved with the use of a custom made interface, which is a tactile object.

With this work, we tried to explore the possibilities of immersion into a virtual environment. This environment consisted of four smaller universes, one for each creator, in which each of us is trying to create a virtual space as a dialogue between the viewer and work, the part and the whole. Each of these universes invites the viewer to participate and explore the different aspects of the virtual environment proposed. Each of them is unique in terms of design but also interaction and response to the viewer.

But the four of them consist of a whole. This whole is created as each of the part is recreated in a loop, one after the other, defining an endless passage between the virtual worlds. Each world has a form in its existence as designed, but varies its appearance and forms through user interaction. As such, *TimeCube* varies its forms, according to the presence of viewers or their absence.

3.2 first approach

Interactive 3d and video mapping: unity and kinect

Our first attempt towards the realization of an interactive 3d mapping came as an idea around October 2013, when during the courses of “Art et Programmation” we had to present our midterm project. For this, we decided to experiment and find some possible ways in which we could present an interactive narration about a place - its history or a fictional story. Our research, discussions and ideas were mainly focused around the notion of creating an interactive space inside which someone could construct a personal meaning according to his movement and choices.

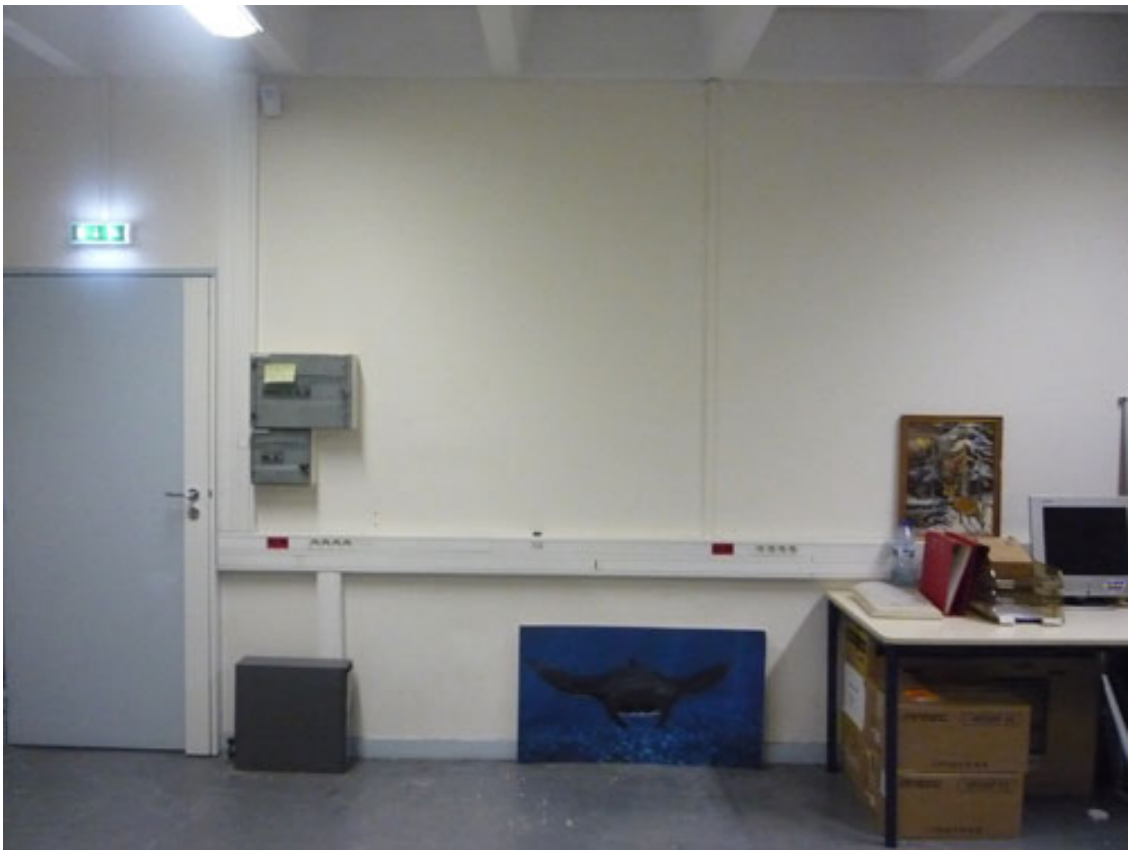
As a first approach to this, it seemed quite clear that we wanted to use real time 3d graphics and animation, not only because of the possibilities offered in terms of interaction by such technologies, but also because we wanted to refer to a playful attribute inside this space – a notion more close to gaming. As a result, we decided to work with Unity 3d.

A dandypunk, Imagineers in Exile - projection mapping storytelling. The work of dandypunk has been a great influence during the first discussions.

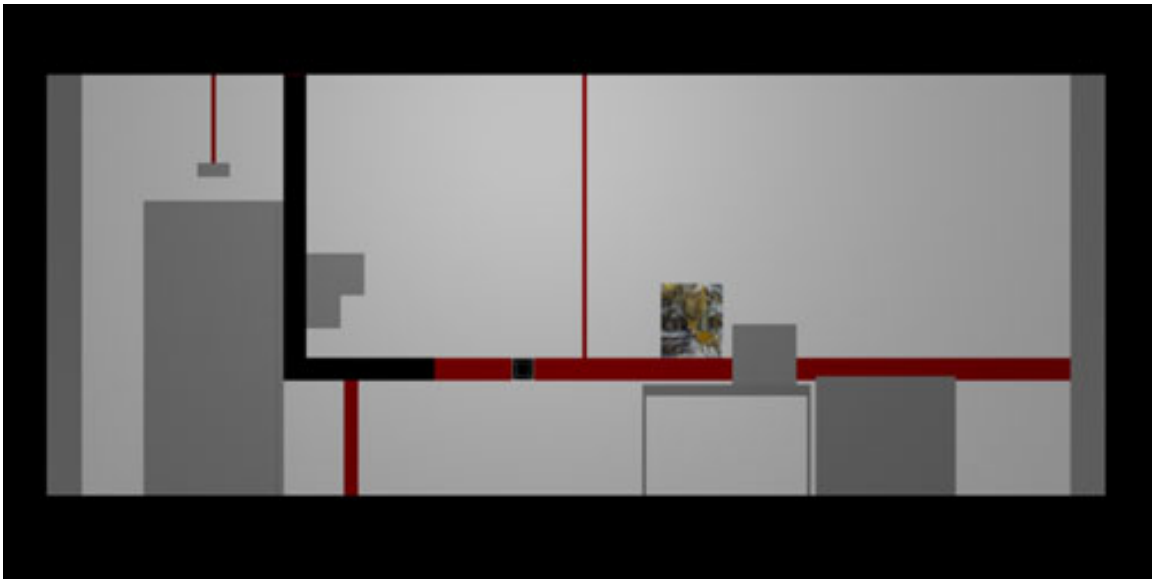
At first we decided working some ideas and experiment in order to figure out some aesthetic concepts or some basic interaction concepts without yet having a specific space in mind. But because of many limitations, such as the limited time we had in our disposal – a few weeks – and the lack of our personal equipment with which we could experiment everyday or even install in a space prior to the presentation, we rather didn’t have many

options but to stay inside the area of the university. As a result, we ended up using a space inside the faculty, which we could have in our disposal for a few days.

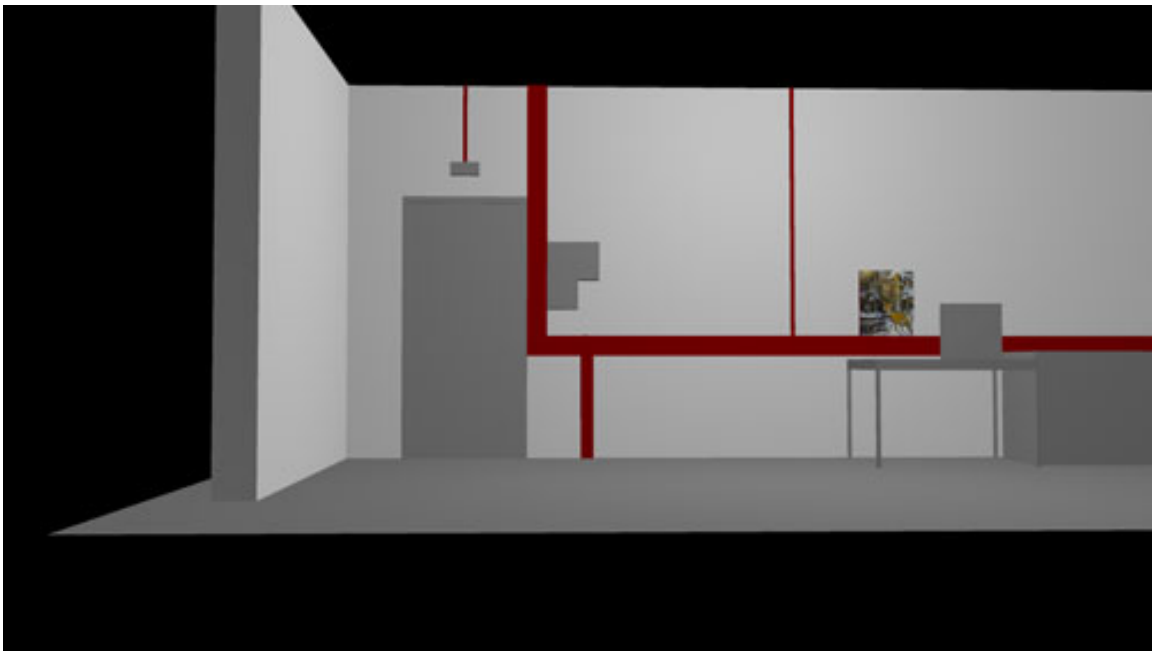
Our major concern consisted of how we could calibrate a projection onto the actual space. From our research on 3d mapping pipeline, we figured out that in most of the cases, a 3d reconstruction of the actual space is needed, so we proceeded in recreating the 3d space in Maya. Then, we imported the recreated environment in Unity, and tried to calibrate the camera according to the position and settings of the projector, which turned out to be very tricky since we didn't have any specific projector in our disposal. As we only had it available for some hours each day, we couldn't define a specific position for the projector. No matter the markings or the calibration of the settings, since it wasn't a professional projector for this purposes, the image appeared every time with different distortions.



The actual space, the facade we used for the reconstruction and the projection



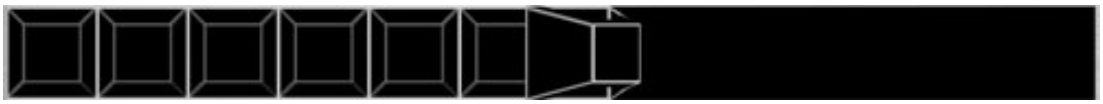
The reconstructed space, 3d model inside Maya



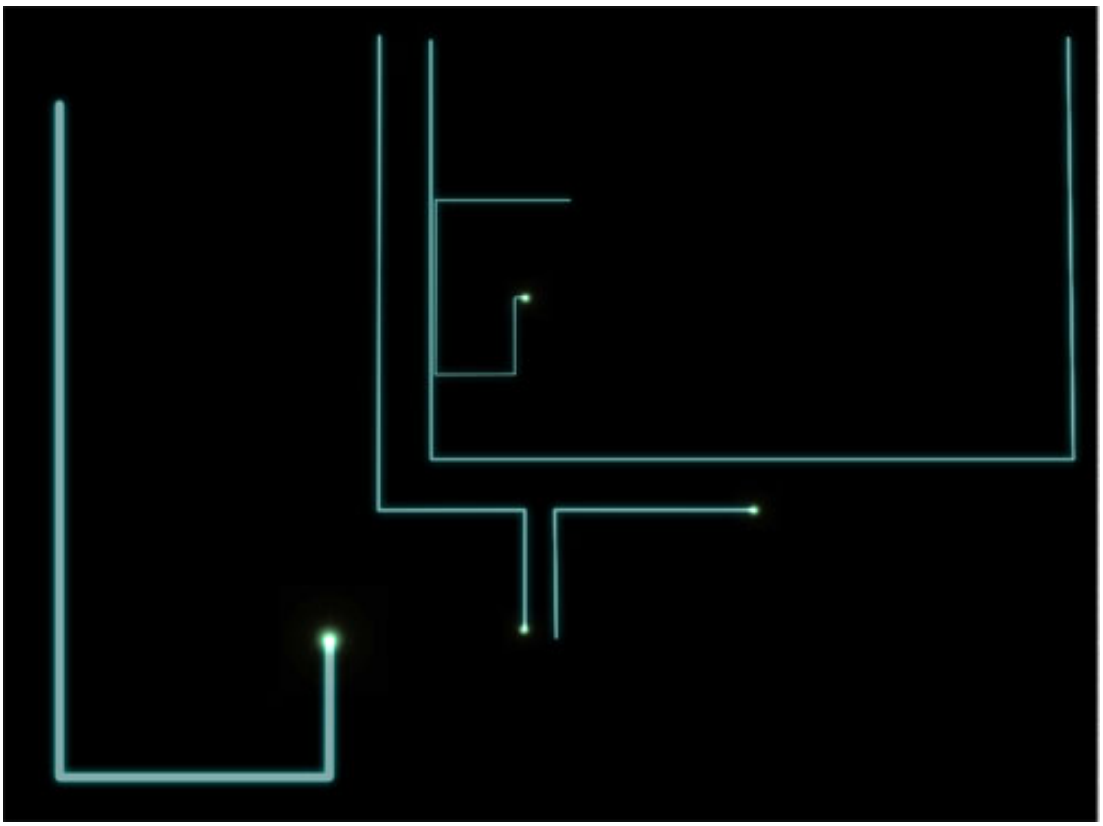
The 3d model inside Unity

After a successful calibration, we were then ready to import any audiovisual material inside unity and construct the interaction with this material. For this reason, each of the members of the group was assigned to produce some kind of audiovisual material. At this point, and because of the limitation of time and space as explained earlier, there wasn't any possibility to realy exploit the potiential of the given space. So we decided to go just for some animations and video effects, in order to produce interaction that would cause audiovisual content to be displayed.

From my part, this content, for the purposes of this project, was mainly inspired by some common visuals found in video mapping performances. As such, I worked with a mel script inside maya, in order to produce an animation of cubes. The idea was to reconstruct part of the wall and divide it into smaller basic geometry units, some cubes, which could animate a folding sequence.



I also created an animation inside After Effects, for which I tried to implement on our reconstruction a quite standard effect on video mapping, consisting of lines of light, tracing around the edges of the environment.



Both videos were exported as movie files with alpha channel. Then, they could be imported into unity, applied as a video texture on the desired surfaces, and then called through scripting according to the interaction.

For the purposes of the interaction, as we wanted to emphasize the movement of the viewer inside the space and most importantly along the length of the façade of the projection, we used a kinect camera. By this means, we could track the position of the viewer inside the space, but also we could define certain areas on the surface of the actual wall – marked with triggers inside unity – which would generate the visual effects by touching them.

Real time interaction by position and movement tracking

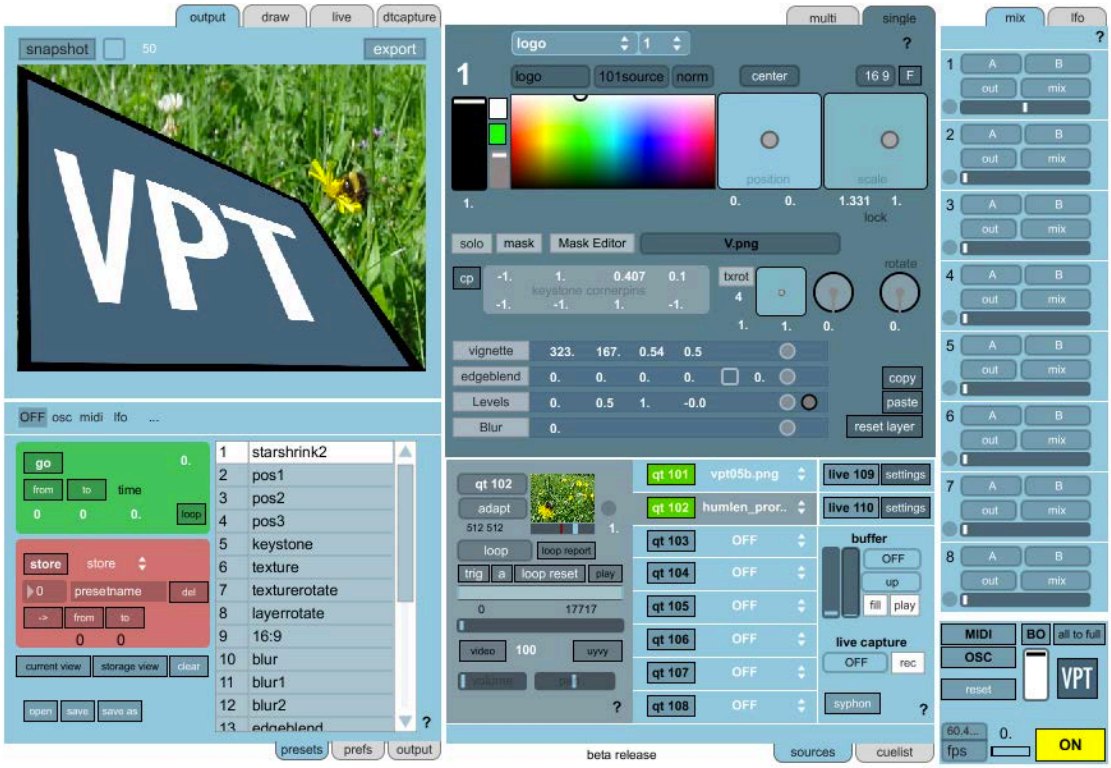
A view of the recreated and modified by the projection space

3.3 projet intensif

Shortly after our first experimentation, the basic period for the development of the application had arrived. At that point, after evaluating the work already done, we had come to decide that unity by itself cannot constitute the main tool for the 3d mapping of the geometry as well as it could for the development of the 3d real time interactive environment.

Therefore, a research begun as far as it concerns software specific for video mapping. Research showed that there are numerous software and software combinations used by professionals and artists in order to achieve video projection techniques. Among them, there are VVVV, MadMapper, Resolume, VDMX, Modul8.

For the purposes of our project, we decided to go for VPT – Video Projection Tools – since it consists of on open software solution. Although it is not one of the best available solution, at least for the present moment, towards this decision contributed also the fact that during our research for interactive mapping and unity, we came upon SYPHON, a plugin developed to bridge different software on a Macintosh. SYPHON is an open source Mac OS X technology that allows applications to share frames - full frame rate video or stills - with one another in real-time. Through SYPHON, we came with a solution with which we could put together Unity and VPT.

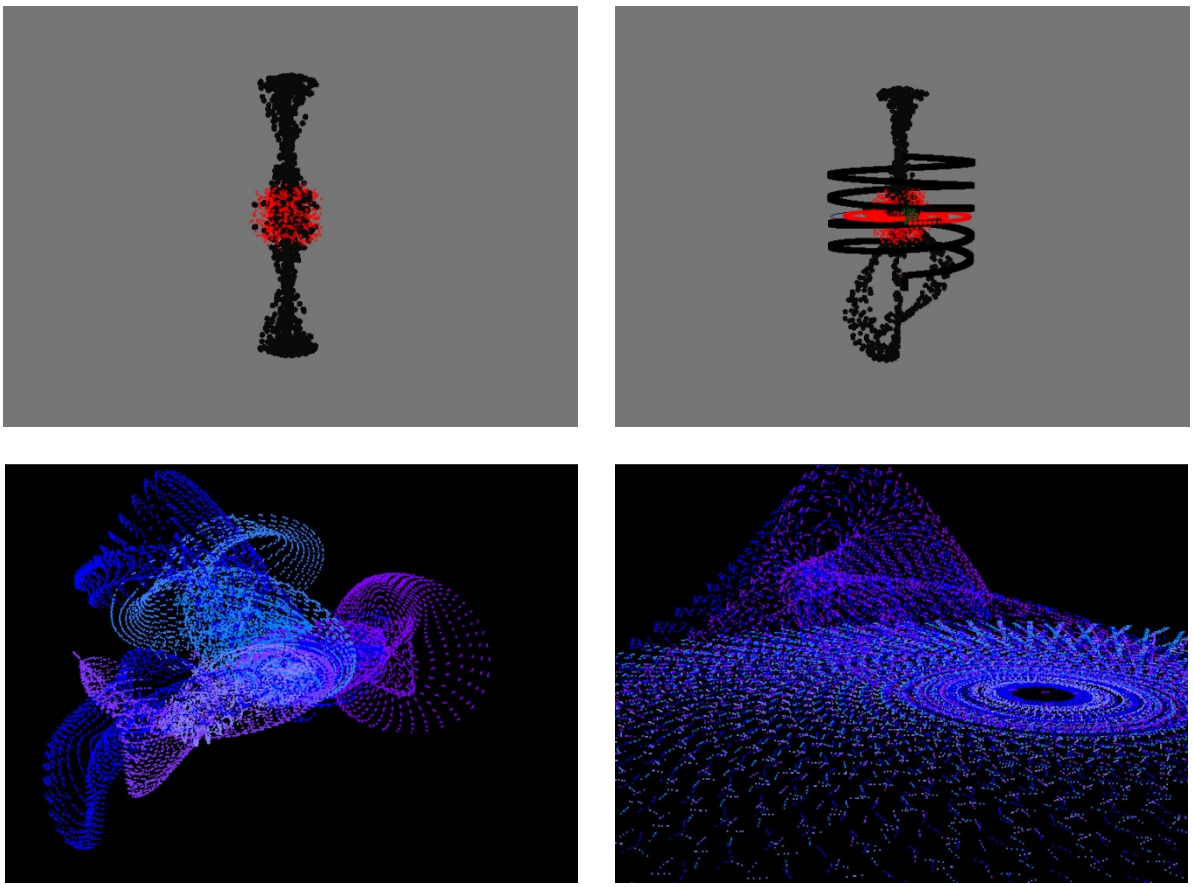


The interface of VPT

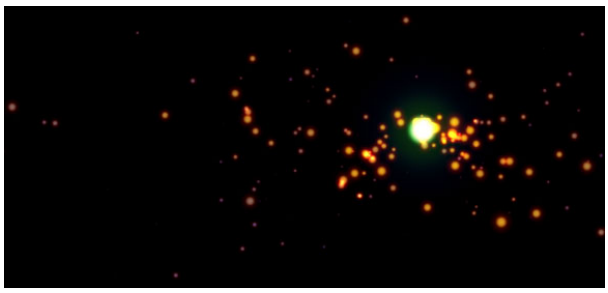
After that, we had somewhat specified the software and hardware needed in order to achieve an interactive projection, combining the technologies of Unity and Vpt. Each of us had to experiment and design a personal space inside Unity. Each of these four spaces would then be combined in order to produce the final work.

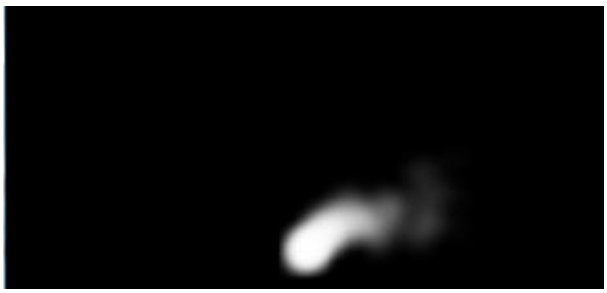
3.4 some personal experimentation

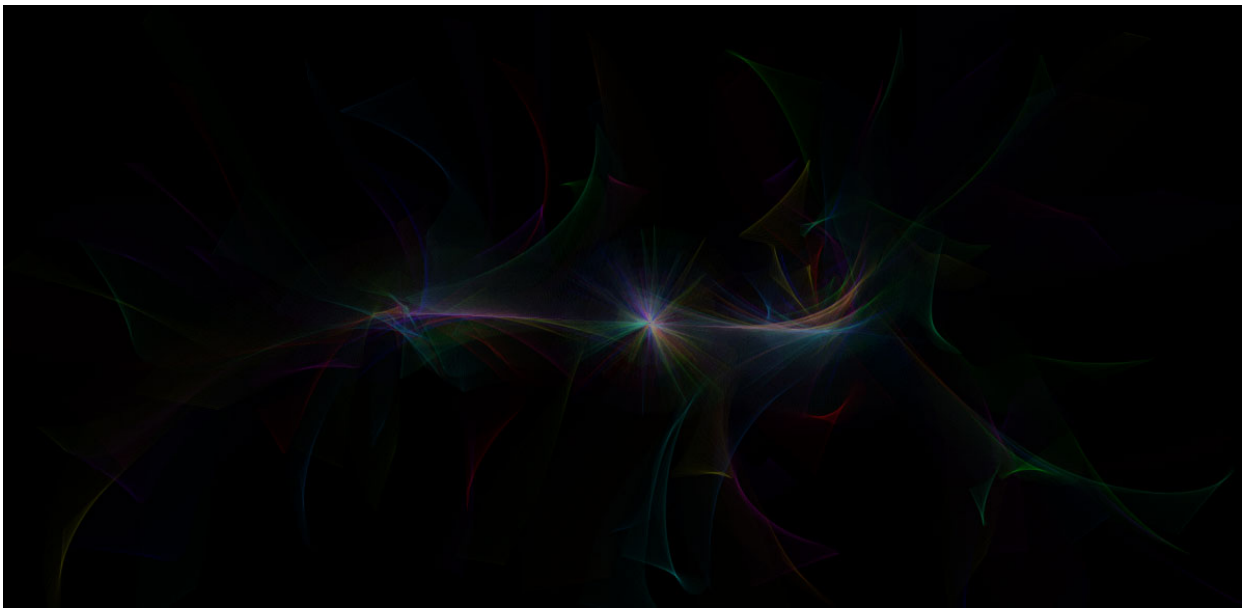
As a personal experimentation, I went onto exploring particle systems in various software. The whole idea emerged as a result from some experimentation with particle systems in Maya during the courses of 2012-2013 in Athens School of Fine Arts. There, professor Manthos Santorinaios organized a three day workshop with X Atelier, which evolved around architectural design with particle systems. Having these experimentations as an inspiration, I further explored the possibilities of creating forms with particle systems in Unity, After Effects and Processing.



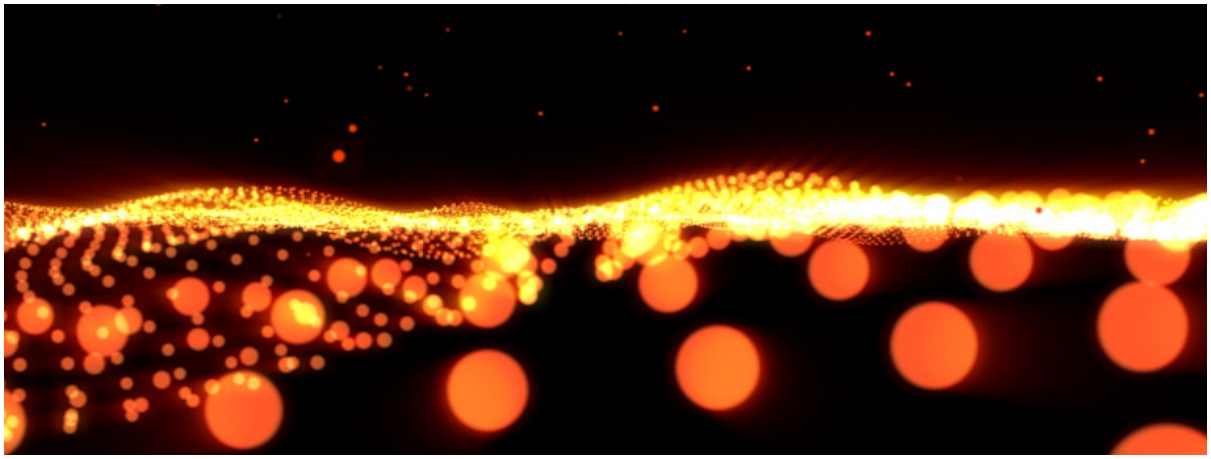
Samples, designing forms with particles in Maya

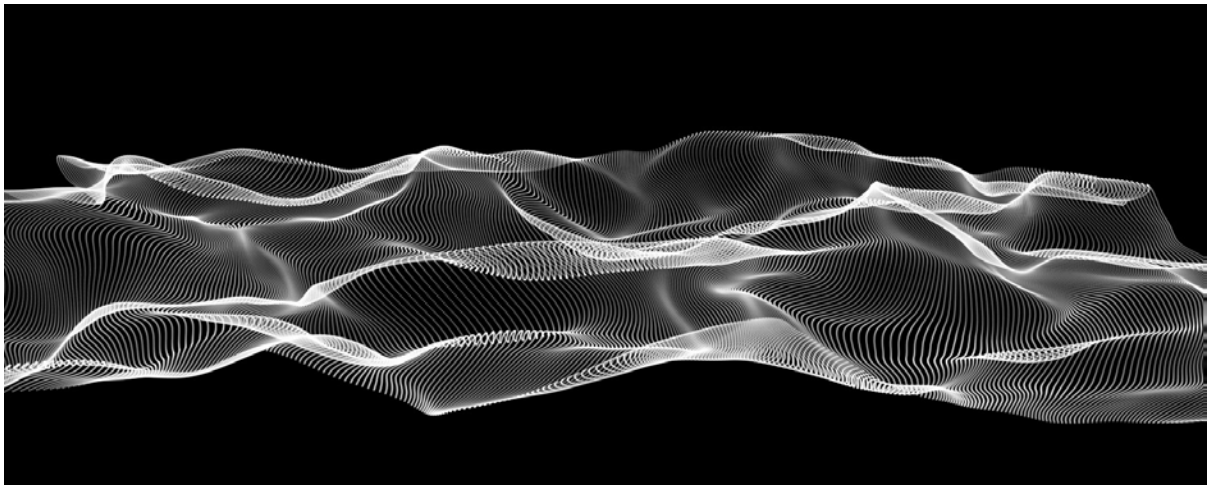


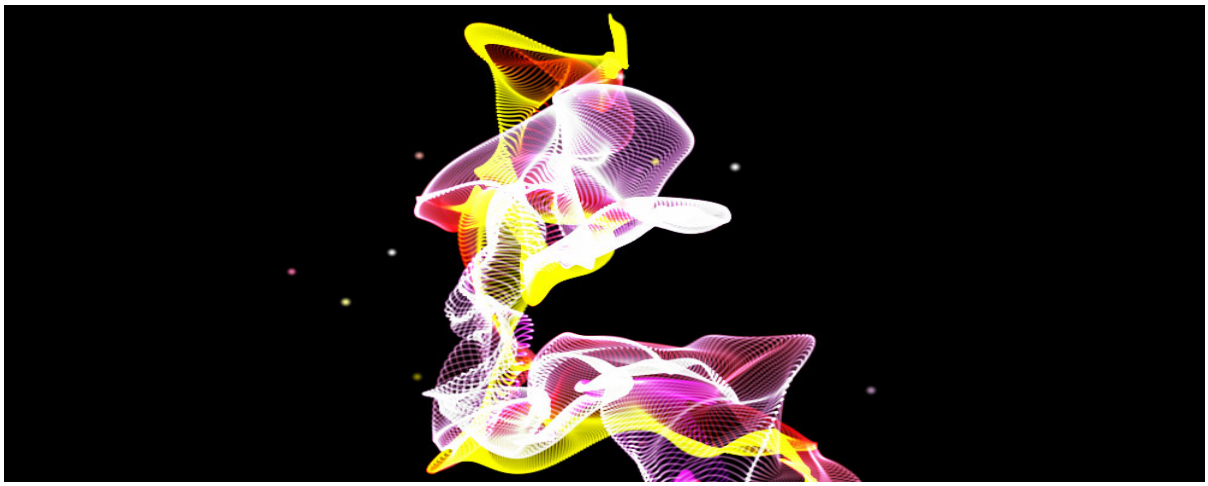




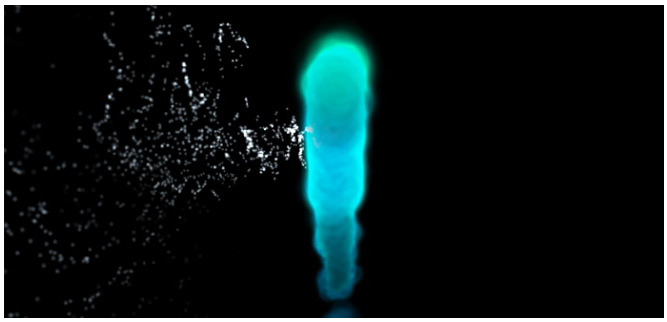
Samples, designing forms with particles in Processing

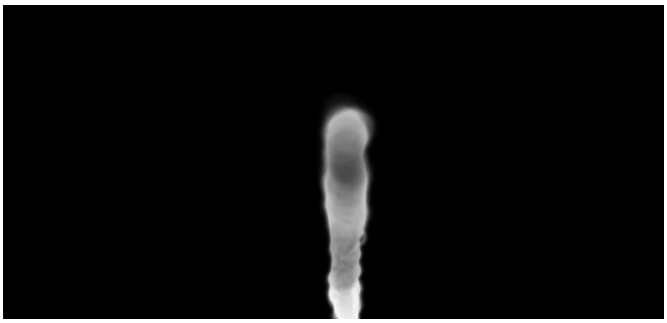


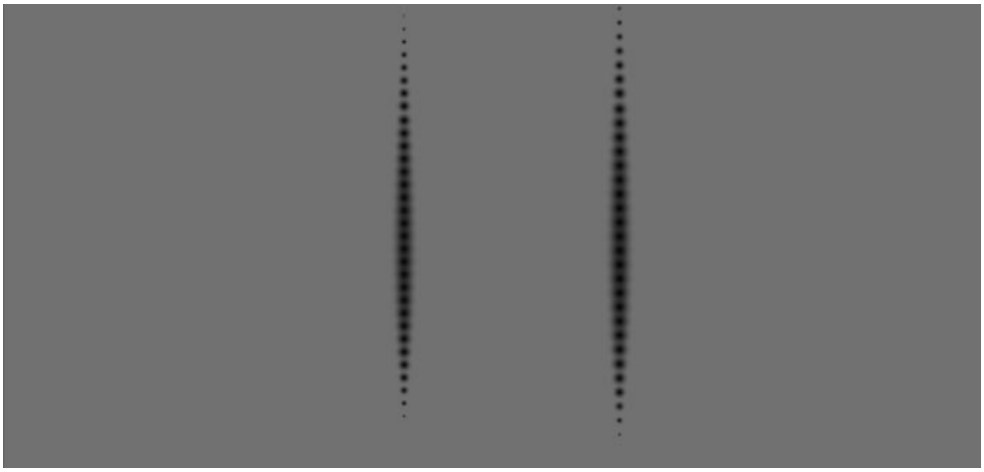




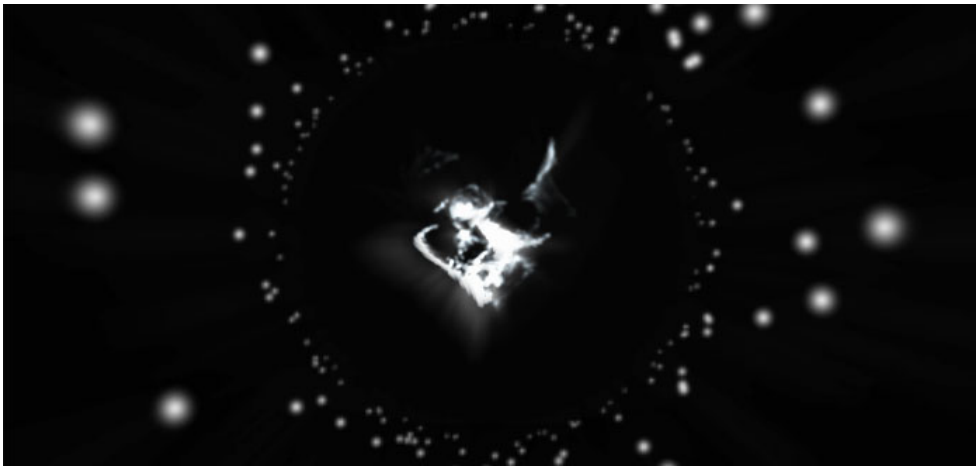
Samples, designing forms with particles in After Effects







Samples, designing forms with particles in Unity3d

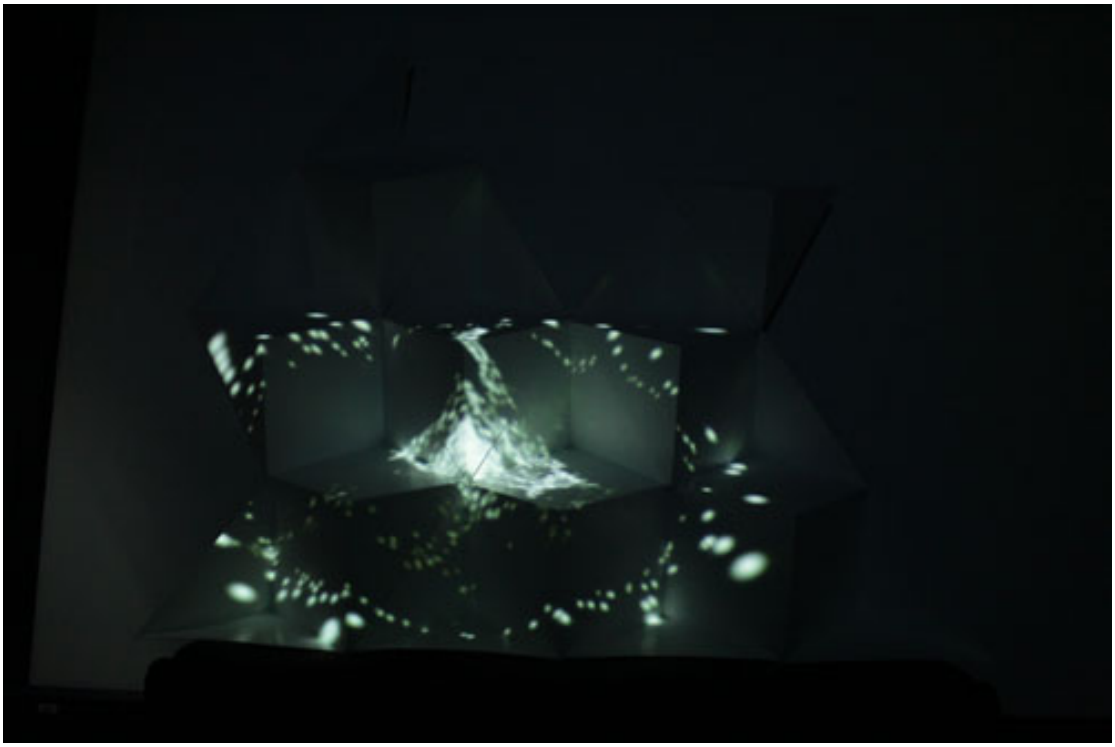


The final scene in Unity3d

Some material of the above experimentation, especially the one produced in after effects has been used in order to create some extra video effects projected on the final installation.

The choice of a particle system in order to design my personal virtual space was mainly based on the fact that particle systems, by their nature, create very fluid forms and as such, it is very interesting to implement interaction in order for the user to be able to create different forms in real time.

The final virtual space was then linked to Super Collider, an environment and programming language for real time audio synthesis and algorithmic composition. Through the use of an OSC plugin for Unity, I was able to connect the two environments together. Inside Super Collider, a script was generating real time audio, and with the use of osc messages, I was able to make the sound interact with the changing form inside Unity with the aid of the interface / tactile object created.



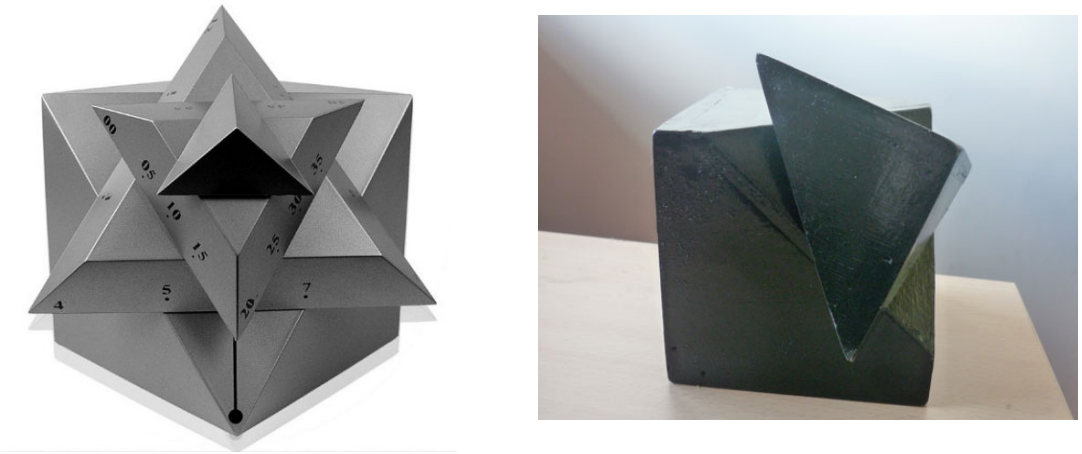
The projected scene on the installation

3.5 interface / tactile object

As an interface for the interaction and communication of the user with the installation we decided to create a tactile object. Space consists of a structural organization of a three dimensional environment and is defined by certain limits or borders, and contains material objects in relative position and orientation between them and between them and the form of this space, as a means to provoke action.

Having this in mind, and since the installation would create a dialogue between the real and the virtual space, we took an object from the real world and hacked it in order to act as the intermediate between the real and the virtual.

The original object consisted of a cube shaped clock. Inspired from this structure, we create a similar prototype out of wood, inside which we implemented an arduino board. The board was controlling two sensors, an accelerometer – which measured the objects orientation inside the real space – and a rotary encoder – which was attached on the pyramid and could define its rotation by the user. With the aid of the arduino board, the object was connected via a usb port on to the computer simulating our environment. Then, with the proper use and combination of programming between arduino and C# we were able to connect the object with the environment in Unity3d.



The object from which we were inspired and the prototype

The object would then interpret user interaction in two ways. First, through the accelerometer, the position and orientation of the object was captured. As the user held the object, he was invited to explore the possible ways to interact with the virtual space. In order to achieve so, we was obliged to move the object and turn it around. Bit by bit he

would discover that the world is changing according to his movements. Second, the rotary encoder attached to the pyramid acted like a timer for the work. The user, by turning the pyramid towards one or another way, would trigger the animation to play forward or backwards.

3.6 interactive narration

After the construction of the virtual worlds and the interface, the interaction had to be implemented in the system. The fact that the original object served as a clock inspired us to play with the notion of time.

As a solution, every virtual world created presented some action which was represented in the form of an animation. Then, the worlds created were put together and each animation would play after another, the whole playing repeatedly and endlessly.

This idea, of an installation presenting some content regardless the presence of viewers, served as a way to make our work more autonomous, evolving in the passing of time. But in the same time, interaction with the user would be of crucial meaning.

Each animation, without any user interaction, presented a passage inside a virtual space. But it's only through user interaction that the evolvement of this space was triggered, resulting in changes of the space-time continuum represented.

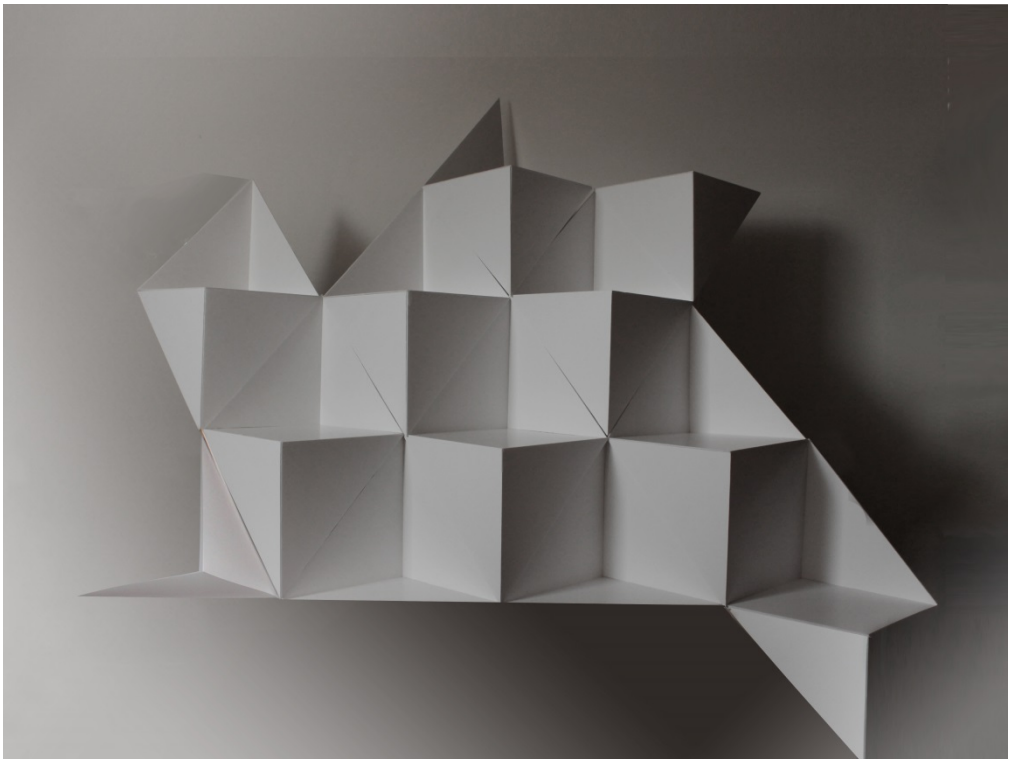
This idea was implemented in the system by manipulating the animation inside Unity3d with C# code. First of all, although the virtual world was shaped by smaller, separate worlds, we needed the idea of the whole, of a single universe, which in terms of programming meant the existence of a single script which would manipulate and manage the single universe.

Then, inside each part of this universe, we needed a script that, according to user interaction and the sensors from arduino, would, from one part, force the animation to play forward or backwards – thus changing the formation of the whole – and on the other part, trigger the evolvement inside each smaller world.

3.7 the structure

As a final step, we created a three dimensional structure, which we used as the surface on which we projected and mapped our virtual environment. In other words we proposed a kind of an augmented structure. The projection on this structure is an attempt to combine the actual with the virtual creating an immersive space.

The creation of the structure was also a liberating element as far as it concerns the presentation of the installation. Instead of aiming finally in a specific space, thus resulting in a site-specific work, we aimed for a more modulable and easy to adopt in various spaces and environments installation. This relation to the space induces an underlying presence of a spatial and architectural composite more or less important in the constitution of the installation itself. In many ways, the possible relations between the physical and the virtual raise a great interest.



As in many installations, our work proposes a way in which the two universes, the real and the virtual, are balanced and employs methods of real time interaction in order to convert the real into virtual and vice versa. With the aid of the real structure, the border between the real and the virtual blend even more, and the virtual space can be conceived also as an extension of perception and cognition.

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