DECOUPLING AND CONTEXT IN NEW MEDIA ART

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to Tatjana and the Tronquiverse

ABSTRACT

This dissertation presents a novel characterization of new media art, centered on media appropriation: the dialectal insertion of technological knowledge into the art practice. The thesis identifies some defining characteristics of new media art's language, and indicates the defining role that explicitation plays.

While media appropriation is not necessarily linked to the digital realm, it provides a natural substratum for it and so this thesis analyzes some aspects of the relationship between art and technology, where it introduces the user–programmer continuum and the perceptual cloud, a new paradigm of human–computer interaction that emerges from the functional and geographical decoupling of the computational and perceptual layers of interactive systems.

Next, it analyzes the sociopolitical inscription of new media art, integrating the economic and political contexts of its practice into the analysis and providing a new reflection on new media art production from the geopolitical periphery.

This thesis is proposed as a hybrid research–practice. A selected subset of the artworks created are presented and analyzed within the dissertation's conceptual framework.

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RESUMEN

Esta disertación presenta una nueva caracterización del *new media art*, centrada en la apropiación de los medios, es decir, en la inserción dialéctica de conocimiento tecnológico dentro de la práctica artística. La tesis identifica algunas características definitorias del lenguaje del *new media art*, e identifica el rol fundamental que la explicitación juega.

Aunque la apropiación de los medios no está necesariamente unida a lo digital, éste provee un substrato natural para ella. Por ello, esta tesis analiza algunos aspectos entre el arte y la tecnología digital, introduciendo el continuo usuario–programador y la nube perceptual, un nuevo paradigma de interacción humano–computadora que emerge del desacople funcional y geográfico de las capas computacionales y perceptuales de los sistemas interactivos.

A continuación, se analiza la inscripción sociopolítica del *new media art*, integrando los contextos económico y político, proveyendo una nueva reflexión acerca de la producción artística desde la periferia geopolítica.

Esta tesis se propone como un híbrido investigación–producción. Un subconjunto seleccionado de las obras creadas durante el programa son presentadas y analizadas desde el marco conceptual de la disertación.

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This work would not have been possible without the help of several persons.

First of all, I would like to thank Dr. Franco Robledo and Dr. Alvaro Cassinelli, my advisors, for their trust, help, and support. Likewise, I would like to thank this thesis' reviewers, Dr. Andrew Burrell and Dr. Pablo Prieto, for their time and effort.

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Extraordinarily important for this work were Dr. Li–Yi Wei and Dr. Qin Cai, my mentors at Microsoft Research. This thesis is very indebted to them and to my work at MSR. My work with Dr. Wei was the basis for *Walrus*, which I developed the following year working with Dr. Cai. With Dr. Cai I also developed *Traces* (which I conceived after a conversation with Dr. Cassinelli) and *Look at me*.

This dissertation would not have been remotely possible without the collaboration of Christian "Chachi" Clark and the rest of my friends at the artist collective Bondi: Pablo "Palmera" Gindel, Tatjana Kudinova, Fabrizio "Tenderbolton" Devoto, Guillermo "Guile" Berta, and Germán Hoffman.

It is impossible to overstate the importance of their help – very especially Clark's and Gindel's – for we collaborated in three of the artworks here presented, *Celebra, Son*, and *Barcelona*. Although I always was responsible for the artistic direction, Pablo Gindel was the electronics expert, Christian Clark produced and organized the work, and the three of us often shared coding duties.

Celebra and *Barcelona* were possible thanks to funding by the Uruguayan Government. The first via its *Comisión del Bicentenario* and the second via its *Uruguay Encendido* program.

This work is also indebted to the spaces of discussion that our School has provided. Especially important have been the courses I have taught within the Computer Engineering program; several generations of undergraduate students have helped me carry experiments on and engaged me in fruitful and eye–opening discussions. Their questions, ideas, and interest have been an irreplaceable source of inspiration.

Finally, and most importantly, I would like to thank my wife Tatjana Kudinova, and my parents, Claudia and Paco, for they continuous inspiration, encouragement, support, and patience.

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CONTENTS

1 INTRODUCTION

Personal background

This is my doctoral thesis on new media art, submitted to the program of Computer Science, within the Programa de Ciencias Básicas – PEDECIBA[1] (Program of Basic Sciences), a joint program of the Ministry of Education and Culture of Uruguay and Universidad de la República (UDELAR).

The work that is shown in this thesis is part of a process that started more than a decade ago, when, in 2002, with Juan Fabrizio Castro, for our Engineering undergraduate final project, we created the *Technocordio*, working on new media art and digital lutherie, constituting the first undergraduate final project in Uruguay in these areas.

I followed this with several works in the area: I completed a Master thesis on New media art, advised by Drs. Sergi Jordá from Universitat Pompeu Fabra in Barcelona, and Eduardo Grampín from UDELAR. As it was with the *Technocordio*, this also constituted the first postgraduate effort in this area in our university.

I started working as Teaching Assistant at UDELAR in 2001. Many years later, after finishing my masters I was appointed *Profesor Adjunto* of the Computer Science department, and in 2010 I founded the *Laboratorio de Medios*, our school's humble medialab[2]. This lab nucleates our efforts in new media art and human–computer interaction, and provided a more fertile environment for this thesis' research.

This dissertation, yet again, is the first work of its kind in our university and in Uruguay. In it, I continue and revise my previous work, and introduce new concepts that I hope contribute to the understanding of new media art. During this process I was lucky enough to publish some

[1] See http://www.pedeciba.edu.uy/ (in Spanish).

[2] See http://www.fing.edu.uy/grupos/medialab

research papers, to exhibit some artworks and performances, and to earn some awards.

Among these, I was awarded with Microsoft Research's 2011–2012 Fellowship Award. This allowed me to complete two internships at Microsoft Research.

In 2011 I worked with Dr. Li–Yi Wei at the eXtreme Computing Group in San Francisco, California, and in 2012 I worked with Dr. Qin Cai at the Multimedia, Interaction, and Communication group, in Redmond, Washington. In the second internship I started the project "Facing Interaction"[3], that continued after the internship was complete.

Some of the works presented in this thesis were started during these internships.

I do find interesting that for some years I fought against the idea of enrolling in a PhD program, for my professional interest has always been centered more on the artistic practice than on its academic analysis.

As I once answered to my university's insistence on the need of a doctorate: "I will not pursue a PhD, for it would mean to spend a long time writing about the things I would be doing if I were not writing about the things I would be doing".

However, I yielded to the insistence and am hereby submitting my dissertation. And happily so. This program greatly helped me to understand many aspects of my production and work, and to develop a more coherent theoretical framework for my praxis.

A while ago my wife was showing me some computer–based graphic designs that she found amazing and beautiful. I told her that those works did not really interested me, and that they reminded me of some

[3] See http://research.microsoft.com/en-us/projects/facinginteraction

of my first computer graphics experiments, circa 1990[4]. She looked at me in surprise, and asked me about why I did not have “pretty things like those” in my portfolio. To which I answered: "because I am not interested in doing pretty things".

I am very happy and thankful that, in part thanks to this doctoral work, I am able to provide a more elaborated alternative answer to that, first intuitive one.

This thesis is the more elaborated answer.

Thesis contents

This thesis adopts a hybrid practice–research approach. While it offers an aesthetic theory of new media art, together with novel interpretations of its current state and future, it partially does so in order to frame the artworks created within the doctoral program.

This document is written using the first plural person, as we find it – probably as a result of our Romance language roots – more conventional and impersonal.

However, it is important to note that the entirely of the theoretical work, as well as the art direction of every artwork presented belong to the thesis author. The collaborations are limited to what is described in the acknowledgements.

Due to its hybrid exegesis–dissertation style, we understand that in order to fully examine this doctoral work, it is also necessary to view the accompanying video documentation[5].

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[4] Created using the TK90X, the first Brazilian clone of the ZX Spectrum computer.

[5] Available at http://www.fing.edu.uy/~laurenzo/phd

This thesis' first chapters describe the theoretical framework created, starting with a new characterization of new media art (developed from our master thesis), its language, and its main development axes.

It is worth noticing that every main line of argumentation of this thesis would deserve a longer, deeper discussion, allowing for several doctorates. However, we frame our research from a new media art perspective and restrict our analysis to those created *in function of* a new media art utilitarian perspective.

Following this heuristic, we will focus on the human aspect of new media art by applying Vilem Flusser's black box theory to new media art, and using it to discuss the role that human beings adopt with respect to technology.

In order to be able to deepen our discussion of this relationship we will then describe and analyze one specific subset of the state of the art of human–computer interaction: the one that comes from understanding the differences between the design of the interaction and its material and technological support.

The two perspectives presented will be next generalized. If we first moved from new media art to the humane realm, and then to discuss the future of digital interaction, we will now offer a sociopolitical reading of our new media art theory.

In order to deepen our understanding and to integrate these three perspectives, several artworks were created and are presented in this document. We will describe them and discuss them in terms of the presented theoretical framework.

Thesis organization

The thesis is organized as follows:

In the **second chapter**, we argue that *media appropriation* constitutes not only the main characteristic of new media art but also its only defining property.

We propose that this characterization separates new media art from the specific digital technology substratum. However, we will also show that the digital computer offers a natural ground for media appropriation, becoming new media art's natural vehicle.

We then identify some common characteristics of new media art's language. In particular, we indicate that *explicitation* plays a defining role in shaping new media art's language.

In the **third chapter,** we focus on some aspects of the relationship between art and technology. We interpellate the definitions of user, programmer, and interaction, aiming to provide a more representative set of concepts that allow describing new media art's relationship with digital technologies.

The **fourth chapter** presents the *perceptual cloud*, an interpretation of the near future of the state of the art of interactive mass media, centered on the decoupling (both functional and geographic) of the perceptually interactive and computational layers of interactive systems. We will also discuss how these decouplings will influence new media art; specifically, we will try to address the relationship between awe and new media art.

Following, the **fifth chapter** attempts to integrate the economic and political context into our interpretation of new media art. In particular, we aim to describe the impact of the geopolitical inscription on new media art.

The **sixth chapter** presents and discusses a selected subset of the new media artworks produced during this doctoral program. We also show briefly how they relate to the concepts presented on the previous chapters.

All the artworks presented are interactive installations, and they all relate directly to the concepts discussed in the previous chapters. We propose the video documentation of the installations – available at http://www.laurenzo.net/~laurenzo/phd – as a very relevant part of this dissertation.

The **seventh chapter** is the last chapter. In it we will discuss more deeply the relationship between the presented artworks and the theoretical framework presented in the first part of this document.

Finally, we will summarize our presentation stressing its main contributions.

This doctoral program also allowed for some publications, exhibitions, and awards:

Publications and presentations

T. Laurenzo. **Perceptual Capitalism**. Submitted to Leonardo, MIT press, 2013.

T. Laurenzo. **The Perceptual cloud**. EIPS, Experiencing Interactivity in Public Spaces, CHI 2013, Paris, France. August 2013.

T. Laurenzo, C. Clark. **Celebra**, Proceedings of International Symposium on Electronic Art, ISEA 2013. Sydney, Australia. July 2013.

T. Laurenzo, Q. Cai, Z. Zhang, T. Blank **Facing Interaction**, Microsoft Research TechFest 2013 Redmond, WA, USA. March 2013.

T. Laurenzo. **Nibia and the ludic component**. International Symposium on Electronic Art, ISEA 2011, Istanbul, Turkey, 2011.

Exhibitions

Celebra

Laurenzo, Clark, Gindel, Devoto, Hoffman.

Museo de las Migraciones, Montevideo, Uruguay, 2013.

Facultad de Arquitectura, Universidad de la República, Montevideo, Uruguay, 2013.

International Symposium of Electronic Art, ISEA 2013. Sydney, Australia, 2013.

Facultad de Ingeniería, Universidad de la República, Montevideo, Uruguay, 2012.

Liceo 61, ProCiencia 2012, Montevideo, Uruguay. 2012.

Espacio de Arte Contemporáneo (EAC), Montevideo, Uruguay 2012.

Nibia

Laurenzo

Museo de la Memoria, Montevideo, Uruguay. 2010.

Museo Subte Municipal, Montevideo, Uruguay. 2010.

Son

Laurenzo, Clark, Gindel

Studio 99, Microsoft. November 2012, Redmond, USA.

National Museum of Visual Arts. Montevideo, Uruguay. 2011.

Barcelona

Laurenzo, Clark, Gindel, Devoto, Kudinova, Abal

Uruguay Encendido, Sofitel, Montevideo, Uruguay, 2013.

Awards

Walrus shortlisted for Laval Virtual 2013. Laval, France.

Celebra shortlisted for Laval Virtual 2013. Laval, France.

Research Fellowship Award, Microsoft Research, 2011–2012.

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2 NEW MEDIA ART

Think of technology as a verb, not a noun.

Red Burns, 2010 [21]

Technologies often tend to develop faster than the rhetoric evaluating them, and we are still in the process of developing description for arts using digital technology as a medium—in social, economic, aesthetic respects.

Christiane Paul[6,7], 2003 [122]

Introduction

As it happens often with contemporary cultural practices, "arts using technology as a medium" is referred to under a number of names and definitions.

Many of these names depict subsets or supersets of what constitutes the conceptual area that encompasses this work. *New media art*, *digital art*, *computer art, interactive art*, *art and technology, media arts, electronic art,* among many others, are found in the literature and are used by artists and designers themselves [144].

These definitions are not entirely equivalent. Some of them focus on one defining characteristic of the production (like "interactive art") while

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[6] Christiane Paul is the Adjunct Curator of New Media Arts at the Whitney Museum and the co–founder and director of Intelligent Agent, a service organization and information provider dedicated to interpreting and promoting art that uses digital technologies. Paul received her MA and Ph.D. from the University of Düsseldorf, Germany. She has taught at New York University and Fordham University and is currently teaching in the MFA Computer Graphics Dept. at the School of Visual Arts, NY.

[7] Biographical notes are not referenced, as they are anecdotal. They are included with the sole objective of providing the reader with a historicity of the quotes.

others focus on the technologies involved (like "computer art"), or are very general (like "art and technology").

The common denominator, which sometimes goes unnoticed, is that they refer to art that uses technology as a medium. Christiane Paul's quote specifies *digital technology* in what becomes an unnecessary restriction. Although it is true that digital technology offers a natural and extremely rich environment for art production, the appropriation processes are not confined to any particular technology.

We find several problems in the literature's attempts to describe or characterize new media art. Firstly, there is an exaggerated focus on the specific technologies and techniques involved (which, in many cases, are the most visible characteristics of the artworks and stand out immediately). Secondly, its contemporaneity and constant evolution complicates the observation and analysis of its processes and production. And thirdly, there is a misunderstanding – or overlooking – of the two characteristics that distinguish the area and allow it to create a clear artistic language, that is, to actually constitute a distinct genre. These characteristics are *media appropriation*, and *explicitation*.

The focusing on the specific technology being appropriated is easy to understand, especially when artists themselves attempt to develop the evaluating rhetoric. Artistic appropriation of any means of semantic production can be exhilarating and convey feelings of freedom and empowerment. This has led to an explosion of enthusiastic literature and tools that aim at fueling this empowerment by spreading some of the needed knowledge.

One example of this would be computer programming. Its appropriation by artists is sometimes referred to as *creative coding*[8]. In

[8] This should not be taken as an implication that coding is not always a creative activity, but, instead, as the – somewhat naïve – reassurement of the appropriation of computer programming techniques by artist and designers, who are sometimes referred to as "creative individuals".

the last years a number of books and, perhaps more importantly, frameworks and tools, have appeared with the explicit intention of helping this appropriation by artists and designers [87][9].

As we will show later, it is no coincidence that computer programming offers an outstanding example, for it is of defining importance in contemporary media creation. Computer programming – software – provides the building blocks of all new media production.

However, it is key to realize that the processes of appropriation are fundamentally independent from the specific technology, technique, or process being appropriated. Moreover, technology is intrinsically mutable, and answering to its permanent change, new dynamics appear that allow for its systematic appropriation. New dialogs are established, allowing for cross–fertilization and feedback between the scientific–technical and artistic realms. In Adamcyzk words: "a reciprocal relationship can be created between the practices of art and science that preserves disciplinary distinctiveness while challenging all participants in the areas where their respective disciplines are weakest" [2].

Throughout this dissertation, we will refer to the artistic genre of "technology used as a medium" as *new media art*.

From the intuitive realization of the qualitative change in the relationship with technology that new media art offers and requires, many definitions have been proposed. Ours is succinct:

new media art is *artistic media appropriation*.

Media appropriation

Artistic appropriation refers to "the use of pre–existing objects or images with little transformation" and constitutes a practice often associated with a critique of the notions of originality and authenticity

[9] See, for example, [59], [94], [98].

[26], the romantic concept of authorship, and art itself, together with their associated social constructions such as galleries and museums.

> *Artists have always influenced and imitated one another, but in the twentieth century, various forms of appropriation, from collage to sampling, emerged as an alternative to ex nihilo creativity. Enabled by technologies of mechanical reproduction, artists began to use found images and sounds in their work. Hannah Höch's Dadaist photomontages, Marcel Duchamp's ready–mades, Andy Warhol's Pop art* Brillo Boxes, *Bruce Connor's Found Footage films, and Sherrie Levine's Neo–conceptual remakes all reflected the changing status of artistic originality in the face of mass–produced culture.*
>
> Mark Tribe, 2006 [144]

Artistic appropriation, perhaps best epitomized by Marcel Duchamp's[10] works *Fountain* (1917) and *L.H.O.O.Q.* (1919, see Figure 1), has played a major role in the artistic production since early 20th century.

This practice, once conceptually disruptive, in new media art "has become so common that it is almost taken for granted" [144]. Digital technologies, with their inherent abilities of reproduction and mutation – once the concept of appropriation has been conceptually colonized – have provided an extremely rich playground for appropriation and recontextualization.

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[10] Marcel Duchamp (1887 – 1968) was a French–American painter, sculptor, chess player, and writer whose work is associated with Dadaism and conceptual art. After the sensation caused by "Nude Descending a Staircase, No. 2" (1912), he painted few other pictures. Duchamp has had an immense impact on twentieth–century and twenty first–century art. By World War I, he had rejected the work of many of his fellow artists (like Henri Matisse) as "retinal" art, intended only to please the eye. Instead, Duchamp wanted to put art back in the service of the mind.

The artistic practices of appropriation artists, which often involve copying images of earlier artworks, popular media, or advertising, often come into conflict with copyright law. A good example of this could be Jeff Koons's lost trials for copyright infringement [86]. It should be easy to see why these conflicts are deepened by digital new media art: its inherent reproducibility eases the path for appropriation and recontextualization, re–stating and amplifying many of the concerns of twentieth century art.

The "readymades", or "found art" are everyday objects – ranging from classic artworks (as in *L.H.O.O.Q.*) to everyday objects (as the glass of water in *Oak Tree* by Michael Craig–Martin [25]) – taken out of their context and placed on display as art in an art environment, i.e., a gallery, museum or artist studio [38]. Readymades constitute some of the most radically appropriated objects, as they are almost not manipulated when re–contextualized.

This artistic practice implied a radical shift from object to concept; in Duchamp's words a move from "retinal art", with which he refers to the "interpretation of the visual world", towards what became known as "conceptual art" [38].

> *The idea becomes a machine that makes the art.*
>
> Sol LeWitt[11], 1965. Quoted in [83]

The introduction of conceptual art changed forever and retroactively the conception of art as human practice.

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[11] Solomon "Sol" LeWitt (1928 – 2007) was an American artist linked to various movements, including Conceptual art and Minimalism. LeWitt came to fame in the late 1960s with his wall drawings and "structures" (a term he preferred instead of "sculptures") but was prolific in a wide range of media including drawing, printmaking, photography, and painting. He has been the subject of hundreds of solo exhibitions in museums and galleries around the world since 1965.

In Joseph Kosuth[12]'s words: "The function of art, as a question, was first raised by Marcel Duchamp. In fact, it is Marcel Duchamp whom we can credit with giving art its own identity." [83]

This is not a shift from perception to concept but an enlargement, an amplification. Art became something that, even if it still mostly exists as perceptual stimuli, cannot exist without cognitive reflection: art can only exist when it talks about art; all art is conceptual, because art can only exist conceptually [83].

> *Being an artist now means to question the nature of art. If one is questioning the nature of painting, one cannot be questioning the nature of art. If an artist accepts painting (or sculpture) he is accepting the tradition that goes with it. That's because the word art is general and the word painting is specific. Painting is a kind of art. If you make paintings you are already accepting (not questioning) the nature of art. One is then accepting the nature of art to be the European tradition of a painting–sculpture dichotomy.*
>
> Joseph Kosuth, 1969 [83]

This contraposition between "art kind" and self–reflective conceptual art, leads us to ponder where new media art stands. Is it an art kind with a replicating background? As we will see later, it often seems so: many idioms, many patterns, systematically appear. However, as a direct result of media appropriation, *new media art is intrinsically conceptual art*.

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[12] Joseph Kosuth (b. 1945) is an American conceptual artist. Considered one of the pioneers of Conceptual art and installation art, initiating language based works and appropriation strategies in the 1960s. His work has consistently explored the production and role of language and meaning within art.

Kosuth argues that there is no conceptual connection between art and aesthetics, and leaves aside the inherent aestheticism of conceptual art: the possibility of searching, finding, appreciating and curating the aesthetics of thought, the beauty in the idea conception. We, instead, argue that art is never art without an aesthetic preoccupation; artists' conceptual quests always encompass a certain journey through an aesthetic axis.

George Dickie[13]'s *Institutional Theory of Art* [34], claims that the art status of a piece depends on the context in which the work is placed or viewed, while Arthur Danto[14]' [29] asserts that a piece's art status is dependent on the context and it's relation to the time and environment in which it was made [65].

> *To see something as art requires something the eye cannot descry – an atmosphere of artistic theory, a knowledge of the history of art: an artworld* [65].
>
> *What in the end makes the difference between a Brillo box and a work of art consisting of a Brillo box is a certain theory of art. It is the theory that takes it up into the world of art,*

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[13] George Dickie (b. 1926, U.S.A.) is a Professor Emeritus of Philosophy at University of Illinois at Chicago and one of the most influential philosophers of art working in the analytical tradition. One of his more influential works is "The Century of Taste," an inquiry into several eighteenth–century philosophers' treatments of the subject. The bulk of the work is devoted to championing, in a most forthright way, Hume's treatment of the subject over that of Kant.

[14] Arthur Coleman Danto (1924 – 2013) was an American art critic and philosopher. He is best known for having been influential, long–time art critic for The Nation and for his work in philosophical aesthetics and philosophy of history, though he contributed significantly to a number of fields, including the philosophy of action. His interests included thought, feeling, philosophy of art, theories of representation, philosophical psychology, Hegel's aesthetics, and the philosophers, Friedrich Nietzsche and Arthur Schopenhauer.

> *and keeps it from collapsing into the real object that it is (in a sense of* is *other than artistic identification)* [29].
>
> Arthur C. Danto, 1964.

New media art actively reflects on its *artworld*. It is not that new media art includes a conceptual part, but, instead, that it only exists conceptually. New media art exists on the artistic conceptualization of technological processes and products. Otherwise it would be reduced to a technical exercise, it becomes decoration, or engineering (the result of a way, or a method of solving a problem). Many times it becomes both, *decorating engineering*, often called "design".

Art is only what challenges what art is. This challenging is historically dependent. A cubist painting probably has *nothing to offer* nowadays. It would make no sense to observe it as an artwork, for it would be a craft exercise, "a visual Muzak", a historical curiosity [83].

Conceptual art conveys the end of art: if art only exists in its self–reflection, in its self–critique, if "art cannot exist outside of art", it follows that we would consider the best art that which systematically falls outside of the art. Something that is not art, or, more accurately, something that was not art just up to that point in time. *Art is only art when it becomes something that is not art*. As Reinhardt once put it "art is always dead, and a 'living' art is a deception" [95]. Robert Filliou also said: "art is what artists do"; to what we answer: *art is what artists did*. However, we do agree with Fillou in his charming quasi tautology: "art is... what makes art more interesting" [83].

Even if appropriation has been part of the art practice for over a century, new media art, with its "intellectual parameters escaping disciplinary boundaries, asserting principles as much aesthetic as technical" [38], shows a ontologically different kind of appropriation, one that operates *on the processes of production* instead of, or in addition to, final products.

This appropriation of the processes, which we call "media appropriation", is a different process than "traditional" artistic

appropriation. It constitutes the main characteristic of new media art and it is what allows for the creation of a new field of artistic production.

New media artists adopt technology as an artistic "raw medium"; in this sense, technology creation becomes (or is able to become) artistic creation: the frontier between technological and artistic production disappears, turning impossible to distinguish between them, for they often are the same.

This technological appropriation radically expands the landscape of possibilities: artists are not long only users of technology but also creators, being able to question, to subvert, and to escape from, the aesthetic and functional premises offered by the technology involved[15].

Media appropriation constitutes an effective and real strategy of empowerment. It also allows for a symbiotic relationship between art, technology and science, not only blurring their boundaries but – as a great number of writings on new media art state – permitting their cross–fertilization.

The appropriation of the processes, of the means of technology creation, implies the cognitive colonization of *types* of knowledge production that are new to the art practice. It implies an appropriation of models and approaches to reality. Again, art is enriched by these appropriations and it opens the door for an enrichment of the models themselves.

These appropriations – we insist: the defining trait of new media art – are not necessarily related to digital media. As we said, it is true that digital media provides a *natural* path for media appropriation, as its systematic processes of remediation trigger and require it; however it is possible to find new media art (i.e. to find media appropriation), that is not digital.

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[15] This division between users and producers of technology is both reductionist and shortsighted. We will contest it in the next chapter.

Figure 1 – *L.H.O.O.Q.* Marcel Duchamp, 1919. It consisted of a cheap postcard reproduction of Leonardo da Vinci's La Gioconda onto which Duchamp drew a mustache and beard in pencil and appended the title. Duchamp (rapidly followed by other Dada artists) originated the readymades, appropriation art predates him.

One delightful example of this is provided by *Random Access*, by Korean artist Nam–June Paik[16]. Paik "stuck more than fifty strips of audio tape to a wall and asked users to 'play' the segments by means of a play–back head that Paik had taken out of a reel–to–reel tape deck and wired to a pair of speakers" (see Figure 2) [122].

[16] Nam June Paik (1932 – 2006) was a Korean artist. He worked with a variety of media and is considered to be the founder of video art. He collaborated with Karlheinz Stockhausen and John Cage, who inspired his transition into electronic arts. Paik is also credited with an early usage (1974) of the term "electronic super highway" in application to telecommunications.

This deconstruction of the tape machine conforms a paradigmatic new media art object that appropriates and reclaims the aesthetic dimension of its inner workings and creates an interactive art piece. *Random Access* is a piece that *requires* in its conception an appropriation of the tape machine's working principles; it could not have existed otherwise.

If, as Graham Weinbren[17] said, "the digital revolution is a revolution of random access" [148], Nam–June Paik's work prefigures a key feature of new and digital media without being digital.

With this we do not pretend to hint that the work in analyzing specific appropriations processes, advances, tendencies, or artworks is, by any means, less valuable or important.

One example of the importance of these analyses can be provided by the study of the delegation of the aesthetic–creative process [43] [87].

As the following dialogue shows, many authors have noted that new media art presents many *recurring concepts*: ideas, themes, and subjects from traditional, modern and postmodern art that reappear systematically in new media art.

[17] Grahame Weinbren, (b. 1947) is South African artist. He is a pioneer of interactivity and has published widely on interactivity and cinema, and has lectured on interactivity and cinema throughout the world since 1982. He has made interactive cinema art–works since the early 1980s. He is the senior editor of the Millennium Film Journal and teaches in the graduate faculty of the School of Visual Arts in New York.

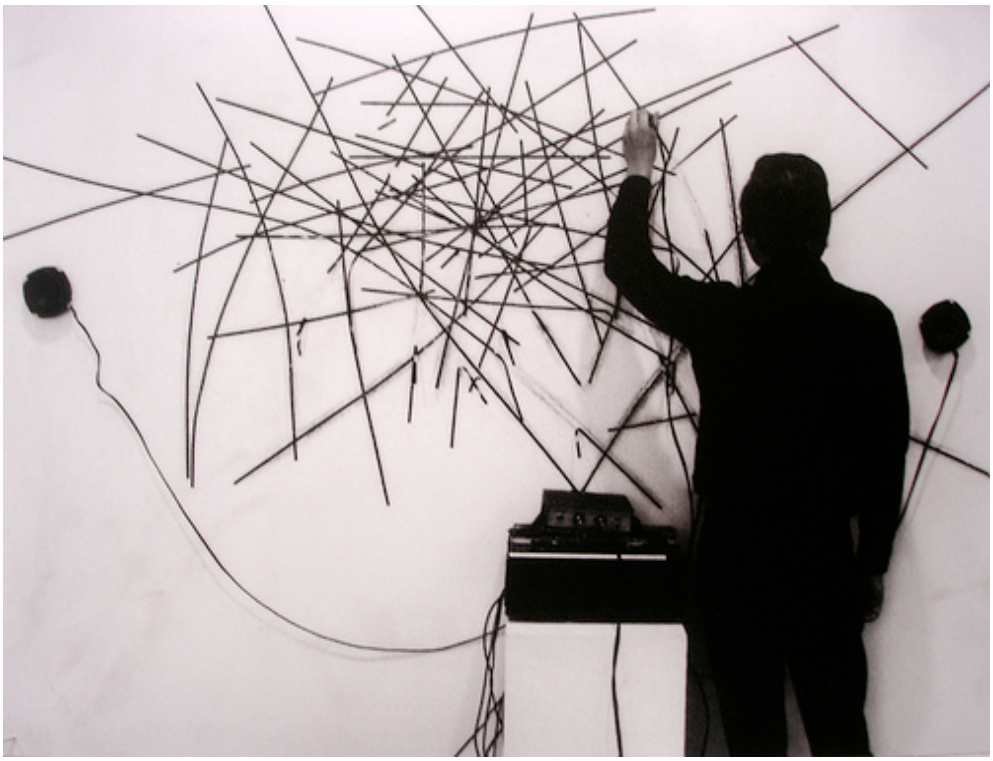

Figure 2 – *Random Access.* Nam–June Paik, 1963. Photography courtesy of Marc Wathieu, taken at *YOU_ser : Das Jahrhundert des Konsumenten* exhibition, ZKM, Karlsruhe.

> *In the end [interpretive approaches to new media] borrow from existing paradigms. They weren't conceived with digital media in mind, and as a result they don't exploit the special qualities that are unique to digital worlds. Yet it's those unique qualities that will ultimately define entirely new languages of expression. And it's those languages that will tap the potential of digital media as new vehicles of expression.*
>
> Steven Holtzman, 1997. [68]

Holtzman misses the point. He himself appeals to a comfortable, modernist rhetoric, in which digital media cannot be significant until they make a radical break with the past. However, like their precursors, digital media can never reach this state of transcendence, but will instead function in

> *a constant dialectic with earlier media, precisely as each earlier medium functioned when it was introduced.*
>
> Jay David Bolter and Richard Grusin, 1999. [13]

Marshal McLuhan[18]'s famous dictum "the medium is the message" still provides an important tool in the analyzing of media. McLuhan also stated that "the 'content' of any medium is always another medium. The content of writing is speech, just as the written word is the content of print, and print is the content of the telegraph" [106].

Bolter and Grusin identify a systematic ekphrasis, which they call "remediation" – the representation of one medium in another – and argue that it constitutes "a defining characteristic of the new digital media." [13].

In effect, it is easy to find "recurring concepts" in new media art; for example, many Dadaist strategies often reappear, including photomontage, collage, readymades, political action, and performance [144], and it is very clear that Marcel Duchamp (among Cage, Man Ray, Warhol and many others) prefigured many of the new media art concepts, works, ideas and tendencies.

> *How one feels about Marcel Duchamp is, essentially, how one feels about a great deal of contemporary art.*
>
> Michael Rush, 2005. [135]

---

[18] Herbert Marshall McLuhan, CC (1911 – 1980) was a Canadian philosopher of communication theory. His work is viewed as one of the cornerstones of the study of media theory, as well as having practical applications in the advertising and television industries. McLuhan is known for coining the expressions the medium is the message and the global village, and for predicting the World Wide Web almost thirty years before it was invented.

The systematicity of the recurring concepts appears both at a large conceptual scale and at a more concrete, thematic scale.

Jones, for example, identifies the self–portrait as a "technology of embodiment" [75], in which technology "not only mediates but produces subjectivities". The photographic self–portrait of, for example, Claude Cahun in 1939 re–appears systematically in video installations and Web art.

Also showing these recurring concepts, Best and Kellner state that "situationist ideas remain an important part of contemporary cultural theory and activism", and argue that Debord[19]'s now classic theory of the spectacle, is still relevant for analyzing contemporary society, especially contemporary interactive spectacles [9].

This re–appearing of themes is not, by any means, a new phenomenon. Instead, "we can identify the same process throughout the last several hundred years of Western visual representation. A painting by the seventeenth–century artist Pieter Saenredam, a photograph by Edward Weston, and a computer system for virtual reality are different in many important ways, but they are all attempts to achieve immediacy by ignoring or denying the presence of the medium and the act of mediation." [13]

However, the speed that new media changes at, and, very especially, the unspecificity of the digital computer, provide an unprecedented fertile field for remediation and recurring concepts.

An exhaustive list of these recurring concepts is impossible: one personal example, our piece *Celebra* (discussed in chapter 6) uses balloons lit by LED, which have been used in a number of artworks,

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[19] Guy Ernest Debord (1931 – 1994) was a French Marxist theorist, writer, filmmaker, member of the Letterist International, founder of a Letterist faction, and founding member of the Situationist International (SI). He was also briefly a member of *Socialisme ou Barbarie*.

being perhaps the most well known "Open Burble," created by Haque et al. for the Singapore Biennale in 2006, while artificially illuminated balloons can be traced back to the Chinese Kongming lanterns – sky lanterns – from around 200 AD, and lanterns have been used for almost three thousand years [89].

The systematicity of the recurring concepts in new media art is a direct consequence of media appropriation. The appropriation of technological media – and therefore the inclusion of the scientific and technical cognitive framework – requires (or, at least, did require) a systematic revision of the proposals of conceptual art.

The shift from decorative art to the art of ideas imposes a change of model of interpretation of reality (and of art). If we assume that all art is conceptual, that it is not possible to produce art that is not conceptual (with conceptualism perhaps operating as the division between art and craft), then appropriation *from* conceptual art requires the reviewing of the strategies of questioning *from the conceptualization* of art.

Moreover, it is intriguing that new media art, a cultural product inherently massive and ubiquitous, had to face so much resistance from both the artistic and, to a lesser extent, technological fields; if a keen interest was to be found in technicians and scientists (although often biased towards the entertainment industry), the artists of late twentieth century seemed to see new media art as a passing, shallow trend [87].

It is particularly interesting that according to Hervé Fischer[20], this resistance climaxed after the dawn of avant–garde, which left us facing a crisis where novelty has no intrinsic value, not being anymore a characteristic to look for [41].

[20] Hervé Fischer is a French artist and philosopher, graduated from the École Normale Supérieure, Paris. For many years he taught sociology of communication and culture at the Sorbonne. He obtained its MBA in philosophy and PhD. in sociology. He was a special guest at the Venice Biennial in 1976, the Sao Paulo Biennial in 1981, and Documenta 7 in Kassel (Germany) in 1982.

And then everything was re–built, but this time using computers.

The digital computer

As well as it being central to understand that the appropriation processes that define new media art are completely independent from *how* this appropriation occurs, it is also fundamental to realize that the digital computer offers a natural, extremely powerful, and ubiquitous mean of appropriation.

This is true up to the point that most, if not all, the literature confuses both things: the mean of appropriation with the appropriation itself.

Digital media have been central objects of study in every attempt to understand new media art. Understandably so, as we are experiencing "the shift of all of our culture to computer–mediated forms of production, distribution and communication" [101].

But it is worth noticing that, again, automatic manipulation of media is not inherently linked to digital representation; what are radically new are its easiness, its accessibility and its unspecificity. Even though analog manipulation of, for example, electromagnetic waves can be found as early as late XIX century, (with Tesla's experiments on electricity in 1891), the construction of an electromechanical device for data manipulation, until this formalization, was for a pre–given purpose.

The digital revolution is a revolution of freedom [87].

There is, by way of the facts, an intertwining between new media art and digital art. In effect, virtually all new media art involves digital technology in some stage.

Even if "ultimately, every object is about its own materiality, which informs the ways in which it creates meaning" [122], we propose to sidestep the discussion of "the digitality", in order to focus on some characteristics of new media art's language that do not depend on the underlying digital substratum.

Effectively, in spite of digital remediation's systematic nature, the recurring concepts, and the specific characteristics of each technological appropriation, Holtzman aptly detects that new media "carries unique qualities that will ultimately define entirely new languages of expression".

Explicitation

New media art does propose and utilize a new artistic language of its own, and it is because of the existence of this language that we can talk about new media artworks without explicitly commenting on how they were created or what was the process behind them.

> *Oil painters use a controlled random process (centuries before John Cage made such a big deal about it).*
>
> Ken Perlin[21], 1999. [79]

The quote by Perlin comments on a specific technology – the use of random processes – being part of art for a long time. However, Perlin accuses Cage[22] of making "such a big deal about it", under the assumption that Cage's "big deal" focused on the *use* of this technology.

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[21] Ken Perlin is an American computer scientist. He is a professor in the Department of Computer Science at New York University where he directs the NYU Games For Learning Institute. He was also founding director of the Media Research Laboratory and director of the NYU Center for Advanced Technology. He received an Academy Award, the 2008 ACM/SIGGRAPH Computer Graphics Achievement Award and the TrapCode award for achievement in computer graphics research, among many others. Dr. Perlin currently serves on the program committee of the AAAS. He was general chair of the UIST2010 conference, and has been a featured artist at the Whitney Museum of American Art.

[22] John Cage (1912 – 1992) was an American musician. By 1939 he had begun to experiment with increasingly unorthodox instruments such as the "prepared piano." He also experimented with tape recorders, record players and radios. His 1943 percussion ensemble concert at the Museum of Modern Art marked the first step in

Consonantly with what we have mentioned earlier, what Perlin does not seem to notice is the fundamental factor of appropriation: the insertion of the technology into the language of the artist, or, more accurately, the creation of an artistic language that include, that is made with, creative manipulation – production – of technology.

The adoption of, for example, a "technology of randomness" allows to *manipulate this technology as a form of art practice.*

However, *using* new technologies does not equal new media art. For example, *random processes* are a form of technology, and the volitional insertion of process of controlled randomness is not always an indicator of new media art.

> *Modern artists such as Mark Rothko and Barnett Newman made color choices that were meant to connect with the viewer emotionally, postmodern artists like Robert Rauschenberg introduce chance to the process. Rauschenberg, says Ho, was known to buy paint in unmarked cans at the hardware store.*
>
> Megan Gambino, 2011. [107]

Rauschenberg's deliberate randomization of the color choosing process constitutes a reflection on the role that color plays in painting and within painting. Even if he situates himself conceptually within the field of painting and his artwork is produced within painting language, we can sense a timid probing of the relationship with the tools and materials.

---

his emergence as a leader of the American musical avant–garde. Cage is perhaps best known for his 1952 composition 4′33″, which is performed in the absence of deliberate sound; musicians who present the work do nothing aside from being present for the duration specified by the title. Some of his other works include Imaginary Landscape #3 (1942), Variations I and II (1958) and Thirty Pieces for Five Orchestras (1981).

Quoting Joseph Kosuth again: "The event that made conceivable the realization that it was possible to 'speak another language' and still make sense in art was Duchamp's first unassisted readymade. With the unassisted readymade, art changed its focus from the form of the language to what was being said" [83].

New media art *requires* this conceptual migration: for it to exist it is necessary to "speak another language", created by media appropriation.

We have already indicated that many themes of "traditional" art[23] appear once and again in new media art. In spite of this, we argue that new media art maintains its identity and builds its own original artistic language. One of the main characteristics of this language consists in the incorporation of implicit traits of traditional art into the art practice.

Under this light, new media art tends to be *the art of making explicit*.

The language of new media art comprises the *explicitation* of some characteristics of traditional art. By making them explicit, it becomes possible to *articulate with them*. In terms of a new language, these already underlying aspects become constituent parts.

Going back to Ken Perlin's quote, randomness was an *implicit characteristic* of oil painting. The characteristics of this random process were not part of the art practice: the tool (the paintbrush) is external to the art of painting, and its creation occurs in a conceptually different moment: it is never considered as part of the art creation process.

This shift from implicit to explicit of certain characteristics present on traditional art does not only occur with randomness but it systematically appears on every interaction between art and technology. Interaction that is as old as art itself, for technology has always played a defining role in art ("only with the invention of oil painting it was possible to

[23] We use the work "traditional" in a rather informal way to refer to all art previous to new media art.

paint outdoors, only the acrylic paint created the smooth surfaces that Pop Art needed" [48])

In this way, every art practice that requires *tools of art creation* (often called "instruments") establishes a specific relationship with technology. And even if these tools are sometimes created in processes inextricably linked to their particular art practice, they are never considered part of the artworks produced with them.

Luthiers, for example, create musical instruments – tools for artistic performance – that transform the artist's gestures into sounds [77]. However, *the construction of a violin is not considered music.*

In this case, the separation between tool creation and art performance is based on some implicit agreements between musicians and luthiers. Firstly, they agree on how a particular instrument should sound. There is a social preconception of the ideal instrument, against which every instrument of its kind is measured.

Secondly, they agree on how this specific instrument has to be played: what kind of controllers and actuators it should have; how its physical characteristics should be, how heavy and in what shape it should be, etc.

Thirdly, they also agree on the social role that the instrument will play, how and where it is going to be played, in which social contexts and how the performance will be perceived by the public.

As a result, the technology involved, the design and creation of the instrument are not part of the art. They constitute enabling technologies that occur on a phase previous to the artistic fact.

Media appropriation always acts as the defining trait of new media art. In this case, the appropriation of the processes and the technology behind the creation of the instruments is able to generate a new artistic path: one where the instrument creation is part of the art production process.

When appropriated, Instruments are *composed* by artists effectively augmenting the landscape of artistic possibilities.

New media art's systematic appropriation operates as a traverse of the axis implicit–explicit. Many implicit relationships between art and technology, by means of the appropriation, become explicit and therefore they are amenable to become part of the art.

The field of musical instruments *composition* with digital tools is usually called *digital lutherie* (coined by Bahn and Trueman and later developed by IRCAM's Schenn and Battier [137]) and it constitutes a vibrant, although somewhat obscure, subgenre of both contemporary music and new media art.

> *we risk having the whole field of interactive expression become an historical curiosity, a bizarre parallel to the true pulse of cultural growth. It needs all the effort and imagination that we can muster to assure that new controllers and interactive instruments indeed become the inevitable continuation of musical expression that we all take for granted.*
>
> Tod Machover, 2002. [97]

One beautiful example of non–digital new media art is provided by John Cage's "Instructions on how to prepare a piano" (see Figure 3). The technology of the instrument (the tool) is being appropriated and inserted into the artistic performance. Moreover, Cage performs a second appropriation: the technology of the description of the performance, transforming it into part of the art piece.

Programming art

One of the most common examples of programming in art – in a loose and informal acceptation – is provided by music. In it we have the sheet music: a description on how the art performance should be carried on. Music sheets play a very interesting role within the art taxonomy, for

they exist in an intermediate state that is taken out of the art. In effect, the first artistic event occurs at composition time. The composer engages in an art performance that generates a testimony of itself: the music sheet. But the music sheet is never a piece of art, it is a *description* of the art, it exists outside the art, and it is not appreciated as an artwork on itself. If one is found at a museum is it simply as a historical annotation, a reminder, of an artistic event associated with it.

The music sheet then becomes part of a second artistic event: the interpretation of the music. The following of the instructions coded in it, by musicians, to generate a new, disjoint art performance: the music itself.

Instructions on how to carry an artistic performance have been appropriated long time ago, up to the point that they became a major strategy used by conceptual artists. Among its originators was Sol LeWitt "whose instructions for several series of geometric shapes or detailed line drawings, made directly on the wall surface, sometimes took teams of people days or weeks to execute." [15] (See Figure 5.)

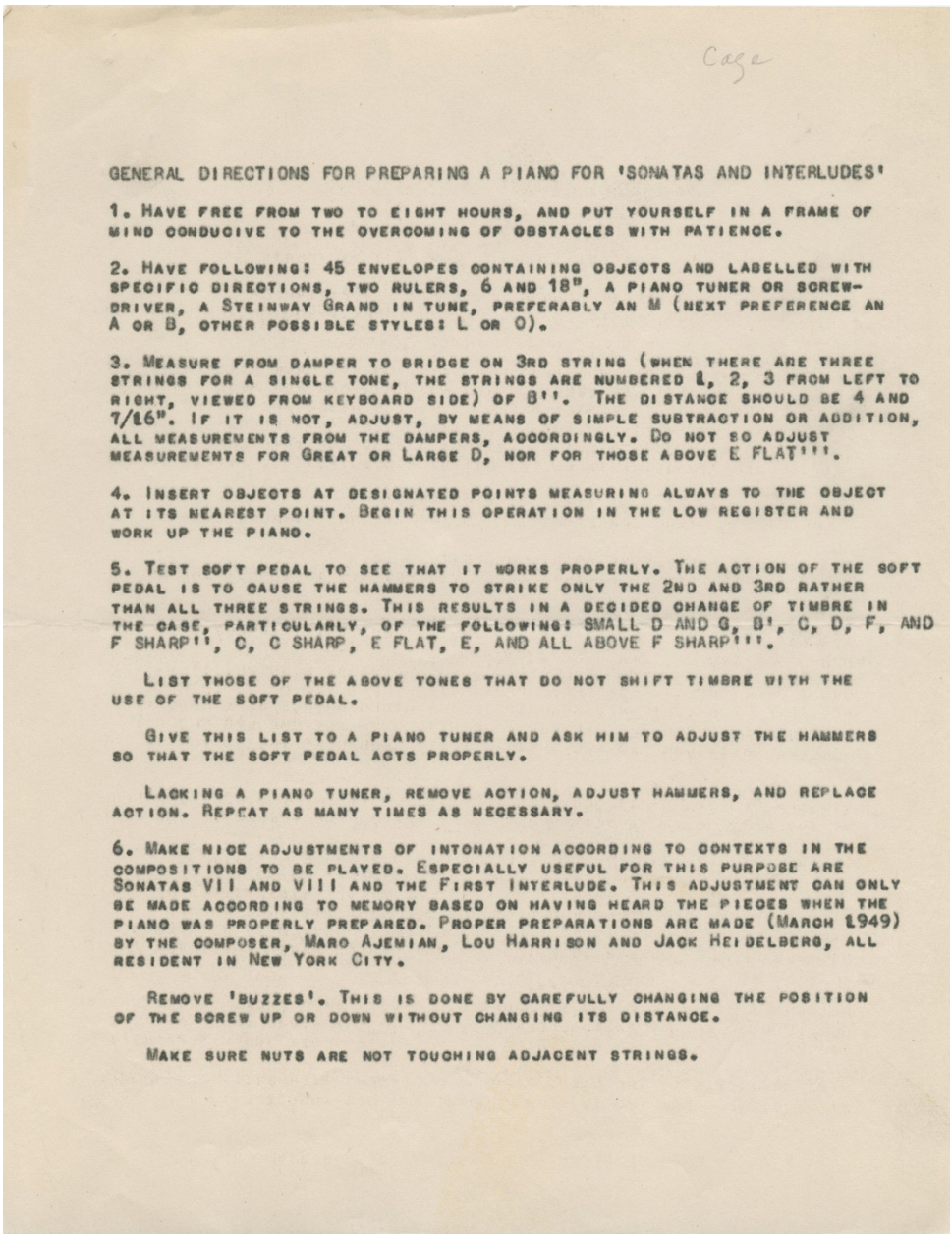
Many other important and inspiring examples of instruction–based art are easy to find, among many others John Cage, Yoko Ono[24], and La Monte Young[25], were particularly influential.

---

[24] Yoko Ono (b. 1933) is a Japanese artist and peace activist, known for her work in avant–garde art, music and filmmaking, for her involvement in the Fluxus movement, and for her marriage to John Lennon, who called her "the most famous unknown artist in the world." She is also known for her philanthropic contributions to arts, peace and AIDS outreach programs. She also brought feminism to the forefront in her music.

[25] La Monte Thornton Young (b. 1935) is an American avant–garde artist, composer and musician, generally recognized as the first minimalist composer. His works have been included among the most important and radical post–World War II avant–garde, experimental, and contemporary music. Young is especially known for his development of drone music. Both his proto–Fluxus and "minimal" compositions question the nature and definition of music and often stress elements of performance art.

These all are works of conceptual art, for they are *about* art and the process of art creation, consumption, authorship, and exhibition. They are seminal, inspiring, and moving, but they do not appropriate the *technology of instructions*.



Cage

GENERAL DIRECTIONS FOR PREPARING A PIANO FOR 'SONATAS AND INTERLUDES'

1. HAVE FREE FROM TWO TO EIGHT HOURS, AND PUT YOURSELF IN A FRAME OF MIND CONDUCIVE TO THE OVERCOMING OF OBSTACLES WITH PATIENCE.

2. HAVE FOLLOWING: 45 ENVELOPES CONTAINING OBJECTS AND LABELLED WITH SPECIFIC DIRECTIONS, TWO RULERS, 6 AND 18", A PIANO TUNER OR SCREW-DRIVER, A STEINWAY GRAND IN TUNE, PREFERABLY AN M (NEXT PREFERENCE AN A OR B, OTHER POSSIBLE STYLES: L OR O).

3. MEASURE FROM DAMPER TO BRIDGE ON 3RD STRING (WHEN THERE ARE THREE STRINGS FOR A SINGLE TONE, THE STRINGS ARE NUMBERED 1, 2, 3 FROM LEFT TO RIGHT, VIEWED FROM KEYBOARD SIDE) OF B''. THE DISTANCE SHOULD BE 4 AND 7/16". IF IT IS NOT, ADJUST, BY MEANS OF SIMPLE SUBTRACTION OR ADDITION, ALL MEASUREMENTS FROM THE DAMPERS, ACCORDINGLY. DO NOT SO ADJUST MEASUREMENTS FOR GREAT OR LARGE D, NOR FOR THOSE ABOVE E FLAT'''.

4. INSERT OBJECTS AT DESIGNATED POINTS MEASURING ALWAYS TO THE OBJECT AT ITS NEAREST POINT. BEGIN THIS OPERATION IN THE LOW REGISTER AND WORK UP THE PIANO.

5. TEST SOFT PEDAL TO SEE THAT IT WORKS PROPERLY. THE ACTION OF THE SOFT PEDAL IS TO CAUSE THE HAMMERS TO STRIKE ONLY THE 2ND AND 3RD RATHER THAN ALL THREE STRINGS. THIS RESULTS IN A DECIDED CHANGE OF TIMBRE IN THE CASE, PARTICULARLY, OF THE FOLLOWING: SMALL D AND G, B', C, D, F, AND F SHARP'', C, C SHARP, E FLAT, E, AND ALL ABOVE F SHARP'''.

LIST THOSE OF THE ABOVE TONES THAT DO NOT SHIFT TIMBRE WITH THE USE OF THE SOFT PEDAL.

GIVE THIS LIST TO A PIANO TUNER AND ASK HIM TO ADJUST THE HAMMERS SO THAT THE SOFT PEDAL ACTS PROPERLY.

LACKING A PIANO TUNER, REMOVE ACTION, ADJUST HAMMERS, AND REPLACE ACTION. REPEAT AS MANY TIMES AS NECESSARY.

6. MAKE NICE ADJUSTMENTS OF INTONATION ACCORDING TO CONTEXTS IN THE COMPOSITIONS TO BE PLAYED. ESPECIALLY USEFUL FOR THIS PURPOSE ARE SONATAS VII AND VIII AND THE FIRST INTERLUDE. THIS ADJUSTMENT CAN ONLY BE MADE ACCORDING TO MEMORY BASED ON HAVING HEARD THE PIECES WHEN THE PIANO WAS PROPERLY PREPARED. PROPER PREPARATIONS ARE MADE (MARCH 1949) BY THE COMPOSER, MARO AJEMIAN, LOU HARRISON AND JACK HEIDELBERG, ALL RESIDENT IN NEW YORK CITY.

REMOVE 'BUZZES'. THIS IS DONE BY CAREFULLY CHANGING THE POSITION OF THE SCREW UP OR DOWN WITHOUT CHANGING ITS DISTANCE.

MAKE SURE NUTS ARE NOT TOUCHING ADJACENT STRINGS.

Figure 3 – *Directions for Preparing a Piano*. John Cage, 1949. Cage created this document to instruct performers of *Sonatas and Interludes*.

This is another clear example of the process of explicitation that new media art encompasses. These works, however conceptually

revolutionary, considered the instructions as something given, something that is not interpellated because it does not belong to the artwork. Its result belongs, its execution, but not its technology, or its design.

Among La Monte Young's 1960 compositions, there is one that is perhaps his best–known artwork. It consists of only one instruction: "draw a straight line and follow it".

Under this interpretation, Young is questioning the nature of the instruction following procedure, hinting on its artistic appropriation.

According to our definition, new media art exists when the medium is appropriated. In this case, the medium is the codification of a series of actions to be performed, the instructions themselves.

As we already stated, instructions have a long history: the pursuit of assignment of labor to automatic means is as old as technology itself. *Every assignment requires instructions.* These instructions might be implicit and codified into the tools shape, or explicit and be embodied outside of the tool, as a set of oral, written, drawn directives, or as new tools that allow the operator to use the first tool. A starter crank, for example, embodied in its affordance the instructions on how to start a car motor (see Figure 5).

As we mentioned before, the digital medium offers a natural way for new media art's processes.

La Monte Young's deceptively simple instruction is a first stop towards instruction appropriation, for it describes something potentially impossible to accomplish, as one possible understanding of the instructions is that the performer has to keep drawing and following the line forever.

In the digital realm, giving instructions to the computer is often equal to programming.

Programming, that is, the construction of software, constitutes an example of appropriation that infinitely expands the possibilities, for the expressive power of the appropriated technology is, for all practical purposes, limitless.

In the same sense, it is impossible to overestimate the importance of software within contemporary life. As Manovich puts it, "software has become our interface to the world, to others, to our memory and our imagination—a universal language through which the world speaks, and a universal engine on which the world runs." [104]

In effect, in spite of us having been able to identify historical new media processes that are separated from the digitality, nowadays all media are digital media, and all media are manipulated by certain automatic process.

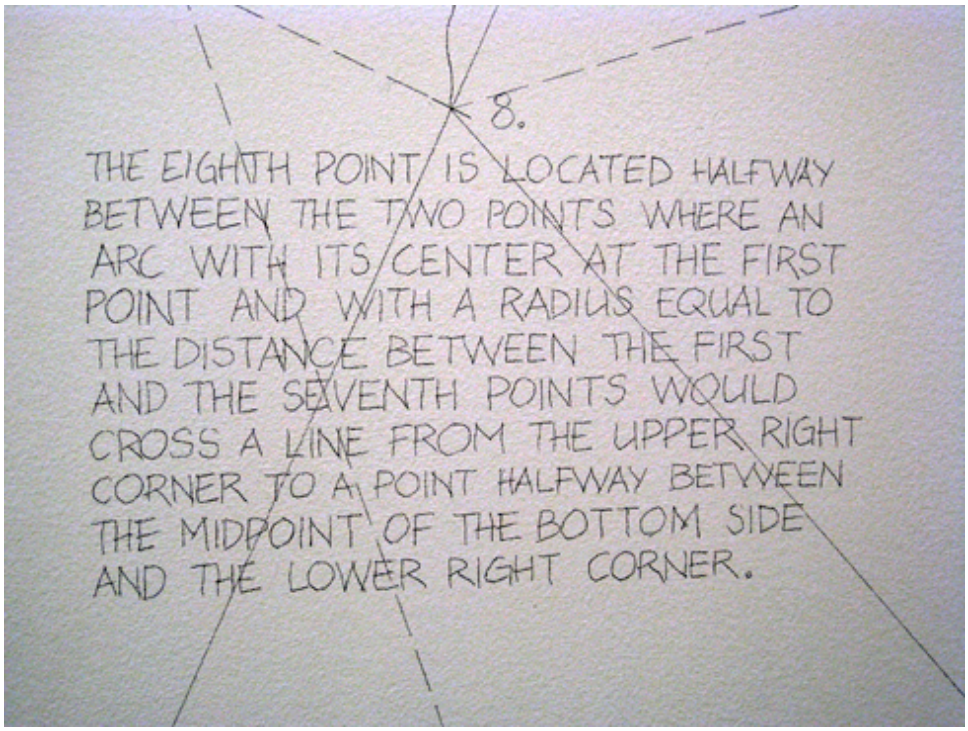


Figure 4 – Detail from *Wall Drawing 305*. Sol LeWitt's, 1975. Photography courtesy of Flickr user OZ, taken at MASS MoCA.

This, evidently, opens opportunities for delegation of some aspects of the cognitive process behind any artistic effort. The artist can escalate

one step on the abstraction ladder, and collaborate with higher–level descriptions of the involved process [87].

The digital computer, thanks to software, can be then considered not as a medium, but as a "meta–medium", "a combination of existing, new, and yet to be invented media." [104] This is equivalent to state that new media's appropriation has become an inextricable part of it: we conceptualize the digital *from* its ability to function as an *appropriating tool*.

Effectively, the range of technologies, methodologies, and processes, appropriated by new media art is virtually infinite and constantly growing. It falls well outside the scope of this work to attempt a list of all the appropriated technology. Suffice it to say that there are examples of artistic appropriation of all the technologies we can think of, from garden sprinklers to jet engines.

Figure 5 – *Ford Model T*. Photo courtesy of the Ford Motor Company

This *omnivorousness* of new media art is rooted on its core, and propelled by the ubiquity of software, which acts as a catapulting agent, as a starting point for new appropriations, and very often as the sole

technology that enables the appropriation (that is, knowing how to write code is the only requisite for many technological appropriations).

The art of interaction

> *The creative act is not performed by the artist alone; the spectator brings the work in contact with the external world by deciphering and interpreting its inner qualifications and thus adds his contribution to the creative act.*
>
> Marcel Duchamp, 1957. [39]

> *Since 1969, I have been trying to raise interactivity to the level of an art form as opposed to making art work that happened to be interactive.*
>
> Myron Krueger[26] [14]

These two quotes do a fair work in summarizing our perspective of interactive art. Marcel Duchamp's sentence alone suffices to understand interactive art as a form of explicitation. Every artwork is interactive, it needs the spectator to complete it, yet, and new media art's explicitation allows the interaction itself to become part of the artistic proposal: it allows for an artistic language of interaction.

This creation of an artistic language of interaction appears in Myron Krueger's sentence. When artworks become explicitly[27] interactive, new art forms, or art practices are created.

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[26] Myron Krueger (b. 1942) is an American computer artist who developed early interactive works. He is also considered to be one of the first generation virtual reality and augmented reality researchers. Krueger studied at the University of Wisconsin. where he received his PhD in Computer–Controlled Responsive Environments.

[27] Some authors prefer to talk about "active interaction" and "passive interaction". We, instead, prefer to name these two modes "explicit" and "implicit" interactions, under

We should be particularly careful at the analysis of interactive art, in order of not falling into the idea of interactivity as an "added flavor" of otherwise known art. Interactivity's own aesthetics conforms a unique field of artistic production and experimentation. That is not to say that "the whole is more than the sum of the parts" but to say that the whole is different, is incomparable, it's conceptual center–of–mass is situated on an orthogonal axis that allows for comparison only in the meta–artistic languages of art analysis rhetoric.

Explicitly interactive art subverts the traditional conception of the relationship between an *active emitter* and a *passive receiver* that traditional art presents. In spite of Duchamp's quote, there is an ontological change that comes with interaction.

Our contemporary conception of explicitly interactive art often requires the computational substratum, for it usually takes the form of computer art. Again, the computer's versatility comes to play a fundamental role, but, also, the historical process of interactive art is inextricably linked to the digitality.

Interactive art started with Myron Krueger computer–controlled art (see Figure 6). "He began as early as 1969 to conceive spaces in which actions of visitors set off effects. In co–operation with Dan Sandin, Jerry Erdman and Richard Veneszky he conceived the work Glowflow in 1969. Glowflow is a space with pressure sensitive sensors on its floor, loudspeakers in the four corners of the room and tubes with colored suspensions on the walls. The visitor who steps on one of the sensors sets off either sound or light effects." [36]

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the understanding that implicit interaction's cognitive requirements often are quite actively demanding. Let us offer *reading* as an obvious example of a demanding implicit interaction.

The notions of interaction that interactive art has been able to propose are, quite expectedly, strongly related with the technologies being appropriated by the artists.

For example, Roy Ascott[28] introduces the term "telematics art" which "challenges the traditional relationship between active viewing subjects and passive art objects by creating interactive, behavioral contexts for remote aesthetic encounters." [139] With telematics art, the physical immediacy with the art piece is no longer a requirement for the art consumption. As a matter of fact, for the first time, we find artworks that only exist when this immediacy is not present and, instead, the spectator interacts with some form of mediated representation of the artwork.

In the same sense, virtual reality's desire for immersion turns it into a medium "whose purpose is to disappear" [13], or, at least, to achieve a unique representation where the interaction apparatus is interiorized. This arises a tension that is well known (yet not often explicitly analyzed) within HCI[29], and presents extremely strong Lacanian reminiscences. This should open up a field of exploration that could be faced from both HCI and new media art perspectives.

Even if as Eric Paulos puts it "you can't evaluate what you can't evaluate" [125], HCI provides strong conceptual and methodological

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[28] Roy Ascott (b. 1934) is a British artist and theorist, who works with cybernetics and telematics on cybernetic art, and whose work focuses on the impact of digital and telecommunications networks on consciousness. He is President of the Planetary Collegium, and DeTao Master of Technoetic Arts in Beijing DeTao Masters Academy. He is the founding editor of the research journal Technoetic Arts, and honorary editor of Leonardo Journal.

[29] We tend to favor "HCI" instead of "interaction design" or similar constructions only because it seems to be more standard. As far as we are concerned, both phrases depict the same area of work and will be used interchangeably.

frameworks that are useful for both conceptualization and work in new media art [87].

The objective of HCI is the study of the interaction between humans and computers, that is, *the study of a user, employing one or many devices, to solve a specific problem, within a given context.*

That is, HCI is not only concerned with the interface, or with the aspect of the devices, but, instead, it operates in this *verbal dimension*; it is concerned with the interaction, with *how* the problem is solved.

HCI designs the interaction, therefore, it designs how the problem is solved, which sequence of steps the user will need to follow, and how the system (users, devices, and context) will be transformed during the interaction.

In a sentence reminiscent of McLuhan's famous dictum, David Rokeby poses that "interface is content" [134], however, we believe that *interaction is content*[30] would suit best.

The appropriation of interaction and the creation of an aesthetics of interaction require to cognitively operate in this verbal dimension. In the words of Martin Rieser[31]: "they [the art objects] can only become truly interactive when authors attempt to transcend the established syntax of earlier forms and the platitudes of multimedia and invent a coherent artistic language for interaction" [133]

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[30] Or, perhaps, "interaction is the message".

[31] Martin Rieser (b. 1951) is a British researcher and artist. He has exhibited and presented papers widely and has curated various exhibitions including 'Electronic Print', the first international exhibition of its kind. He is co–editor of new Screen Media; Cinema/Art/Narrative and currently works at Bath Spa University College at Bath School of Art and Design as Professor in Digital Arts. He set up one of the first post–graduate courses in the UK in Digital Art and Imaging at the City of London Polytechnic in 1980–85.

> *In the impossibility of replacing the essential element of color by words or other means lies the possibility of a monumental art. Here, amidst extremely rich and different combinations, there remains to be discovered one that is based upon the principle [that] the same inner sound can be rendered at the same moment by different arts.*
>
> *But apart from this general sound, each art will display that extra element which is essential and peculiar to itself, thereby adding to that inner sound which they have in common a richness and power that cannot be attained by one art alone.*
>
> Wassily Kandinsky[32], 1912 [93]

New media art, then, can be seen as the art practice that is created by being able to operate artistically in the technological realm. Media appropriation results in the creation of new materialities that dialectically construct the art experience. The creation of a rhetoric that analyzes new media art requires a discourse that cognitively colonizes the involved technology.

This definition of new media art does not say anything about the specific media that are appropriated (and therefore it is absolutely unspecific about the technology involved); however, our practice is centered on digital, computational technologies, which provide a natural (and omnipresent) vehicle for contemporary cultural production.

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[32] Vassily Vassilyevich Kandinsky (1866 – 1944) was a Russian painter and art theorist. He is credited with painting the first purely abstract works. He began painting studies (life–drawing, sketching and anatomy) at the age of 30. He taught at the Bauhaus school of art and architecture from 1922 until the Nazis closed it in 1933. He then moved to France where he lived for the rest of his life, becoming a French citizen in 1939 and producing some of his most prominent art.

Figure 6 – *Videoplace*. Screenshot from Myron Krueger's installation, which is usually regarded as the first (explicitly) interactive artwork.

Effectively, it is under the assumption that for all practical purposes, analyzing new media art implies analyzing computer art, that in the next chapter we will discuss some aspects of human–computer interaction that are particular relevant to our analysis of computer–based art.

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3 USERS

Human–computer interaction

> *No cultural field so far remained more unrecognized than computer science and, in particular, its specific branch of human–computer interaction, or HCI (also called human–computer interface design, or HCI). It is time that we treat the people who have articulated fundamental ideas of human–computer interaction as the major modern artists. Not only they invented new ways to represent any data (and thus, by default, all data which has to do with "culture," i.e. the human experience in the world and the symbolic representations of this experience) but they have also radically redefined our interactions with all of old culture.*
>
> Lev Manovich, 2002. [100]

In this chapter we will talk about some specific aspects of human–computer interaction – HCI – strongly related to our theory of media appropriation: users and power.

A definition of human–computer interaction, is given by the ACM's Special Interest Group on Computer–Human Interaction[33] (SIGCHI), where HCI is described as "a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them" [66].

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[33] SIGCHI is the Special Interest Group on Computer–Human Interaction, one of the Association for Computing Machinery's special interest groups. It is the world's leading organization in HCI. It hosts the major annual international HCI conference, CHI, with around 2,500 attendees, and publishes two of the main international publications on HCI: ACM interactions, and ACM Transactions on Computer–Human Interaction (TOCHI).

As we mentioned in the preceding chapter, it is fundamental to think of interaction design[34] as the design of interaction as a whole, and not only the design of the interface that a given product or appliance offer.

This, of course, requires conceptualizing the interaction as a significant distinct event, subject to being studied and characterized[35], which complexifies the subject of study. HCI studies the interaction as something that happens over time, when users employ a particular device to solve a problem in a specific context, and therefore HCI practitioners are not designing only the interface that these devices offer but also the sequence of actions that emerge.

When an HCI practitioner designs, for example, a coffeemaker, not only the system's image and behavior are being designed but also the way in which the user prepares coffee in the kitchen.

To be more precise, the HCI practitioner *designs a negotiation* between the actions that the appliance proposes and the context where it is used, the characteristics of the environment, of the user, the particular problem, and so on.

The main subject of interest of HCI is, then, the design of this negotiation and all the cultural phenomena that emerge from it. The analysis of these phenomena involves an enormous corpus of knowledge, turning interaction design into a field intrinsically interdisciplinary.

We must be aware that human computer–interaction is actually larger than this, and therefore it is easy to imagine areas of interest that barely fit this analysis. One such example would be the design of the software of a call–center. In this case, with a captive public, an ad hoc design,

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[34] We use the terms HCI and interaction design interchangeably.

[35] There is a parallel need of a conceptual root for studying the aesthetics of interaction.

and a stable and known context of use, the HCI practitioner would not be at all concerned of this negotiation but, instead, would focus on other, predefined, objectives (for example, maximizing the number of calls answered by an operator per unit of time).

Still, in the more general sense of the design of interactive appliances for unspecified contexts, our analysis holds.

We will avoid falling into the strong temptation of analyzing the relationship between HCI and new media art. There is a consensus on the benefits and cross–fertilization that arises from their interaction [2] [87]. Instead, we will focus on some aspects that build some of the ideas of the following chapters of this dissertation, while maintaining at all times our interest on new media art. That is, we will look at HCI from the perspective of the arts.

Human–computer ideology

> *The core phenomena in any problem of politics, indeed in any problem concerning humanity, are phenomena that have at their center human minds who animate them and who, in turn, are themselves symbolic or cultural processes occurring in the brain; thus, to understand and explain problems of politics one must understand and explain the relevant symbolic and mental processes, which is to understand and explain human actors' forms of consciousness and motivations.*
>
> Liah Greenfeld and Eric Malczewski, 2010. [60]

> *All art is political, Jonson, otherwise it would just be decoration.*
>
> Edward De Vere, Earl of Oxford, on the film "Anonymous", written by John Orloff. [70]

It is easy to agree that all relevant enough cultural phenomena admit a political interpretation and, therefore, carry a political stance. As we have seen, interaction design involves an extensive phenomenological corpus that intersects many areas of knowledge, which renders sensible the need of awareness of some of these political stances. There is not, and cannot be neither methodology nor praxis ideologically uncontaminated. The Ricœurian[36] processes of selection (in Ricœur's words "dissimulation"), legitimation, and social integration are unavoidable on the social construction of knowledge [132].

As it happens with all observable phenomena, the background, the context, and the knowledge of the observer have a direct impact on *what* can be observer and on *how* the observations will be interpreted. From an Engineering point of view, some of the conclusions that appear from media analysis do strike as naïve. One paramount example is the late realization of the prevalence and importance of the digital on media manipulation, creation, and dissemination. In the same vein, Lev Manovich's famous "laws of new media" [101], while reasonable and important in their systematicity, are not much more than a collection of already well–known characteristics of digital media.

As well as HCI requires for both its analysis and practice a multidisciplinary approach (embodied by teams or single persons, what Malina once called "New Leonardos" [99]), new media art does require a high level of fluency in the arts and in the technologies. Media

[36] Paul Ricœur (1913 – 2005) was a French philosopher best known for combining phenomenological description with hermeneutics. As such his thought is situated within the same tradition as other major hermeneutic phenomenologists, Martin Heidegger and Hans–Georg Gadamer. In 2000 he was awarded the Kyoto Prize in Arts and Philosophy for having "revolutionized the methods of hermeneutic phenomenology, expanding the study of textual interpretation to include the broad yet concrete domains of mythology, biblical exegesis, psychoanalysis, theory of metaphor, and narrative theory."

appropriation, once again, appears as the fundamental, defining characteristic of new media art.

In his latest book, "Software takes command", Manovich anew states the obvious: that software constitutes the central backbone of new media production. In Manovich's words: "There is only software. [...] Software is the central element and theory has not put attention to it. [...] To understand media today we need to understand media software"

Again, there seems to be a distance between media theorists and reality, and this late discovery of software as the main actor of "the digital" is surprising. It is hard to tell if this blindness of sorts arises from a misunderstanding of how things are done, or if there is an actual lack of theoretical and analytical framework of the "new media". It is not clear if the constructed rhetoric is naïve or poor.

Media theories need to move over the fascination of the discovery of *how* media technology is built. Media has to be appropriated *from the rhetoric*, and theory needs to catch up with the practitioners in order to establish a meaningful dialogue. The theoretical discourse should not be constructed from a fascinated alien perspective.

Flusser's black box theory identifies the need for media appropriation in order to decipher new media productions. In Flusser's words: "The coding happens inside this black box and therefore every critic of the technical image has to be based on that, to reveal the inner life. As long as we are not in possess of this critical view, we remain analphabets." [42]

The notion of "ideology" admits several readings, from the Marxism notion of falsehood that hinders the scientific knowledge, to the conceptions of Gramsci[37] and Althusser[38], "who see ideology as an

[37] Antonio Gramsci (1891 – 1937) was an Italian writer, politician, political theorist, philosopher, sociologist, and linguist. He was a founding member and onetime leader of the Communist Party of Italy and was imprisoned by Benito Mussolini's Fascist

essential part of human existence, [...] a communally shared sets of ideas which people draw on to make sense of their existence." [138]

Moreover, ideologies become part of material, individual experiences, constituting an individual's worldview, naturalized as ways of "experiencing the world" [138], and operate as actuators of implicit political stances behind design and implementation choices.

There is a need of analysis of the ideological stances taken by HCI practitioners and by interaction designers. Paraphrasing De Vere in the quote that opened this section, as with any construction of knowledge, *all design is political*.

In HCI, the *politicality* is evident as designers and organizations sample the world choosing the problems to be solved and their solutions. It is impossible to think about these decisions without realizing that there is always a political model of reality behind them. In Phoebe Sengers' words: "the proposed 'solution' tends to be understood as technologies that monitor users' behavior and either influence them to make a

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regime. Gramsci was one of the most important Marxist thinkers in the 20th century. He is a notable figure within modern European thought and his writings analyze culture and political leadership. He is known for his theory of cultural hegemony, which describes how states use cultural institutions to maintain power in capitalist societies.

[38] Louis Pierre Althusser (1918 – 1990) was a French Marxist philosopher. He was born in Algeria and studied at the École Normale Supérieure in Paris, where he eventually became Professor of Philosophy. Althusser was a longtime member—although sometimes a strong critic—of the French Communist Party. His arguments and thesis were set against the threats that he saw attacking the theoretical foundations of Marxism. These included both the influence of empiricism on Marxist theory, and humanist and reformist socialist orientations which manifested as divisions in the European communist parties, as well as the problem of the "cult of personality" and of ideology.

correct choice, where the correct choice is generally determined by the technology's designer." [138]

Freidman and Nissenbaum identify three types of "bias" in computer systems, preexisting, technical, and emergent, where a "bias" is the slant, the behavioral concretization of philosophical and political stances [44]. We argue that this bias is unavoidable as it is inherent to any human production.

The assumption (both explicit and implicit) of the market – that is, the assumption of "the applicability of market models and economic exchange" is one example of ideological models inserted into the HCI practice. This conception of "the market as natural fact" also shows how "traditional HCI discourse obscures political and cultural contexts" [12].

In the same sense, there is an underlying agreement under the acceptation (academic, social, economical) of any interactive appliance, and of every technical artifact. "Ideological analysis reveals that this problem framing embodies a series of political commitments about who determines what behaviors are acceptable, how users should relate to the authority of technology, and what role technology should play in solving societal problems." [12]

To perform any serious political or ideological analyses that reflect any reality, the socio–political context and a characterization or identification of the "societal problems" would have to be integrated. Design decisions are not only product of the ideological models and interests of the designers ("designers" understood in the broadest sense of the word, including organizations, companies and policies) as they include the social, economical, and political contexts where the products are designed, offered, and inserted.

Even if we will not attempt to provide such analysis for any cultural or design artifact, we hope that the acute conscience of how inevitable it is to apply the *sieve of ideology* will help us to be vigilant of our own assumptions, and in identifying at least some of the ideological and political undercurrents in interaction design and new media art.

Each man, finally, participates in a particular conception of the world, has a conscious line of moral conduct, and therefore contributes to sustain a conception of the world or to modify it, that is, to bring into being new modes of thought.

Antonio Gramsci, The prison notebooks, 1929 – 1935. [58].

Users as functionaries

Users of tools are much more prevalent than makers of tools. This imbalance has traditionally been rooted in the vast difference in skill levels required for using a tool compared to making a tool: To use a tool on the computer, you need do little more than point and click; to create a tool, you must understand the arcane art of computer programming.

John Maeda[39], 2004 [98].

The previous quote showcases a belief that seems deeply rooted into almost everyone who interacts with technology: that there is a definite border, a frontier, which divides computer programmers from computer users.

This assumption is so prevalent that usually there is no explanation offered behind it. A common analysis of digital media usually includes these two actors: users and programmers. Many users of tools and few makers of those tools.

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[39] John Maeda (b. 1966) is an American artist, graphic designer, computer scientist and educator whose career reflects his philosophy of humanizing technology. For more than a decade, he has worked to integrate technology, education and the arts into a 21st–century synthesis of creativity and innovation. Maeda became president of the Rhode Island School of Design (RISD) in 2008.

This division has been around for a long time; nevertheless, in the early stages of computing history all users where programmers. Or, better put, there was not a conceptual division between programming a computer and using one.

The creation of the user interface as a distinct concept is, interestingly, technological–centered: the computer is assumed, the user must be specified [62], and gave birth (in the computational realm) to what Flusser calls "functionaries".

The functionary dominates the apparatus by controlling its exterior, its interface, and is in turn dominated by the ignorance of its interior. In other words, functionaries are persons who dominate a game for which they are not competent [42].

In an historical twist, the increasing complexity of the software created a new layer of complexity that, in turn, created a new layer of opacity. The powerfulness of new software products required an improvement in the expressive power of their users. In this way, software products created or adopted programming languages that operate within their own medium and offer a greater expressive[40] power to its users.

The new layer of complexity operates in self–contradictory ways: on one hand offers an appropriation path, diminishing the opacity of "the inside" of the apparatus, on the other hand, it creates a new level of abstraction that – in a completely Kantian turn – further separates the users, effectively increasing the apparatus' opacity.

However, a most significant cultural phenomenon appears: users writing code. Users becoming programmers. There is an appropriation of the ubiquitous underlying technology: software creation. This hybrid–type of user acquires a very sophisticated vocabulary in the language

[40] Adding, among other things, the ability to automate and delegate process and activities.

proposed by the interaction design of the tool for which they become experts.

This empowerment of the users becomes particularly important, as software creation techniques are extremely translatable from one programming environment to other; the logical building blocks of the vast majority of programming languages are extremely similar.

The user–programmer continuum

In a parallel phenomenon to the complexification of software and its need of allowing users to express themselves programmatically, new programming languages have been designed that attempt to facilitate (and often succeed) the appropriation of the digital medium. As we have seen, this appropriation equals to the appropriation of the underlying technology, that is, the ability to write computer code, to program.

A new name for this activity has been coined: "creative computing". This coinage probably had the only intention to demystify computer programming and encourage non–programmers to learn how to code, while reclaiming the pertinence for "creative" individuals to the new environment. This is very interesting: the division between users and programmers is so deeply rooted into our contemporaneous culture that cultural operators *decided to rename computer programming* in order to help users to mentally cross the user–programmer frontier.

> *As programming becomes easier and more accessible, the tools for expression are becoming more complex and difficult to use. Programming tools are increasingly oriented toward fill–in–the–blank approaches to the construction of code, making it easy to create programs but resulting in software with less originality and fewer differentiating features.*
>
> John Maeda, 2004 [98]

Other efforts have been made in order to help this mentally crossing; several art–oriented programming languages and frameworks have been created. There are programming languages that do not look like programming languages (e.g. patchers like Max/MSP, PD, or VVVV [87]), and programming languages that might look like programming languages but are inserted into an environment where its programmability somehow gets less noticeable (e.g. shader programming in 3D computer graphics software like Autodesk's Maya or 3Ds Max).

The main characteristic behind the success of these "creative computing" environments are: a simplified syntax that does not hinder power; a consistent, step–by–step, online documentation; a custom, simple, programming environment; multiple platforms, including web; easiness to migrate to other (art–oriented or not) programming languages; and an active community and an open–source model [87].

> *"Merleau–Ponty[41] argues that...our subjective embodiment, our sensory and cognitive apparatus and our practical purposes inescapably structure the way the world strikes us. It follows on Merleau–Ponty's view that if we wish to understand the world it is not enough to study the world. We have to study ourselves."*
>
> Stephen Priest, 1998. [126]

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[41] Maurice Merleau–Ponty (1908 – 1961) was a French phenomenological philosopher, strongly influenced by Edmund Husserl and Martin Heidegger. The constitution of meaning in human experience was his main interest and he wrote on perception, art and politics. He was on the editorial board of Les Temps Modernes, the leftist magazine created by Jean–Paul Sartre in 1945. At the core of Merleau–Ponty's philosophy is a sustained argument for the foundational role perception plays in understanding the world as well as engaging with the world. Merleau–Ponty emphasized the body as the primary site of knowing the world.

These two symmetrical tendencies (programmability of end–user–oriented software and the creation of programming environments that try not to look like them) admit analysis and interpretation from within HCI.

If one possible objective of the artistic practice is to know more about the human condition, HCI, with its systematic study of the human interactor, appears as a natural technology to be appropriated.

HCI has a peculiar historical relationship with power, for one of the main roles assigned to an HCI practitioner is to *represent* the users, to work as a sort of users advocate within the software construction process [69].

This is satisfying in the sense that acknowledges the need for this power distribution; however, it conceptualizes the user as a powerless entity to whom solutions will be provided. In the end, there is an ideological dispensation of power, which demarcates the operational conceptual field and conceals a potentially richer field of appropriating interaction modes between humans and technology.

It is obvious that there are no programmers that are not users. The most skilled in expressing themselves programmatically, when writing code are "pure" users of the operating system, the compiler, the IDE, and whatever other tools they happen to be using.

Our proposal is that *there is no a–priori conceptual difference between users and programmers for programming languages are a specific subset of the interaction languages.*

In 1985, Hutchins, Hollan, and Norman introduced the concepts of articulatory and semantic distances as variables of direct manipulation interfaces. These concepts can be extended to every interface, where verbally symbolic interaction schemes are considered indirect manipulation.

Semantic distance measures what is possible to be expressed in the interaction language and how concisely can it be expressed. Articulatory

distance, in return, measures how similar the interaction expression is to the idea behind it, how close a metaphor the interaction language offers.

Programming a computer consists on the codification of orders in a specific interaction language. Programming languages consist of interaction languages with short semantic distance and usually long articulatory distance.

The only difference between a user clicking on a button and a programmer writing a specific algorithm are different values for the semantic and articulatory distances of the interaction language used.

The binary division between users and programmers is not more than the crystallization of an ideological distribution of power.

As we indicated, this distribution is propagated by a reductionist taxonomy of software constructions that does not reflect the complexity of the interaction modes between humans and computers and is functional to a power distribution schema that empowers a certain subset of interactors to the detriment of the vast majority of interactors, demeaned as “users”.

This was intuitively understood by new media artists and the renaming of programming into “creating computing” reclaims some of that power.

The main difference, between users and programmers, then, resides in *the attitude* that governs the interaction. Programmers naturally adopt an appropriating attitude that dives into the opacity of the apparatus, trying to understand its functioning and to profit from the freedom that emerges.

The digital revolution is the revolution of appropriation, for it awards freedom.

New media art’s systematic explicitation of the appropriated technologies operates by situating the artist on different places on the

user–programmer continuum. It is clear that every artistic production (for it always implies a certain relation with technology) situates the creator somewhere in this axis; however, it is new media art's appropriation that turns this position (and then, the attitude towards the technology) explicit. The location within this axis becomes part of the art practice.

This yields an interesting result, technological appropriation somewhat translates the art practice into the performative art field, because *how* an art piece is created becomes a defining part of the artwork.

As an example: the (artistic) product created "functionarily" manipulating a certain piece of software (such as Adobe After Effects) becomes ontologically different from an identically looking product programmed with the Processing language.

The difference lies in the explicitly different relationship with the technology. Even if the results are the same, the appropriating relationship only in one case situates the technological manipulation inside of the artwork.

Tool–specific freedom

The user–programmer continuum is mirrored by the software products involved in media creation and manipulation. As we have seen, end–user–oriented software offers programmable capabilities, while programming languages offer friendlier environments that underpin the creative appropriation.

How a specific piece of technology is conceptualized is subject to modification by the conceptual framework of the artist's analysis together with the relationship of the software with its context.

For example, bitmap–drawing software could be seen as tools for creating drawings, or as pieces of software conceived to allow their users to modify the values in a specific area of a computer's memory.

The meaning and significance of the use of a specific tool is also dependent on the tool's conceptual opacity. The cultural significance of a new media art piece requires the appropriation of the technology from the rhetoric.

In this regard, an interesting discussion would be the comparison of a record player and a violin, as musical instruments. If one would want to pick the best musical instrument, it is easy to find reasons for both of them (a violin can only sound like a violin, while a record player can sound as many things. A record player only can play whatever is recorded on the available records while a violin can play whatever its operator chooses. This choosing is very hard in a violin, while it's much easier on a record player. A violin does not need an external power source while a record player does, and so forth).

What should not surprise us is the conceptualization of the record player as an instrument, for it has been long ago artistically appropriated by DJs and other musicians. But even if it had not been, our knowledge of its possibilities and the involved technology should allow us to build this rhetoric from the appropriation.

> *"Each problem [...] should be faced with a sort of ingenuity, [...] with an attitude humble and vigilant. It should be thought again, with the basic body of knowledge that is now the heritage of all men." "As a consequence of the mistaken attitude of imaging a science and technology already done, that only wait for us to discover them, a blindness is created among us"*
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> Eladio Dieste[42], 1998. [35]

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[42] Eladio Dieste (1917 – 2000) was a Uruguayan engineer. He obtained his degree from Facultad de Ingeniería (UDELAR, 1943). He built a range of structures from grain silos, factory sheds, markets and churches, all in Uruguay and all of exceptional elegance. He pioneered the work in structural ceramics.

Eladio Dieste's words show the need for the creation of context–aware artistic and technological practices. This, however, does not imply a lack of technical knowledge but, instead, the realization that geopolitically central narratives might not be adequate for geographical, social, or economically peripheral realities.

In attention to this, in the next chapter we will discuss – from a prospecting point of view – interaction design, that is, a specific subset of knowledge of high importance for new media art's practice.

Then, in the following chapter we will consider the geopolitical and social contexts of new media art, with emphasis on peripheral narratives.

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4 THE PERCEPTUAL CLOUD

Introduction

> *Radio should shift from a means of distribution of contents to a real communication tool. It should be able not only to transmit but also to receive, not only to let the audience listen to something but also to let the listener speak, not only to isolate him, but also to link him to the others. Let the listener provide contents to radio.*
>
> Bertold Brecht[43], 1932. [17]

> *No place left to hide from interactivity.*
>
> Bruce Sterling[44], 2007. [31]

In his essay "Radio Theory", Brecht anticipates and claims for the Internet and new media's ubiquity. Even more specifically, Brecht prefigures what will be the central idea of this chapter: *interaction ubiquity*. As Sterling forecasts, explicit, computational interaction will be everywhere.

This forthcoming ubiquity is predicted and analyzed from many theoretical perspectives and related taxonomical umbrellas: the Internet of things, everyware, ubiquitous computing, context–aware computing, invisible computing, calm computing, physical computing, and ambient intelligence, among others [78].

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[43] Bertolt Brecht (1898 – 1956) was a German poet, playwright, theatre director, and Marxist. A theatre practitioner of the 20th century, Brecht made contributions to dramaturgy and theatrical production, the latter through the tours undertaken by the Berliner Ensemble, the post–war theatre company operated by Brecht and his wife, long–time collaborator and actress Helene Weigel.

[44] Michael Bruce Sterling (b. 1954) is an American science fiction author and futurologist who is best known for his novels and his work on the "Mirrorshades" anthology. This work helped to define the cyberpunk genre.

Most of these perspectives, both complementary and overlapping, imagine (or propose) a near future interaction schema based on robustly networked devices, usually small and inexpensive. This ubiquity would come into being thanks to two main developments: firstly, the creation of mobile devices that are able to modify their behavior according to their context (geographical or situational) – for example a mobile phone that knows when its user is in a romantic dinner and acts accordingly – and secondly, the addition of computational and interaction capabilities to pre–existing physical objects, for example, adding computing power to everyday objects, like frying pans, fridges, toothbrushes, or cars.

Adam Greenfield in his book "Everyware: The Dawning Age of Ubiquitous Computing" indicates an extremely common design principle underlying these approaches: "If computers are everywhere they had better stay out of the way." This perspective of invisible computing is present on the core of ubiquitous computing[45]'s conception of the future of interactive devices.

The analysis of the state of the art and the immediate future of ubiquitous computing usually do not mention remediation as a relevant design heuristic or concept.

As we have seen, remediation constitutes a central characteristic of the digital media, where its inherent unspecificity turns it into a *metamedium*.

In the words of Alan Kay:

> *The computer is a medium that can dynamically simulate the details of any other medium, including media that cannot exist physically. It is not a tool, although it can act*

[45] We will favor the term "ubiquitous computing" when needing to refer to any of these related and similar concepts.

> *like many tools. The computer is the first metamedium, and as such it has degrees of freedom for representation and expression never before encountered and as yet barely investigated. The protean nature of the computer is such that it can act like a machine or like a language to be shaped and exploited.*
>
> Alan Kay [103].

Although there is no reasonable doubt whatsoever about the imminence of one or many versions of ubiquitous computing [61] the metamedial quality of the digital media is usually ignored by ubiquitous computing literature, preventing it from taking into account the unavoidable processes of remediation that will arise.

In his book "Software takes command", Manovich transcribes the following quotes:

> *It [the electronic book] need not be treated as a simulated paper book since this is a new medium with new properties.*
>
> Kay and Goldberg, 1977.

> *Today Popular Science, published by Bonnier and the largest science+tech magazine in the world, is launching Popular Science+ — the first magazine on the Mag+ platform, and you can get it on the iPad tomorrow... What amazes me is that you don't feel like you're using a website, or even that you're using an e–reader on a new tablet device — which, technically, is what it is.* It feels like you're reading a magazine. *(Emphasis is in the original.)*
>
> Popular Science+, 2010. [104]

Remediation and simulation are well imbued into digital media. As the preceding quotes show, even when it constitutes a free, unbounded, new medium, it always remediates – appropriates – previous solutions.

Screens

Any attempt at reading into the future of interactive media has to root itself into an analysis of the present state of interactive technology.

Screens have become an integral part of the human experience. With at least a 75 percent of the world population with access to a cell phone, people naturally introduce screens in every aspect of their everyday life [152].

This by no means constitutes a claim or suggestion of any assumption of an equal or even remotely just distribution of the existing resources. "The term ubiquity in a world where, like the figurations of the woods mentioned earlier, earlier, access to clean drinking water is effectively a privilege of the accident of birth" not only constitutes a "dark irony", but also *has to* become the main epistemological tool from which any reading of reality must commence [123].

According to Google's 2012 study on media consumption, not only are screens always in the center of our interactive experiences, but also users tend to be "multi–screeners". In the USA, 90 percent of media time today is spent in front of a screen, and 38 percent of it on smartphones [56]. In addition, Google found that "77 percent of TV viewers are using another device at the same time, a media phenomenon known as second screen behavior. This is part of a larger trend of Multi–Dimensional Entertainment that is seeing creators leverage the unique capabilities of multiple devices to create experimental forms of narrative that involve audiences more deeply in a story." [71]

This interactive technology landscape – with the ubiquity of the screen – should not be considered as an omnipresent but unidirectional media flow, but, instead, as a constant two–way flow of data.

In effect, with the addition of cameras and touch surfaces to almost every screen–based device, screens are now bi–directional communication devices. They are not only devices to be looked at, but

also devices that look back at us. The digital eye became a ubiquitous feature of current portable technology [131].

This, as often is the case, has been made explicit by new media artists, even to the point that "magic mirrors" have became a gesture, or cliché, or design pattern in new media art (it has been said that mirrors where the first interactive art pieces).

Specially notable is that we are training these devices not only to look back at us, but also to "understand" us in a similar, or coherent, way with how we perceive and understand the world and ourselves. Devices that recognize faces, infer emotions, body postures, and gestures are present in a wide range of devices, from photo cameras to video games and TVs.

The bi–directionality of the screen is ubiquitous, and the difference between sensing and showing information is blurring, not only by the extremely frequent camera–screen pairing but also with the introduction of sensing pixels, Wedge–like devices [109], and touchscreens.

In his book "The universal eye", Wajcman[46] identifies a new panopticism in this massive emergence of the cameras. Our society would be turning from a society of images into a "society of the gaze". We still have an excess of images and of mechanisms of image production, but our society is suffering from an insatiable appetite for new eyes.

Under Wajcman's view, the ideology of the "completely visible" appears: everything is visible, the gaze trespasses everything, and there are no resisting opacities left.

The semantic corollary to the ideology of the complete visible is a dangerous one: *everything real is visible*. This prevalent idea behind the

[46] Gérard Wajcman (b. 1949) is a French writer and psychoanalyst. He is a lecturer at the Department of Psychoanalysis at the University Paris 8.

emergence of cameras is only sustainable when the apparatus itself is opaque. The scopic drive is always directed towards *the reality,* and the user–functionary's own ignorance establishes the belief of the perceived reality.

This is a fundamental ontological concern: the perennial subject–object problem reappears in a virtualized, mediated, fashion; aggravated by an extended lack of appropriation of the medium.

The functionary perspective is prevalent, for it is functional to the instauration of new technologies, that is, it is functional to the ideology behind those technologies. An ideology that has, as we will briefly discuss in the next chapter, strong economical, political, and societal roots.

New technological advances in image capturing and reproduction contribute to the opacity of the apparatus: on one hand the technology becomes more difficult to appropriate; on other hand, the fidelity of the reproduction improves. As a blunt example, "the image is not flat anymore" [131], for it is recorded and reproduced in three dimensions.

In fact, depth cameras – cameras that measure an additional variable to each perceived pixel: the distance from the camera to the object painting the pixel – will soon be as ubiquitous as regular "RGB" cameras. Devices like Microsoft's Kinect Sensor, Leap Motion's Leap Sensor, or the Structure sensor (a Kinect–like 3D sensor for mobile devices, which, incidentally, successfully reached its crowdfunding target of one hundred thousand US dollars in only one day and continued to rise more than one million US dollars) [131]: are being mass produced and will be added to many mobile computing devices.

As we just said, this bi–directionality is effectively perceptual: screens not only see the world but interpret it (and us). Many examples of the implications of this are showing in new interactive applications. For example, existing applications range from the simple changing of the font size in function of the distance to the user or use of head tracking

to simulate three–dimensionality, to inferring emotional factors (anger, frustration) and responding accordingly.

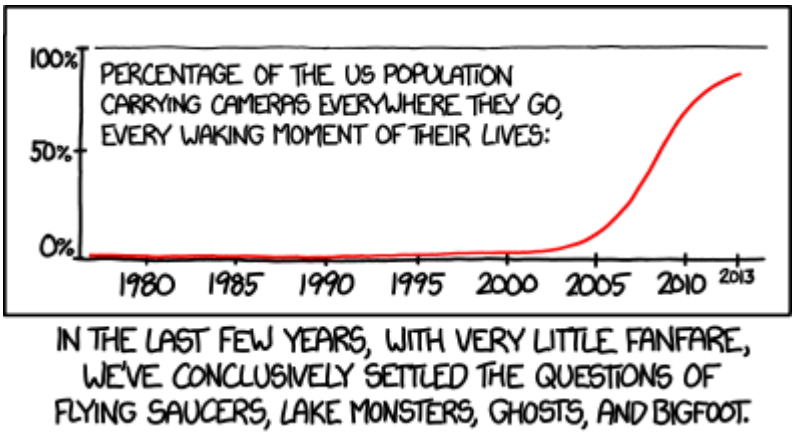

Figure 7 – Randall Munroe, xkcd comic strip #1235, "Settled".

Our relationship with cameras is an active one. We are at the same time subject and object of the digital gaze for there is an incredibly big (and increasing) amount of people carrying, at all times, a digital camera.

The pervasiveness of screens and cameras is at the root of the models of ubiquitous computing. Ubiquitous computing's unavoidable future is constructed on the same line of evolution that the cardinalities in the interaction between humans and computers show.

Under an evolutionary point of view, ubiquitous computing will incarnate a "third generation of computing, with the mainframe, with many users time–sharing one computer, then the personal computer (PC) with one user to one computer, and then many computers time–sharing one user or flows of users." [47]

However, in spite of this evolutionary approach, we can identify other processes that will drastically change the shape of the immediate future.

Decoupling

A parallel trend – which can be somewhat seen as a wink to the mainframe paradigm of earlier computing days – has been recently

dubbed “cloud computing”. In it, different operators can provide almost everything “as a service” to be consumed on demand via Internet.

Definitions of what is currently offered as a service overlap. Among others, we can find infrastructure as a service, platform as a service, storage as a service, software as a service, data and databases as services, security as a service, and testing as a service.

The “cloud”, however, should not be understood only as the remote use of computing power, data storage or another infrastructure, but also as the effective decoupling of the computing power (in its broader sense) from both local computing power, and its human interface.

Although remote storage and remote computing have been present for a long time in computer history, its seamless, transparent, or invisible integration into mobile devices is very new. Apple’s Siri service for their iPhone smartphone remains one of the most used and relevant examples. Siri (which stands for “Speech Interpretation and Recognition Interface”) offers a versatile natural language interface, capable of understanding many basic phrases and to reply in a spoken voice.

What it is remarkable is that this interaction is performed by a mobile device that uses Apple’s servers to process the audio (and store it, which should rise a great concern for the users’ privacy. IBM, for example, forbid its employees to use it at work [8]).

This decoupling of the processing and the interface is invisible to the user (unless the user has limited or no connectivity, in which case the service does not run). The phone acts as the human interface of a remote computing service. However, for the user it is the impossible to tell that it is not the mobile device that performs the operation.

A second decoupling of the computing and interaction layers has received many names and has seen many incarnations. At University of Tokyo, Cassinelli’s team coined the phrase “invoked computing” for one instance of such decoupling [154]. Invoked computing proposes to empower the users with the ability of invoke computing behavior onto

any physical device (they showcase this with a pizza box acting as a laptop computer and a banana acting as a telephone). This is accomplished by using image projectors converting any surface into a screen, and parameter speakers using ultrasound to "project" sound into any object.

Other examples of this with steerable projectors that can point to arbitrary spaces can be found in our own Mapinect [67], and in Microsoft Research's Beamatron [150].

As Cassinelli points when introducing Invoked Computing, "the most challenging part of this proposal is the automatic detection of suggested affordances." Although this can be side–stepped by users learning a set of command gestures or by presenting users with, for example, projected touchable menus, the "magical" augmented reality–like properties that Cassinelli et al.'s propose do require the automatic correct interpretation of the invoker object's affordances.

The perceptual cloud

> *If technology is a drug – and it does feel like a drug – then Charlie what, precisely, are the side effects? The "black mirror" of the title is the one you'll find on every wall, on every desk, in the palm of every hand: the cold, shiny screen of a TV, a monitor, a smartphone."*
>
> Charlie Brooker on his TV miniseries "Black Mirror" produced buy the BBC, 2011. [18]

Even if both mentioned decoupling strategies are not entirely new, their combination is not only novel, but also it will have a profound impact on everyday life and on how we conceptualize computers and their use.

The future scenario is this: every surface within every object everywhere is a potential interaction device or part of an interaction device. Every surface is a screen, every object a speaker. Every suggested,

metaphorical, affordance of every object is real. Every user movement, every gesture, every spoken word is analyzed, is reacted–to, and possibly recorded.

Although we do not know the exact implementation of this radical transformation of the environment, we are confident about its unavoidable advent. The required ubiquitous sensing and audiovisual projection will probable be achieved by a combination of in–situ devices (projectors, parametrical speakers, etc.) and wearable appliances (in the styles of MIT's 6th–sense [111], or Google's Project Glass [55]).

It is the double decoupling of the perceived interface support from the actual interactive device, and the perceived computing support from the actual computing device that will allow for this radical transformation of everything everywhere.

We name this *the perceptual cloud*[47].

This new paradigm will have a tremendous impact not only on what users assume and expect from computational interactive systems, but also on everyday life and its concerns, especially privacy, image ownership, and perceptual ownership.

The first implementations of interactions showing characteristics related to the perceptual cloud operate over a pre–defined set of affordances. Siri, for example, delegates the computational processing while adapting its answers to some level of context sensing. Similarly, commercial devices that turn surfaces into touchscreens using depth cameras are already available [30]. In any case, its main impact will be in the introduction of *affordance as a service*.

The concept of affordance is a central concept of HCI. Introduced by J. J. Gibson[48], it became popular when Donald Norman[49] installed it as a

[47] First presented in [88].

center concept in his model of interaction design. In Norman's conception, the affordance is the codification of a possible use into the perceivable characteristics of an object. These characteristics indicate that the observed object *affords* a specific use [114].

This interpretation of affordance is very rich and flexible, as it, for example, allows the insertion of contextual parameters, as they might affect the perception of the object. It also includes virtual objects: objects which perception is mediatized by some mechanism of representation (for example a button drawn in a computer screen).

Affordance as a service will have a tremendous impact in our conception of reality. Even without discussing Flusser's black box, affordance theory is constructed over the model of functional perception, the "functional coloring" of objects. The inherent flexibility of affordance as a service will dynamically color our surroundings.

McLuhan's theory of the "extensions of man" was contradicted by Kittler[50], who stated that "media are not pseudopods for extending the

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[48] James Jerome Gibson (1904 – 1979), was an American psychologist who received his Ph.D. from Princeton University, and is considered one of the most important 20th century psychologists in the field of visual perception. In his classic work The Perception of the Visual World (1950) he rejected the then fashionable theory of behaviorism for a view based on his own experimental work, which pioneered the idea that animals 'sampled' information from the 'ambient' outside world. He coined the concept of "affordance", the opportunities for action provided by a particular object or environment.

[49]Donald Arthur Norman (b. 1935) is an academic in the field of cognitive science, design and usability engineering and a co–founder and consultant with the Nielsen Norman Group. He is the author of the book The Design of Everyday Things. Much of Norman's work involves the advocacy of user–centered design.

[50] Friedrich A. Kittler (1943 – 2011) was a literary scholar, post–structuralist philosopher and media theorist. He was Full Professor of German at the University of Bochum; in 1993 he went to Berlin to accept a chair in Aesthetics and History of Media at the Humboldt–University. In 1993, he received the media arts prize for theory from

human body. They follow the logic of escalation that leaves us and written history behind it." [52] McLuhan's approach only makes sense when the subject–object problem is forgotten. As we have noted, we tend to think that reality equals what we perceive; therefore, we tend to assume that the universe re–mediated by a camera *is* the reality. Effectively, we do assume media as a human extension.

Paul Virilio[51] said: "the speed of light does not merely transform the world. It becomes the world. Globalization is the speed of light. And it is nothing else!" [5] In other words, he is saying this: globalization exists because the camera shows the reality. Globalization, the unified and unifying conception of the world, is embodied in the speed of light, in the maximum speed at which we perceive reality.

But Kittler is not antagonistic to McLuhan. On the contrary, they coexist in the unfolding of the camera's role. The camera offers the reality and we forget the subject–object problem, to the extent that there is something called Augmented Reality. What a misleading name! And, at the same time, how revealing of our camera blindness, of our effective forgetfulness of the subject–object problem, of our desire to extend our body. For the scopic drive is, also, the desire to escape from the body's tyranny, from the limit of the immediate.

We return to this because the McLuhanian process of human extension might help us in prefiguring the impact of the perceptual cloud.

Effectively, the perceptual cloud can be seen as a parallel process of extension centered not in the human but in the human environment. It is a shift of the ontological center of the human extension, in such a way

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the ZKM Karlsruhe; from 1995 to 1997, he headed a Federal Research Group on Theory and History of Media.

[51] Paul Virilio (b. 1932) is a French cultural theorist and urbanist. He is best known for his writings about technology as it has developed in relation to speed and power, with diverse references to architecture, the arts, the city and the military.

that it is rooted outside: out of the body and out of our perception. It empowers the environment.

The problem subject–object should not be left aside. Augmented reality taught us this: we can augment the reality via the extension of our senses. *We can grant affordances as reality augmentation*. The shift of the ontological center is not related with perception; instead it has to do with the cognitive anchoring. Augmented reality exists when this anchoring occurs outside the user.

A question remains: what will happen when every affordance is possible?

If we assume the camera as an extension of the eye, then the world extends our functional interpretation of itself. Real world will afford the instantiating of other functional reality. The invoked affordance folds reality on itself and auto–projects itself.

With every affordance being possible, a taxonomy of affordances will emerge. Some will be more universal than others. The social, political, and cultural divides will manifest themselves in the abilities and desires towards the instantiated affordances.

The digital divide will re–edit itself and become embodied. The differences of technology accessibility will re–appear on the projection of interaction onto everyday objects, in both the economic and cultural accesses to these invocations.

The phenomenon of decoupling is not very present on the literature. Manovich talks about screens becoming thinner, but he misses the point behind their physical disappearance, behind the virtualization implied on every surface being a potential screen and the exponential multiplication of digital ubiquity.

This renders the frontier between digital and non–digital realms more permeable and potentially changes our relationship with every space we inhabit, for every space becomes a support of all possible instantiations. Our relationship with the computational services also change, for they

will be conceptualized in function of the convenience of their instantiation in a given context and situation.

"Cellspace technologies" are technologies that work by "delivering data to the mobile physical space dwellers. Cellspace is physical space that is 'filled' with data, which can be retrieved by a user via a personal communication device." [102]

Interestingly, we already are used to that; with personal data appliances (smartphones, tables, notebooks) we can instantiate "the digital" into our reality. However, it always stays confined *inside* the digital device, while in the perceptual cloud both realms are intertwined in a new, potentially artifact–free, fashion.

Decoupling will require researchers to stop thinking of the computational layer as something important, as it will be possibly hired as a service. Research, design, and production of new computational media carriers will continue. However, it will do so in parallel, as many times, new offers will not be perceptually paired to a specific device.

Interaction as a service will not only decouple the involved hardware, but also its ownership, as it will allow for temporary ownership (rental) of interaction schemas, regardless of the supporting hardware's ownership status.

> *Augmented space is the physical space which is "data dense," as every point now potentially contains various information which is being delivered to it from elsewhere. At the same time, video surveillance, monitoring, and various sensors can also extract information from any point in space, recording the face movements, gestures and other human activity, temperature, light levels, and so on. Thus we can say that various augmentation and monitoring technologies add new dimensions to a 3D physical space, making it multi–dimensional. As a result, the physical space now contains many more dimensions than before, and while from the phenomenological perspective of the human subject, the*

> *"old" geometric dimensions may still have the priority, from the perspective of technology and its social, political, and economic uses, they are no longer more important than any other dimension.*
>
> Lev Manovich, 2006. [102]

The perceptual cloud resides in an axis orthogonal to the classic, reality–augmented reality–virtual reality, as it admits processes typically associated with any of these three stages.

To this effect, the specific display used to consume visual media, adds to the overall phenomenological experience. Decoupling integrates under the same interaction schema all the display possibilities. Augmented reality stops existing as a distinct phenomena as it appears naturally with automatic perception and pattern recognition paraphernalia.

Other new carriers of digital interaction, like wearable and augmenting devices (such as Google's Glass), fit perfectly and seamlessly into the perceptual cloud ecology. Moreover, Google's Glass could not exist without the perceptual cloud, and the main risk to its surviving is the danger of confounding the support with the interaction scheme instantiated, to fail on understanding how separate these two concepts are.

Some design issues

> *Once we have surrendered our senses and nervous systems to the private manipulation of those who would try to benefit by taking a lease on our eyes and ears and nerves, we don't really have any rights left.*
>
> Marshal McLuhan, 1966. [106]

> *The close connection between surveillance/monitoring and assistance/augmentation is one of the key characteristics of the high–tech society.*
>
> Lev Manovich, 2006. [102]

The perceptual cloud poses fundamental opportunities and challenges in terms of design, and therefore in terms of political design, of ideology.

Design has a world transforming potential, for it not only shapes the tools we use to interact with the world but it also shapes our ideas and conceptions about the world itself.

We will use maps to exemplify this: "from the earliest world maps to Google Earth, cartography has been a vital interface to the world." [118] As we cannot perceive the world directly, the world's virtualizations – maps – are the only way we can perceive it.

Maps guide our perceptions of what the world is and steer our actions in it. We build our mental representation of the world via maps. *Our idea of what the world is is created in function of this interface.*

However, maps are not (and cannot be) an accurate depiction of the world. Instead they are an "abstract and influential creative practice, rich with the power to engineer political views, religious ideas and even the material world itself." [118]

One easy example of both maps' power and abstraction is given by the Mercator Projection: the world map most commonly used, and the one used by Google Maps [54], among uncountable others.

Indeed, the Mercator projection is the projection used in the world map we use on an everyday basis. However, if we look at Figure 8 we can see two shaded areas corresponding to Greenland and Africa. These two areas are represented with similar sizes, yet in reality, *Africa is almost fourteen times bigger*.

Figure 8 – Mercator projection. Greenland and Africa are shaded. Greenland's size is of 2.166 million square kilometers, while Africa's is of 30.22 million square kilometers, almost fourteen times bigger [117].

Map design shows the power of interaction design as it builds our reality. The world we inhabit is the fictional result of design consumption.

Another example of the relationship between design and reality is provided by the "desire paths". This term, coined by Gaston Bachelard[52] shows, as we can see in Figure 9, the desire path that emerges in function of the sustained transit of peasants. That is, it appears due to a systematic use of the system that directly contradicts the proposed design.

[52] Gaston Bachelard (1884 – 1962) was a French philosopher. He made contributions in the fields of poetics and the philosophy of science. To the latter he introduced the concepts of epistemological obstacle and epistemological break. He rose to some of the most prestigious positions in the Académie française and influenced many subsequent French philosophers, among them Michel Foucault, Louis Althusser, Dominique Lecourt and Jacques Derrida

Design exists in these two examples' apparent contradiction: it is powerful enough as to change our conception of the world. It is weak enough so as to be blatantly ignored by its users.

In Clay Shirky'[53]s words, design exists in the tension between arrogance and humility. Arrogance to tell users what they should do, humility to understand that users are experts in their reality.

> *Arrogance without humility is a recipe for high–concept irrelevance; humility without arrogance guarantees unending mediocrity. Figuring out how to be arrogant and humble at once, figuring out when to watch users and when to ignore them for this particular problem, for these users, today, is the problem of the designer.*
>
> Clay Shirky, 2007. [140]

These two forces behind design are always present, and both encode ideological and political stances. We need to be particularly aware of the inevitable ideology of the perceptual interpretation.

The perceptual cloud's appropriation of human perception and the instantiation of affordances will always encode a certain interpretation of the world, a specific ideological model of reality, creating what we could call *perceptual colonialism*.

Two years ago, a YouTube video showing a little girl of approximately one year old trying to perform multi–touch gestures on a printed magazine went "viral" [37]. Even if the conclusions of the video uploader were, in our opinion, plainly wrong, what is interesting resides in the

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[53] Clay Shirky (b. 1964) is an American writer, consultant and teacher on the social and economic effects of Internet technologies. He has a joint appointment at New York University (NYU) as a Distinguished Writer in Residence at the Arthur L. Carter Journalism Institute and Assistant Arts Professor in the New Media focused graduate Interactive Telecommunications Program (ITP).

video's popularity. It provides an example of how used we are to the idea that new interaction designs re–shape our everyday experience and re–define normalcy.

Figure 9 – A desire path in the UK. Photo by Kake Pugh, used under a Creative Commons license.

The ontological shift provided by the perceptual cloud is not, by any means, exclusive to it. Similarly, systematic efforts, such as Google Maps, are deeply related to Flusser's suggestion that the apparatus of the camera compels the user to take photographs, and in a demented encyclopaedism to attempt exhausting the infinity of all possible images.

The omnipresent mediation of digital interfaces to the world poses extremely sensitive and delicate relationships of power, with a profound impact in real life. However, it is the delegation of computational processes to powerful, centralized centers that will produce the biggest impact.

For example, according to a recent report from Navigant Research, in just over two decades, autonomously driven Cars (such as Google Car) will account for 75 percent of all light vehicle sales worldwide. In total, Navigant expects 95.4 million autonomous cars to be sold every year by 2035, totaling more cars than are currently built every year. [113]

This will deepen the already existing delegation of navigation decisions to automatic systems, creating modes of interaction with the reality where users are no longer subjects of the interaction, but, instead, its objects. Besides initiating (and eventually monitoring) the execution of the interaction, users would have no active role in its performance.

As we have discussed, this entails a power negotiation. For example, if we delegate our navigational decisions within a city to a company (as we often already do), we would be surrendering economically valuable decisions. What would happen if Google, for example, wants to negotiate with the fact that it can choose whether people would be passing in front of a shopwindow or not?

This type of relationship is not new: we always have had mediated relationship with socially shared spaces. For example, it is more expensive to buy a newsstand next to a bus stop than one situated far from everywhere.

On the other hand, this has potentially positive impact: the creation of more efficient cities, where data is democratized, allowing for new narratives in the relationship with the city, and for cities that more efficiently regulate themselves and their resources.

Contradictory impulses like this are prevalent in our relation with technology, especially in our relation with commercial technological offers. For example, we want online services to learn about our tastes in order to provide customized experiences while at the same time we want our information to be ours alone.

However, it is worth noticing is that these constitute almost always *social design problems and not a technical ones*. For example, there are

known solutions that offer anonymity and privacy while at the same time allowing for most (if not all) the advantages of personalized services.

Similarly, gentrification processes are well known and documented and have been exploited by economic operators for many years (to the systematic disadvantage of the less powerful who find themselves expelled within the cities). In any case, we are still to see the actual effects of these operations within the perceptual cloud.

Historically, capitalistic processes do require regulation in order to protect the less powerful. However, under the difficulties that the regulation and comprehension of mixed (virtual / actual) processes have had, it does seem that a great effort of education would be needed in order for governments to be able to develop or update the normative.

The perceptual cloud will restate and amplify these concerns. Especially taking into account that our relationship with shared social space is already being questioned. However, the inherent flexibility and dynamicity of virtualized practices present both an opportunity and a risk factor.

The very concept of public space is to be contested. Nowadays, in Julian Oliver's[54] words, due to the prevalence of advertising and billboards, we are facing "a new kind of dictatorship that one cannot escape", that contests whose public space is. The cognitive–perceptual surfaces have been appropriated by companies and we should reclaim the cognitive space [119].

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[54] Julian Olvier is a New Zealander "Critical Engineer" and artist based in Berlin. He has shown his work at many museums, international electronic–art events and conferences, including the Tate Modern, Transmediale, Ars Electronica, FILE and the Japan Media Arts Festival. His work has received several awards, most notably a Golden Nica at Prix Ars Electronica 2011 for the project Newstweek.

These concerns will become more urgent with the perceptual cloud, where the contested cognitive space will not comprise only billboards but every surface and their possible invoked digital interactions.

In the perceptual cloud era an inversion of reality might occur, an extreme Flusserian process: we will only be able to see the reality that the perceptual cloud allows us to. The perceptual access to reality would be virtualized and possibly controlled. Wearable devices such as Google Glass have a potential for interference that is yet to be comprehended and analyzed.

However, in crisis lies opportunity. As Rogério De Paula notes, People build "spaces of opportunity" wherever and whenever possible [124]. In his own words:

> *It is critical to understand and appreciate the ways—often taken for granted and overlooked by the research and design communities—in which people, in particular those from low–income groups, exploit opportunities that the environment (social, physical, technological, etc.) offers for any sort of economic growth or business, often informal.*
>
> Rogério De Paula, 2013. [124]

However, we cannot help but wonder how will capitalism ensure that the socioeconomic divisions will be maintained? How will it counteract the democratizing potential of the perceptual cloud and of decoupling?

The axis subject–object of an interactive procedure is dynamic and dependent on time and context. Therefore, what will be the capitalist arrangement that makes sure that there still are persons–objects, a *conditio sine qua non* for it?

Gibson's famous dictum "Future Has Arrived — It's Just Not Evenly Distributed Yet" is wrong: the future is evenly distributed: *the most common form of Human–Computer Interaction consists on being recorded by a surveillance system.* Maldistribution lies in the roles, and, sadly, still

offers no new insight on well–known and well–established social distribution patterns.

Indeed, the relationship with technology is well distributed and in the roles reside the inequalities. The most common form of HCI is being observed, tagged, and recognized by a surveillance system. A passive, objectifying interaction.

Two contemporary examples

The objectification of the interactor is not, again, exclusive of the perceptual cloud. Reflecting on new media art implies reflecting on the relation with technological devices that are produced by companies well inserted in capitalist dynamics.

Bruce Sterling – before the Snowden affair – sustained that the Internet is shaped by Apple, Microsoft, Google, and Facebook. Not by a government. The structure of power thus shifts from the center of the pyramid (the U.S.A.) to the second level (multinational companies, the E.U., Japan).

The relation with the products of this multinational companies acquires a new dimension of power. Media appropriation involves constructing a rhetorical discourse of this power distribution, especially because technological appropriation occurs in the implicit and explicit negotiation with these multinationals.

We will discuss two contemporary designs based on Apple Computer's mobile phone that will hint on future interactive processes to appear.

S.M.T.H.

S.M.T.H. is a mobile phone game developed by Petr Svarovsky. According to his own description[55]: "S.M.T.H. (Send Me To Heaven) is a sport game. The player is supposed to throw the phone as high as

[55] Text slightly edited for readability.

possible and catch it. The App measures the height the phone flew from the player's hand. The higher, the better. There is a possibility to upload the result to a server and check the results of other players."

Using the device's accelerometers, the app calculates how high the phone goes, and the results are uploaded to the app's leader boards, which are organized by the top ten scores of the day, week, and worldwide.

The app attempts to sense when unrealistic flight patterns appear, invalidating the use of parachutes or similar tricks. Currently, the top score is held by someone who threw a phone more than 40 meters high. According to Svarovsky, people are building slingshots to catapult their phones and posting photos of them on Facebook [147].

The game design itself is interesting for it is built on the affective and economic implications of the possible results of the interaction. However, our interest resides on the game's rhetoric effect on ownership.

In spite of being very popular and with a noticeable presence in news mass media, the game was not accepted by the Apple store, since Apple rejects developer submissions that could harm their devices [147].

Being rejected by Apple effectively means *it cannot be installed in Apple mobile phones.*

We reject the argument that there are ways for installing it (e.g. by jailbreaking the device), the vast majority of users do not know, or do not want to perform this manipulation (a similar argument can be held against Barack Obama's claim that PRISM–related privacy concerns were unsustained as people could install software that would effectively prevent the eavesdropping).

In S.M.T.H. the perceptual cloud's decoupling appears on the very notion of ownership. Who does the device belong to? How could it be possible that the company that the user bought the device from has the right to define what can or cannot be installed in it?

In the capitalist environment ownership and payment are inextricably linked. When one person buys an iPhone, what exactly has been paid for? The physical device? iCloud and Siri (that is, the use of Apple's servers for storage and computation)?

What happens is that users pay in different and complementary ways: on top of paying with money users pay with data, with their data, their context's data, and the data that comes from the use of the device.

As it has been said many times that people are not Facebook's users but Facebook's product, users pay for their devices with interaction.

There is an interesting characterization here, as there are different aspects of this *productization* of the user. Users pay with information about themselves but also pay by using the acquired product. *We buy things and pay for them by using them.*

This configures exactly the same economic procedure of ad–based publications, websites, TV–stations, and radio stations. Services (and now also objects) that seem to be free and still provide gains to their owners exist because *they are not free, instead, they accept a new type of payment: interaction.*

Interaction, then, is valuable, "monetizable", and measurable in dollars. This restates the problem of ownership: paying with interaction means that the interaction originally belonged to the user. Users transfer their ownership to the company that provides the service.

It immediately follows that it would be desirable for users to be able to negotiate the terms of this payment. How much, how, and who to pay with their "interaction capital" could be explicitly discussed.

However, it is arguable that this capital of interaction is co–created by the user and the provider of the interactive appliance. In any case, as users *pick* and *pay for* the interactive appliance, their value can be seen as agnostic with respect to the specific device or service.

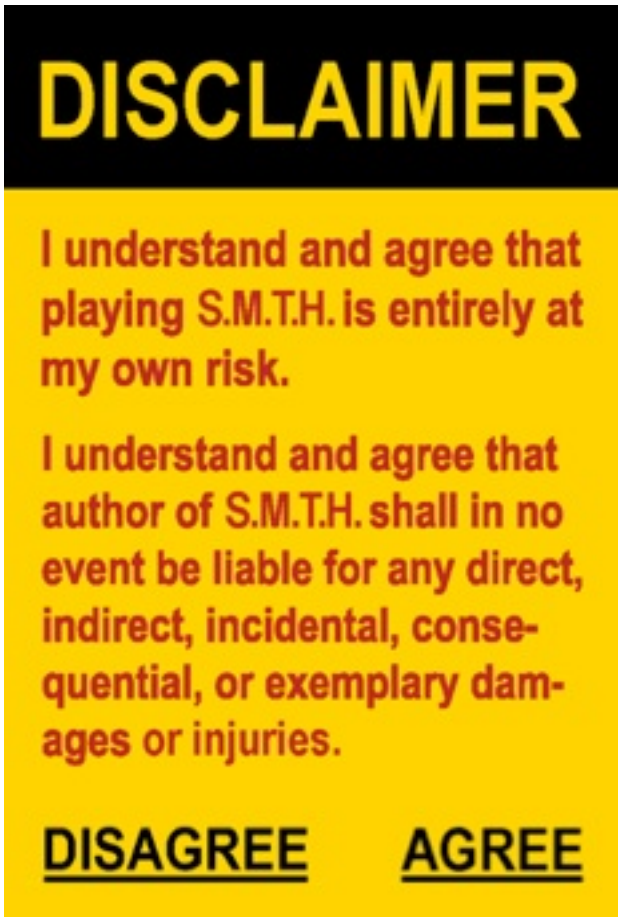

Figure 10 – Send Me To Heaven's disclaimer screenshot

The perceptual cloud operates in both ways: it would support strategies of users empowerment, of creation of spaces of opportunity. However, it is very probable that the perceptual cloud will tend to work in some other direction, stripping users from their right to choose whether they want to pay with their interaction and with their data.

This user disempowerment can be (and will be unless normative that does not allow to is created) taken to the extreme, where users will become, effectively, de–humanized, captivated, productified, monetized.

Fan check machine

A second example: for Billboard Magazine Brazil, the agency Ogilvy & Mather Brazil created a vending machine that dispenses a copy to a 'real' fan of the artist on the magazine cover.

Figure 11 – Still from Fan Check Machine documentation. Ogilvy & Mather Brazil for Billboard Magazine Brazil [53].

The "Fan Check Machine" determines if you are a "real fan" of the artist on the magazine's cover by checking if there are more than twenty songs by the musician in your Apple iPhone.

Interaction is as follows: users plug their phone into the machine, which will search through the phone. If the iPhone owner has more than twenty songs of the artist on the magazine cover, the machine dispenses a free copy of the publication [53].

As S.M.T.H. did, Billboard Magazine's campaign also hints of new ways of relation with digital devices that will appear in the perceptual cloud: the device here acts as a witness – or talebearer – of our acts, a judge with the power of rendering us as not apt for the offered prize.

The mode of payment based on data that we just described is absolutely explicit here. Users have to physically surrender their devices, plug them into the machine, and have it scrutinize its contents. Again, there is a noticeable shift of power. Users stand as powerless objects of an interaction schema that supersedes them.

In addition, of particular interest is that the Fan Check Machine was not created to be experienced first–hand but, instead, to be observed in action through YouTube.

The whole interactive experience is created, not with the presencial participation in mind, but with in function of a mediated one. The interactive experience is virtualized and "transpersonalized". The disempowerment is taken to the extreme for, in addition, the interaction becomes part of a narrative that is not experienced in first person.

This creates a new type of piece: one that is built under the assumption that will be seen directly by few people but, from scratch, is conceptualized (and documented) for massive consumption through the Internet.

As this also happens in new media artworks, it is sound to ponder what constitutes the artwork and what is documentation. In any case, they intertwine, and documentation impacts on the artwork. The artistic fact can be thought of as the conception and construction of the work, while the artistic activity is extended as to include the documentation of the work.

The documentation is very demanding in terms of time, knowledge and infrastructure. Artists need to have the physical tools, money, knowledge and time to create the documentation *through which the work will be*, consumed, classified, criticized, evaluated, and compared (with other artworks under similar circumstances).

Art in the perceptual cloud

> *The idea is that reality is no longer dominated by humans, but now we coexist with technology. Every single action, even emotional relationships that we have, are going to be mediated by technology. [...] Augmented reality allows you to have software that superimposes information on objects that you see. So if you take a camera of the Eiffel Tower, it will*

actually give you information of the history of the Eiffel Tower. Now in Germany, they've devised software that will actually allow you to delete that information as well. So if you decide you don't like homeless people in your city, and you use this software and implant it in your contact lenses, then you won't see them at all.

Ayesha Khanna[56], 2011. [80]

There are many objections to the idea of a perfectly choreographed perceptual cloud, and the ways that companies will attempt to steer it towards their most profitable future are yet to be seen, but, regardless the implementation details, a version of it will certainly happen, and it will constitute an extremely fertile – and unavoidable – field for artistic expression and reflection.

Even if we still do not know what art in the perceptual cloud will be, there are a number of common themes, concerns, and interests, which not only will translate onto it, but will also be amplified by it.

What artists have to say about privacy, visual pollution, and control in the perceptual cloud era? Artworks like Julian Oliver's The Artvertiser [120] or Julius von Bismarck's Image Fulgurator are naturally translated (and, again, amplified) by the perceptual cloud.

The Artvertiser, by Oliver in collaboration with Clara Boj and Diego Diaz, consists of a "device that resembles a high–tech pair of binoculars. A computer in the device uses a computer vision algorithm to detect the sharp corners and rectangles that typically define a billboard or poster

[56] Ayesha Khanna is a technology and smart cities expert, PhD candidate, and entrepreneur. She is CEO of Urban Intel, which provides interactive online courses for skills development. and founder of the Hybrid Reality Institute, a research and advisory group focused on emerging technologies and their implications for society, business and government. She also directs the Future Cities Group at the London School of Economics and is a Faculty Advisor at Singularity University.

advertisement. Once an advertisement is within view, the system selects an image from an onboard database and inserts it over the advertisement. The Artvertiser was created as a way to give consumers more control over their environment. As the authors claim, it transforms the 'read– only' spaces of billboards into 'read–write' spaces. While the political ramifications of this are interesting, and the potential to "rent your eyes" to artists and advertisers is a compelling business model, it also has interesting implications when analyzed in terms of scale." [7]

Von Bismarck's Image Fulgurator consists of an apparatus that briefly projects an image while a flash photograph is being taken, so that the projected image appears in the photograph without the photographer's immediate knowledge [28].

It is easy to see how these artworks' aesthetic and concerns resonate vividly with an eventual instance of the perceptual cloud.

Oliver's expressed need to reclaim the perceptual and cognitive real estate usurped by billboards becomes more urgent. Quoting Gärdenfors[57]: "As the number of screens around us grows, the way information is designed will need to change. With each individual screen trying to grab our attention, we might respond by learning to ignore them to avoid information overload. To counter this possibility, could we imagine new and complex screen arrangements that act to our advantage by addressing real and immediate needs?" [50]

As a matter of fact, "activism in art is not a new phenomenon and has a long history." [122] Is it natural, then, that new media art's often reflects on its appropriated medium social issues.

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[57] Björn Peter Gärdenfors (b. 1949) is a professor of cognitive science at the University of Lund, Sweden. He is a member of the Royal Swedish Academy of Letters, History and Antiquities and recipient of the Gad Rausing Prize (Swedish: Rausingpriset). He received his doctorate from Lund University in 1974. Internationally, he is one of Sweden's most notable philosophers. In 2009, he was elected a member of the Royal Swedish Academy of Sciences.

Some recurrent themes are privacy and surveillance. How will new media artists react to the perceptual cloud's exacerbated Orwellianism.

> *We are right on the verge of being an entirely new kind of human society, one involving an unprecedented penetration by the state into areas which have always been regarded as private. Do we agree to that? If we don't, this is the last chance to stop it happening. Our rulers will say what all rulers everywhere have always said: that their intentions are good, and we can trust them. They want that to be a sufficient guarantee.*
>
> John Lancaster, 2013. [85]

However, besides activist reflection, the opportunities the perceptual cloud offers are immense. Collaboration and delegation will be taken to new levels, and new types of artworks might arise.

Awe

> *Aesthetic awe is regarded as the ultimate humanistic moment, the prototypical aesthetic response to a sublime stimulus, and one that has been sexually selected. The sublime is pancultural and encompasses great beauty, rarity, and physical grandeur.*
>
> Vladimir .I. Konecni, 2005. [82]

Even if aesthetic awe has always been present in art, new media art has traditionally sought for an *instrumental awe* as one of its main aesthetic objectives.

The entanglement between artistic and technological production that media appropriation entails has created a tendency of new media artworks that focus on the aesthetics of technical – often interactive – innovation.

However, with the ubiquity of the interactive technologies, the medium of interactive digital arts is reaching a new state of maturity where the immediate reflex of showcasing new ways of capturing users input, to control machinery, or to display information will not longer be active[58].

In the perceptual cloud, the ideas of screen, interaction, perception, devices, and affordances will be malleable: Does the dish where you eat remind you of a steering wheel? Well, *then it is one*. Every possible affordance will be potentially active and operational.

The embodiment opportunity that Natural User Interaction offered media artists will have to be re–situated into a reality where everything can embody anything in a way that it is natural, transparent, *and expected*, for every user.

It is the concept of a malleable notion of interaction is what offers the widest opportunities. Interacting with computers – in the most general sense, devices or systems capable of performing programmable computation – will not be anymore defined by any pre–conceived set of gestures, interfaces, devices, or reactions.

Our *technological awe* corresponds, to a certain extent, to Mario Costa's "technological sublime", by identification the appearance of a new aesthetic dimension, that is, the realization that technology creation constitutes (or may constitute) an artistic activity on itself without the need to reproduce previous artworks [27].

New media art's need of technological awe is indebted to the Kantian concept of sublime, by creating a technological and conceptual sublime. By negating the audience assumptions on some characteristics of the

[58] The artistic appropriation of new pieces of technology will continue to have a significant role in new media art, what we argue is that the maturity will allow for other searches. Moreover, the upcoming saturation of the audience is what will mine the "reflex".

technology (purpose, abilities, etc.), a conceptual feeling of overwhelming arises.

It is exactly on the perceptual cloud's systematic negation of this Kantian sublime where new media art's opportunity resides. Our argument is that the perceptual cloud's infinite malleability and mechanisms of adaptation to human–computer interaction needs will produce a shift towards concept on new media arts production.

It is indeed an intriguing landscape, one where all main themes of new media art are either left untouched or amplified, but its main strategy for capturing interest is disarticulated.

Although non–specificity might be the "curse and opportunity of computer art" where "everything is possible but nothing is necessary" [48], an artistic language of computer art has been created. This language is about to change, since, in the perceptual cloud, pre–conceived ideas of computer representation and interaction are to be expanded and radically changed. Moreover, explicitation – as introduced in chapter 2 – might not be relevant anymore, for all digital interactions are instantiated, that is, virtualized by a representation within the perceptual cloud techniques.

In any case, the very human universe will be expanded, and it is for the artists, again, to find what is necessary.

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5 CONTEXT

Introduction

> *Politics is aesthetics in that it makes visible what had been excluded from a perceptual field, and that it makes audible what had been inaudible.*
>
> Jacques Rancière, 2004. [129]

In order to analyze a cultural phenomenon it is needed to take into consideration its historical, social, and political contexts. However, art's relationship with politics is extremely complex and admits a wide plurality of views.

Rancière's quote casts a first conceptual light onto this relationship: there is an immanent artistic characteristic in politics, for its verbalization of societal processes is inherent aesthetic. Coherently, Luis Camnitzer[59] argues that the Tupamaros – the 1970's leftist Uruguayan guerilla movement – embodies Latin American conceptualism's most authentic and relevant artwork. According to Camnitzer's argument, there is an undeniable aesthetic quality in, for example, the Tupamaros' military actions, such as the *Toma de Pando*[60].

The sociopolitical context has always been a "central aspect" of artistic production, although it "long remained inconspicuous, or even

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[59] Luis Camnitzer (b. 1937) is a German–born Uruguayan artist and academic who resides in the United States. He is a conceptual artist who creates work in a variety of media that breaks down limitations and questions that define the center versus the periphery. Even though select works of Camnitzer deal with explicitly political content, he states that all his art is deeply political, "in the sense of wanting to change society." His approach to Conceptualism often utilizes language to underscore issues of power and commodification, exploring the relationship between images, objects, and texts.

[60] An episode framed in the Tupamaro's guerrilla warfare in the 1960s. On October 8, 1969, several members of the Tupamaros took by assault the police station, fire station, the telephone exchange and several banks in the city of Pando, 32 kilometers from Uruguay's capital city, Montevideo.

invisible". According to Friesinger, "It took the great exertions of the context–oriented methods of modernism to return it to the field of view, from which it was hidden, for the most part, by the tendency of bourgeois art appreciation to oversee the social and historical embeddedness of an artifact or an aesthetic approach." [45] It is not, still, until the avant–gardes, that appears what Peter Bürger[61] calls a new art–based praxis for life, as a reaction to the identification of art being the objectification of the self–understanding of the bourgeoisie [20].

Even if we assume the immanence of the context in art production, the characteristic of this relationship is still unspecified. Kenning[62] argues that art betrays itself if it is too direct in its opinion, especially in its political opinion, while Rancière states that "an art is emancipated and emancipating when it renounces the authority of the imposed message, the target audience, and the univocal mode of explicating the world, when, in other words, it stops wanting to emancipate us." [81]

As Steve Klee[63] notes, this discussion on the ambiguity of art does not include, explicitly politic art, in what constitutes an unforgivable reductionist blindness: "If all art that incorporates clear political slogans and demands is dismissed as authoritarian because of its univocality

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[61] Peter Bürger is Professor Emeritus of Literature and Aesthetic Theory at the University of Bremen. He is most famous for his 1974 Theory of the Avant Garde.

[62] Dean Kenning is an artist and writer. His artworks are made using various media, including kinetic sculpture, sound, video, digital collage and live performance. He is interested in a non-contemplative aesthetic of material compulsion, B-movie horror, humor and idiocy. His work is often directly communicative, concerned with political subject matter. He is currently a Research Fellow in Fine Art at Kingston University.

[63] Steve Klee is a practicing artist working primarily in video. He is interested in avant-garde moving-image traditions as well as those associated with conventional storytelling. He is a member of the academic groups PoCA (The Political Currency of Art) at Goldsmiths and Contemporary Marxism at Chelsea College. And has recently finished an AHRC funded PhD by Practice (2010) which focussed on the aesthetic and political philosophy of Jacques Rancière.

then we will misrecognize those moments when these slogans actually introduce ambiguity into the social by forcing a split in the distribution of the sensible." [81]

This blindness is not explained by, but resonates with the hegemonic centrism of the art discourse analysis. Politic art seems to be more common and more easily co–opted by the peripheral[64] artworld.

Coincidentally, Buckley argues that "as a political mode of knowledge, art is powerful precisely for the ways in which it can disarticulate those received or existing forms of political and disciplinary subjectivities (that which Rancière has called the 'regimes of perception')." [19]

Furthermore, the dismissal of political art neglects activism. The militant practice of artists who reclaim certain media, languages, processes, or contexts as their own. Activist art has played a significant role in creating appropriation techniques and in creating and enabling spaces that in subsequent stages permitted artistic appropriation.

New media art, in particular, offers a tremendously rich and effective field for activist art. The somewhat recently coined term *hacktivism* stands for the blending of conceptually subversive new media ("hacking") practices and politically subversive ones.

According to Blais and Ippolito, the executable nature of new media art – in particular where mass digital media are appropriated – constitutes its differential and more powerful characteristic, since it allows for concrete, active, influence on the world.

In their own words: "Executability has given hacktivists not only an arsenal of new tools but a much wider arena in which to exercise these new powers. Because computers are now linked via a global network, code that affects a single operating system can be redirected to execute

[64] We use "periphery" as in world systems, postcolonial, and dependency theories' meaning.

on computers around the world. No longer confined to the sanctuaries of gallery and museum, digital work has been executed in government–agency databases, in corporate Web ad banners, and on the hard drives of private citizens." [11]

However, art, activism, or "hacktivism", by no means emerged with digitality. As Neumark[65] affirms, speaking about Fluxus' Mail Art: "They not only expanded the boundaries of art, media, and communication, they defi(n)ed them. They traveled not as vehicles, but as meaningful cultural and artistic objects, while shifting the meanings of culture, communication, and art objects in their journeys. The journeys of Mail Art marked a particular configuration of geography and social, economic, and cultural relations; they contributed to a remapping of the relation between art and everyday life." [24]

This early example of media appropriation showcases the re–configuration that political art may provide: an informed, critic, dialogue with the sociopolitical context of the art practice's cultural artifacts and societal inscription. Such dialogs are transversal to the specifics of the art practices, or, as Matthew Fuller[66] puts it, the specific "art methodology" [46].

The need for context analysis is rooted in the intrinsic dialectical nature of art. In effect, all art is political, for, as Ricœur notes, "praxis incorporates an ideological layer; this layer may become distorted, but it is a component of praxis itself." [46]

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[65] Norie Neumark is an American sound and media artist and author who lives and works in Melbourne, Australia. She regularly collaborates with Maria Miranda as Out–of–Sync and over the last six years they have been making media art work that starts with performative encounters in public places.

[66] Matthew Fuller is a British academic, author, and artist. He is Director of Creative Programmes at CCS with involvement in and oversight of the MAs Interactive Media and Culture Industry and the MA/MSc Creating Social Media as well as the development of practice–based research opportunities for doctoral students.

It is in these terms that in chapter 3 we argued that every art production undeniably entails an ideological standing. Again, we do not pose that there are no differences between political and apolitical art, or we could say, between explicitly and implicitly political arts. A parallel can be traced with interaction: even if every artwork can be deemed interactive, there is a distinctive aesthetic quality in political art that should not be left unconsidered.

To move forward in this thesis' analysis, it is necessary then to broaden our scope and discuss some concepts that allow us to introduce some political notions into our new media art analysis discourse. We identify a need for a sociopolitical vocabulary in art (and very especially new media art) rhetoric.

General Intellect and Cognitive Capitalism

A useful model to start tackling the dialectal relationship between art and context is provided by the concept of "general intellect"[67], first presented in Marx's Grundrisse in a section entitled 'Fragment on Machines' (written 1857–8, first published 1939) [84].

The general intellect describes an increasing involvement and relevance of the human knowledge in the work process, and the understanding that "wealth is no longer the immediate work of the individual, but a general productivity of the social body that utilizes both workers and technologies". [84] The notion of general intellect makes available a political understanding of aesthetics, language, and society by addressing that information – embodied in technical expertise and social knowledge – became a crucial force of production.

[67] Although there related concepts, such as Spinoza's "Common Notion", or social brain, the General Intellect proves to be especially apt, if only thanks to its framing within Marxism and capitalism theory.

Ultimately, the general intellect "is a measure or description of 'how general social knowledge becomes a direct force of production'." [46]

In Paolo Virno's[68] terms, the general intellect is the linguistic cognitive faculties common to the species, which constitutes a new kind of richness: *cognitive wealth* [146].

This cognitive wealth is not synonym with dematerialization. Even, if as Lazzaratto[69] notes, "Immaterial labor finds itself at the crossroads (or rather, it is the interface) of a new relationship between production and consumption. The activation, both of productive cooperation and of the social relationship with the consumer, is materialized within and by the process of communication." [90] It can be understood that "capitalism informational economies tend to involve more materialization and commodification of knowledge and, contra the thesis of dematerialization, increased consumption of what is classically termed as matter (oil, paper, aluminum, heavy metals and plastics)." [63]

General intellect as a model, leads to the analysis of art's role as a means of knowledge production, that is, wealth creation, and the dialectal relationship that this have with said artistic processes.

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[68] Paolo Virno (b. 1952) is an Italian philosopher, semiologist and a figurehead for the Italian Marxist movement. Implicated in belonging to illegal social movements during the 1960s and 1970s, Virno was arrested and jailed in 1979, accused of belonging to the Red Brigades. He spent several years in prison before finally being acquitted, after which he organized the publication *Luogo Comune* (lit. truism in Italian) in order to vocalize the political ideas he developed during his imprisonment. Virno Currently teaches at the University of Rome.

[69] Maurizio Lazzarato is a sociologist and independent Italian philosopher, residing in Paris. His research focuses on immaterial labor, the ontology of labor and cognitive capitalism. He is also interested in the concepts of biopolitics and bioechonomics. He is a researcher at Paris I University and member of the International College of Philosophy in Paris. He was a member of the editorial board of the journal Multitudes of which he is a founding member.

Capitalism imposes the logic of commercial exploitation on everything that appears within its frame, whereby art that is critical of this logic – like alternative lifestyles – has no chance of escaping it, even if it seeks to distinguish itself by doing so. Regardless of whether an artistic position criticizes or affirms the economic form of society, it is dependent on it just the same. [...] As a consequence, many artists have emphatically broken with the specialization that bourgeois art once dictated as a condition for artistic self–discovery (excepting a handful of renowned artists having multiple gifts). Instead of mastering a single discipline, today's context artists change their field of activity as freely as their location – often in a thoroughly virtuosic sense.

Art collective Monochrom, 2013. [45]

The operation of the general intellect within the society, is aptly seen via the thesis of cognitive capitalism. As we have mentioned, since the crisis of Fordism, capitalism has seen the ever more central role of knowledge and the rise of the cognitive dimensions of labor.

As Vercellone[70] notes, "this is not to say that the centrality of knowledge to capitalism is new per se. Rather, the question we must ask is to what extent we can speak of a new role for knowledge and, more importantly, its relationship with transformations in the capital/labor relation." [145]

Cognitive capitalism differs from traditional capitalism in that – as Talankin once said in order to attack Vygotski[71] – it "virtualizes" the

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[70] Carlo Vercellone is an Italian economist. He is a professor at University Paris 1, Sorbonne and member of the Research Laboratory Matisse–ISYS. He has published and edited several books on cognitive capitalism.

[71] Speaking at the First All–Union Congress on Psychotechnics and the Psychophysiology of Labor, Leningrad, 1931.

concept of tool or that of labor, and allows for mental factors such as culture to be determinations, rather than strict economic factors. [151]

It is indeed striking how Marx's works and contributions still apply after the crisis of Fordism and Taylorism. In the cognitive capitalism, the valorization of knowledge leads to a new form of capitalism. This valorization operates with knowledge not as a common good, a human acquis, and instead treats it as commodity, an article of trade or commerce.

Cognitive capitalism is, then, a new stage of capitalism after industrial capitalism, which does not have to rely on the affluence of digital technologies, but, instead, relies on the creation of knowledge, and on the economic return of the cognitive dimension of work.

This new stage is built upon a crisis of the labor theory of value. Effectively, the labor theory of value shows how – in the industrial capitalism – the capital appropriated the production and abstracts itself from labor. Labor is operated by the capital in such ways that allow for its commoditization. Thus, division of labor and serialization are instrumented, permitting to measure labor in simple unqualified work units.

In cognitive capitalism, this, however, does not apply directly, as the general intellect adopts a "diffuse intelligence" where capital does not seem to play a necessary nor defining role in its creation. Ownership of the means of production is relegated to the background and knowledge becomes central. Knowledge that transcends the expertise in operation of new technologies but instead also involves the ownership of the social processes of creation of new knowledge.

In order to satisfy capitalism's need of commoditization, *cognitive capitalism is built on artificial scarcity*. This commoditization operates on things (knowledge) that are not commodities: the private appropriation of knowledge.

Artificial scarcity is created by fencing the knowledge. Knowledge is not

set free in the society but, instead, is bounded by intellectual property laws, patents, and secrecy policies that keep it in the private sphere.

It is interesting the role that tertiary education (which is based on public funding) plays in cognitive capitalism. Universities educate cognitive workers that operate in the private sector, applying their education on the creation of value that stays in the companies and does not return to society.

There is an underlying scission between what is *public* and what is *common*. Artificial means of scarcity divide them and prevent knowledge to be set as part of the common. Instead, cognitive value returns to the society as the result of a choreographed production, as knowledge–artifacts and not as knowledge (in Flusser terms: applied scientific text). In this way, knowledge remains in the Marxian reign of need without being able to reach the reign of liberty.

New media art and politics

> *"...Pop culture and the mass media are subject to the production, reproduction and transformation of hegemony through the institution of civil society which cover the areas of cultural production and consumption. Hegemony operates culturally and ideologically through the institutions of civil society which characterizes mature liberal–democratic, capitalist societies. These institutions include education, the family, the church, the mass media, popular culture, etc."*
>
> Dominic Strinati, 1995. [141]

As we mentioned, new media art's potential executability has allowed for hacktivism strategies that foster the perennial dialogue between art and politics.

Art is intrinsically deregulatory: it exists – or may exist – on its own epistemological framework, or, we should instead say, on its own

ontological universe. However, new media art' relationship with technology, situates it on a peculiar situation, with a unique position to reflect on contemporary political issues.

The interplay between art and the political significance of its materiality is not new. The Italian Arte Povera, for example, was "seen by some as radically political in the late 1960s", as a direct result of their use of *poor materials*, which "opposed not only the industrial aesthetic of American pop and minimalism, but also all forms of systematic, and hence authoritarian, thinking, celebrating instead individual, lived experience through a 'new humanism'" [76].

As well as the political quality of Arte Povera resides on, or emerges from, the relationship with the material substratum, new media art's media appropriation carries a political art discourse.

If we are to discuss new media art's *politicality*, it is necessary to consider the politics of the appropriation process and not only the specific artistic activities (or methodologies) that the appropriation enables. In this way, while tempting, the discourse of executability or the analysis of affordability, should be postponed.

As Christiane Paul states, "art has always employed and critically examined the technology of its time" [122]. However, again, it is new media art's appropriation what distinguishes it as a genre.

It is no accident that new media art co–exists with cognitive capitalism: both are the result of the valorization of knowledge. What capitalism does in terms of commoditization, art does in terms of re–definition and re–edition of its own praxis, and it is in this duality where the dialectal relationship new media art–politics exists; in the orthogonal (if not antagonistic) approaches to knowledge creation and societal administration.

In this analysis it becomes necessary to understand that cognitive capitalism's relation with knowledge is not emergent but politically

designed, and in this environment the art practice exists and is adopted, and co–opted.

Media appropriation, though, is intrinsically and unavoidably political, for it undermines the basic underlying process of cognitive capitalism. It is more probable that it is this ontological antagonism what lies behind new media artworks having "gradually formed a common practice whose objectives allude to utopian theories of social organization lying closer to certain visions of communism, direct democracy and anarchism, rather than to the realities of neoliberal capitalism within which new media are produced and predominantly operate" [136], instead of previous discourses of mere opportunity, exposure, and scope.

Perceptual capitalism

If, momentarily, we go back to the discussion of the logic of dematerialization, it is easy to see its particular relevancy in function of the immanence of the digital. Accordingly, a relatively recent term has come into use in the analysis of digital artistic practice: post–digital [23]; although loosely defined, it makes explicit the pervasiveness of the digital realm into cultural production, and effectively states that its omnipresence implies a qualitative change of both the production and its consumption: its appreciation, valuation, and eventual conversion into economic goods no longer depends on, or is related to, its digital quality.

This is often seen as a move towards a more human–centered evaluation of culture, which is, by no means, a requisite, and therefore, a naïve reduction. Instead, post–digital refers to the standardization of the digital in all the aspects of human culture, rendering its digital quality meaningless if considered separately from other values, aesthetical, social, or functional.

This immanence of the digital reminds us of the triumph of capitalism. Zizek[72] recounts an anecdote where an editor asks a journalist (Marco Cicala) to replace "capitalism" with a synonym, like "economy" [155]. This rendering of capitalism as not only the ultimate, but also *the only* socio–political and economic arrangement of society attempts to remove from the framework of analysis the very components of capitalism. *It attempts to establish a post–capitalist discourse.*

These two "post–" readings have several more points in common, with both appearing in the perceptual cloud (defined in chapter 4). Indeed, the perceptual cloud requires methods of artificial scarcity analogous to those present in contemporary cognitive capitalism.

We need to be aware of the ubiquity described by these two "posts", while focusing on (at least some of) the implicit socio–political discourses that these hegemonies carry.

If the perceptual cloud's decoupling leads to a new paradigm of human–computer interaction that effectively redefines and repurposes our relation with the digital realm, both in private and public spaces, this will not and cannot be apolitical. Once again, its "politicality" is not inherent or Ricœurian, but explicit, volitive, and designed, and it has to be considered as such by any rhetoric.

Perceptual scarcity

Post–capitalism arises when public universities invisibly act as the creators of cognitive workforces that operate within private companies

[72] Slavoj Žižek (b. 1949) is a Slovene philosopher and cultural critic. He is a senior researcher at the Institute for Sociology and Philosophy, University of Ljubljana, Slovenia, international director of the Birkbeck Institute for the Humanities and a professor of philosophy and psychoanalysis at the European Graduate School. In July 2013, he was appointed as an Eminent Scholar at Kyung Hee University, Republic of Korea. He writes widely on a diverse range of topics, including political theory, film theory, cultural studies, theology and psychoanalysis.

and therefore translate property (again, knowledge) from the common to the private.

The perceptual cloud's decouplings have a potentially tremendous social power: by making every affordance possible, the perceptual cloud could establish human–computer interaction (and so possibly all computation) as part of the common. The decoupling of the interaction layer from the computational layer could be used to rearticulate the economical affordability of both interaction and computation.

A socialist mode of consumption of interaction – erected on the inevitability of the perceptual cloud ubiquity – could be constructed.

However, even before this ubiquity has been installed, the perceptual cloud is already been coupled with artificial means of scarcity. The political implications are various. For example, the rendering of any surface interactive, the simplest application of the perceptual cloud, immediately proposes questions on how this interaction will be commoditized, and which means of payment will it support.

Still, we do not know how artificial scarcity on interaction will be attained, being interesting that selective interaction will require perceptual identification to be operative. Nor do we know what means of payment will arise. Will users pay with data? Will they pay with interaction, with money or, more likely, with a combination of them (and other modes)?

Also to wonder is how – or whether – will it be possible to hide from interaction. Not only how will we be able to escape the proposed logic of commodification, but also in which ways will it be possible to physically escape from actual interaction?

We have already surrendered perceptual real estate to advertising, would it be possible to preserve *cognitive* real estate?

Even if the ideas of the dominant class are always the societal dominant ideas [16], the perceptual cloud renders a unique opportunity of questioning the "post", that is, questioning the matter–of–fact aspect of

capitalism, for if its processes are re–inscribed into political and social discourse, then a new *perceptual common* can be created.

New media art can be, then, doubly powerful, for media appropriation can yield transparency (or, at least, questions) to the technological substratum.

Geopolitical subjectivity

> *The digital revolution is over.*
>
> Nicholas Negroponte[73], 1998. [23]

> *Every truth is authoritarian.*
>
> Sandino Nuñez[74], 2013. [115]

However prevalent the forces of globalization are, the automatic translation of centrally[75] conceived models, interpretations, and practices, constitutes an eminently political act. Besides the linear acknowledgement of a debatable necessity of historical and context rooting, the construction of a centrally conceived rhetoric is never innocuous.

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[73] Nicholas Negroponte (b. 1943) is an American architect best known as the founder and Chairman Emeritus of Massachusetts Institute of Technology's Media Lab, and also known as the founder of the One Laptop per Child Association (OLPC). He also was the first investor on the Wired magazine.

[74] Sandino Núñez Andrés Machado (b. 1961) is a Uruguayan philosopher, television host, teacher and writer. He holds a degree in philosophy from UDELAR, specializing in epistemology and philosophy of science, philosophy of language, linguistics and discourse analysis.

[75] Central, as opposed to peripheral, originating in the core countries. Anew, within world systems, dependency, and postcolonial theories.

Postcolonial theory has traditionally recognized the center–periphery asymmetries in the construction of knowledge, with an explicit intention of reclaiming histories that have been neglected by dominant historical narratives. However, postcolonial studies "have been notoriously absent from electronic media theory, and criticism", being somewhat stuck in an inebriated recognition of "the potential of new technology" [40].

New media art, meanwhile, poses, again, a rather unique perspective within the arts for its inherent technical requirements locates it on an axis of explicit usefulness usually alien to art discourse. Especially when, according to Raunig[76], activist practices are allowed only if they are "purged of their radical aspects, appropriated and coopted into the machines of the spectacle." This becomes apparent in "mainstream media, which invariably reproduce only two patterns in reference to insurrection: the mantle of silence or the spectacularizing and scandalizing of protest." [130]

> *Where the real world changes into simple images, the simple images become real beings and effective motivations of hypnotic behavior. The spectacle, as a tendency to make one see the world by means of various specialized mediations (it can no longer be grasped directly), naturally finds vision to be the privileged human sense which the sense of touch was for other epochs; the most abstract, the most mystifiable sense corresponds to the generalized abstraction of present–day society.*
>
> Guy Debord, 1977. [32]

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[76] Gerald Raunig is a philosopher, art theoretician, who lives in Vienna. He is lecturer at the University of Klagenfurt and the University of Luneburg and co–director of the European Institute for Progressive Cultural Policies, Vienna. He is also coordinator of the transnational research project "republicart", and editor of the periodical "Kulturrisse". He is author of several books and essays on art theory, political aesthetics, cultural politics and politics of difference.

It is under this framework that the need of a geopolitical view of new media art appears. As Garcia Canclini[77] notes, geopolitics refers to large global structures and implies cultural or symbolic power in knowledge practices. It is then a problematic field, a descriptive tool that incorporates a certain asepsis product of its own conscience [49]. Geopolitics can be seen as a tool for uncertainty, as an admission of the Kantian nature of models.

Nevertheless, this pretense for asepsis should not be taken as a lack of involvement, for our conceptualization is one of resistance. As Lazzarato states, "to say no is the minimum form of resistance". Our resistance must open a creative process, a process of transformation, of active participation. [91]

The very first "no" that we must utter, our first form of resistance consists on acknowledging that the artistic historical narrative of media arts and its analysis of context interrelation is constructed from within a central perspective. Even the general intellect, as introduced, does not allow for a characterization of the geographical distribution of the social worker, nor it reflects on the implications of such distribution and the relation with the centers of power.

New media art in the periphery cannot be apolitical, for the very appropriation of technology is political event: *it implies surrendering to an applied scientific text that is written in the center*.

As art history is written in, from, and for the cultural centers, the characteristics of peripheral art in general, and peripheral new media art

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[77] Néstor García Canclini (b. 1939) is an Argentine academic and anthropologist, known for his theorization of the concept of "hybridity." He currently works at the Universidad Autónoma Metropolitana in Mexico City and is the director of its program of studies in urban culture. His books include Hybrid Cultures, published by the University of Minnesota Press in 1995 and recipient of the first Ibero–American Book Award for the best book about Latin America chosen by the Latin American Association.

in particular have not been analyzed or, at best, have been inscribed on a centrally conceptualized narrative, carrier of colonialist granting of meaning. A narrative that fails, for example, to understand how political art naturally and systematically appears in the periphery (very specifically in Latin America) without creating much (or any) of the ontological tensions that appear in central narratives due the lack of ambiguity.

Camnitzer, in his book "Conceptualism in Latin American Art: Didactics of Liberation" proposes "conceptualism" as the original process of conceptual and political art [22].

Latin American conceptualism composes an original artistic movement that appeared and expressed itself with its own language, in parallel to central artistic processes.

Yet, as Camnitzer shrewdly points out, "art history is written in the cultural centers" and so, any difference between conceptual art and conceptualism has not been analyzed.

Artistic discourses that emerge outside of the cultural centers of the world, according to Camnitzer, have their own roots, and, its understanding requires an appropriate historical framework. However, the label "Latin American conceptualism" is "a concession to the hegemonic taxonomy" [22].

We do not aim at discussing, or finding, the artistic languages that emerge from the geopolitical periphery, but instead, we work in understanding that the sociopolitical and economical contexts always play a defining role in the construction of the (commodifiable) knowledge, the worldview.

If new media art is always conceptual, then the sociopolitical dimension adopts a very particular role. It is in new media art's relationship with technology where we are to focus, not in the construction of a "purely artistic" language, but in the differencing components of new media art. If we identified media appropriation as the defining path of new media

art, and explicitation as it's most transversal aesthetic quality, which differences in them appear in the periphery, specifically, in Latin America? Or, what conceptualist new media art entails?

According to May Puchet[78], by reproducing the center–periphery model, Latin American art is reduced to a dichotomy proper of the modernizing discourse and to the arduous task of developing a peripheral replacement of these peripheral stories that constitute "the other".

We should reflect on whether the idea of "Latin American art" responds to specific contexts where each region contributes from their cultural and symbolic horizons, or if it is structured according a universal reference frame that contains the concepts of modernity, avant–garde, and progress [128].

Nevertheless, we argue that it is possible to assert the existence of both a distinct reality and the parallel construction of a language that transcends, at least in some cases, the re–reading of international tendencies from a local or "localist" perspective.

The simultaneous appearance, in Latin America, of processes that restructure the relationship of art with its materiality, should not be seen as a prefiguration (nor re–edition) of the Italian Arte Povera but, instead, as an genuine instrument for probing reality and for the construction of an autonomous poetic.

In this context we can talk about Latin American conceptualism as a *strategy* instead of a *style*. Even if the style is influenced by the center, the periphery historically has not cared about stylistic nuances and, instead, produced conceptualist strategies that focused on communication [128] [22].

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[78] May Puchet is an Uruguayan artist and lecturer, working at Universidad de la República's School of Fine Arts.

In analyzing peripheral new media art, it becomes essential to understand how it calls into question an *arrangement of power* constructed from a hegemonic canon centered on Europe and the USA, that operates as an articulatory axis for interpretation. Specifically, an axis that has to prevent us from the perennial risk of exoticism, a risk always present in centrally constructed art narratives.

Media appropriation in the periphery

> *We are annoyingly citing facts of the same species, and doing by imitation what others did in ignorance, to prove that we have studied the lesson.*
>
> *Imitate originality, as you imitate everything.*
>
> Simón Rodríguez[79], 1828. [22]

In the periphery, with its contextual conditioning, the *necessity* for originality seems evident. In Simón Rodríguez terms, "we invent or we are mistaken".

From the assumption of the need of a peripheral new media art constructed from a non–hegemonic discourse we can state that the traversing of the axis technology consumer–technology producer cannot be performed in the same way that it occurs in the center, for the relationship with technology and its societal inscription are radically different.

Arte Povera proposed the liberation that arises from renunciation, stating – among other things – that art can (re) emerge from a tabula

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[79] Simón Rodríguez (1769 – 1854), known during his exile from Spanish America as Samuel Robinson, was a South American philosopher and educator, notably Simón Bolívar's tutor and mentor.

rasa of materiality. Similarly, conceptual art appropriated the meaning and use of tools, of apparatus produced by technology.

Both strategies implemented an appropriation of the *poetic dimension* of these apparatuses; however, they did not appropriate their *technical dimension*, technology is taken as contextual, as something given. It appears for art to reinterpret, remix, and adopt it.

New media art, as we have seen, proposes this technological dimension as part of the sensible, it inscribes the reason, purpose and technicality of the tools into the art practice, "fractalizing" the technology and its products: each change creates new tools and new possible changes, systematizing serendipity.

It is natural that in a society of knowledge an art language is created from within this knowledge, and it is in the differences of the relation with knowledge where a big part of the need for a peripheral, conceptualist, new media art, resides.

In fact, what is needed is a meta–appropriation: the sociopolitical appropriation of the context that would allow for original new media art, that is, *the appropriation of the processes of construction of knowledge*.

> Camnitzer's attempt to inscribe the Tupamaros' guerilla into an artistic discourse becomes, under this light, more sensible: in the periphery, the political dimension is inseparable from the conceptualist art practice.

As Chomsky[80] stated: "'Globalization' is used within the doctrinal system to refer to a very specific form of international economic

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[80] Avram Noam Chomsky (b. 1928) is an American linguist, philosopher, cognitive scientist, logician, political commentator and activist. Sometimes described as the "father of modern linguistics", Chomsky is also a major figure in analytic philosophy. He has spent most of his career at the Massachusetts Institute of Technology (MIT), where he is currently Professor Emeritus, and has authored over 100 books. He has

integration designed in meticulous detail by a network of closely interconnected concentrations of power: multinational corporations, financial institutions, the few powerful states with which they are closely linked, and their international economic institutions (IMF, World Bank, WTO, etc.). Not surprisingly, this form of 'globalization' is designed to serve the interests of the designers." [92]

Coherently, Thomas[81] "argues for an approach which is far more alert to the historically specific forms which it adopted in different periods and places, as well as to the various strategies employed by colonial projects, their discursive successes and existential failures." [149]

Some techniques of meta–appropriation have already appeared. Eladio Dieste's quote in chapter 3 clearly argues for the re–creation of knowledge from within the practice's specific context.

As Alonso[82] states, in his "praise of low tech", it is fallacious to think that only from the technical possession a critic discourse can be created. [3] What is needed is the creation of differential strategies in the relationship with technology. "Strategies", as systematization of a "problematic insertion" in the relationship with applied knowledge.

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been described as a prominent cultural figure, and was voted the "world's top public intellectual" in a 2005 poll.

[81] Nicholas Jeremy Thomas FBA (b. 1960) is a British archaeologist, Professor of Historical Anthropology, and Director, Museum of Archaeology and Anthropology, University of Cambridge, since 2006; Fellow of Trinity College, Cambridge, since 2007. He was elected to the British Academy in 2005. He was awarded the 2010 Wolfson History Prize for his book Islanders: The Pacific in the Age of Empire.

[82] Rodrigo Alonso is an Argentinean curator. He is a Professor at the University of Buenos Aires (UBA), Universidad del Salvador (USal) and the National University of Arts (IUNA), Buenos Aires, Argentina. He is also a Professor and member of the Advisor Committee at the Master on Curatorial and Cultural Practices in Art and New Media, Media Centre of Art and Design (MECAD), Barcelona, Spain.

Many of such strategies are possible, from a technical postmodern Arte Povera (both as a reclaim of the low tech and as the proposal of a ground zero for the appearance of new aesthetics) to actively working on the creation of processes of meta–appropriation.

What remain fundamental are the identification of these strategies and, very especially, the understanding of the political stance that they inevitably entail.

Nicholas Negroponte is quoted saying that the Digital Revolution is over; we cannot help but hope that it is just starting.

—

6 SELECTED ARTWORKS

As it was indicated in the introduction, this thesis is intended to operate in a dual dissertation and exegesis role. In this chapter we will present some of the artworks created within the doctoral program.

This dissertation hybridity – that is, it being partially practice–based – entails the need for experiencing the accompanying artworks. In function to this, video documentation of all the pieces is offered at http://www.fing.edu.uy/~laurenzo/phd.

This presents a first analysis of the artworks, while the pieces insertion within this thesis' discourse will be discussed in the next chapter.

Nibia

Background

Nibia Sabalsagaray (1949 – 1974) was a twenty–four years old Uruguayan literature teacher and social activist, tortured and killed in captivity at the beginning of the last military dictatorship (1973–1985) in Uruguay.

The Military Justice categorized this crime as a suicide by hanging.

Despite the validity of Uruguayan Law 15.848 (*Ley de Caducidad de la Pretención Punitiva del Estado*) that granted amnesty to military responsible for crimes committed during the dictatorship [143], in September 2004, Sabalsagaray's sister presented to the Uruguayan Justice a letter requesting the change of the categorization of the expedient, from suicide to murder, and the identification and punishment of those responsible [33].

Since the submission of the letter, there were systematic attempts to stop the initiated process and to archive the letter, thus denying the application. It was not accepted initially by the Court, then it was argued that it had to be presented in the same office that processed the case in 1974, which no longer exists, then Judge Rolando Vomero dismissed it under Law 15.848, but it is finally accepted thanks to the validity of its request of categorization change of the original file.

The process arrived to the Executive, Dr. Guianze is assigned as a prosecutor and Vomero again drops the file. Guianze requested a "historical autopsy", the judge denied it. This denial is later reversed and the autopsy is performed.

In 2008 Judge Vomero indicates that the file should be closed. Guianze argues that it is unconstitutional to apply Law 15.848 in this case. The Prosecutor of the Court rejects the proposition. Nibia's sister, Stella, submits another request and, thanks to her being family, its accepted, and arrives to the Executive, which effectively rules the unconstitutionality of Law 15.848.

The Legislative and the General Assembly reaffirm the unconstitutionality, but those pronouncements had no legal effects. The Prosecutor of the Court and the Court endorse and legitimize the proposition and declare Law 15.848 unconstitutional in October 2009.

In 2009, for the first time, an active General, Dalmao, is summoned to appear before the court.

On November 8, 2010, Judge Vomero indicted General Dalmao and retired Colonel Chialanza to be responsible for the especially aggravated murder of Nibia Sabalsagaray.

In June 2011, both military appealed the sentence. On August 31, 2011, an appeals court confirmed the sentences of General Miguel Dalmao and Colonel Jose Chialanza, who were convicted in 2010 for the aggravated murder in 1974 of Nibia Sabalsagaray during the military dictatorship.

In spite of the numerous attempts to deny the request to the Court, the case, sometimes for reasons more circumstantial or accidental – such as the assignment of Guianze as prosecutor – and some many other times by the strength of the presented evidence, together with the work of those involved, advanced in its path.

In April 2013, Dalmao is sentenced to 28 years of prison [142], being the first active military imprisoned in Uruguay.

The artwork

The project presented is an interactive installation that questions the relationship between (Uruguayan) society and its recent past, through recontextualization and redefinition of one particular image.

Moreover, the installation tries to explicit that the relationship with the recent past and its iconography is never foreign: the military dictatorship was not an exogenous phenomenon but a direct product of the activities of those who carried it out and those who supported it. Society is never passive. The spread reading that we all are chemically pure victims, that – as victims twinned by the painful shared past – the only thing to do is find the best way to turn the page, is, at best, reductionist.

Figure 12 – Nibia Sabalsagaray. This particular photo of her is very well known in Uruguay.

The work consists of a room, dark, with black walls, with only one entrance, blinded by double black curtains.

Hanging towards the end of the room, there is a projection of the locally very well known picture of Sabalsagaray (see Figure 12), in black and white (although it already has a sepia tint). One–and–a–half meters

ahead of the projection, there is a wooden stool with a standard lighter on top of it.

Outside the room, a four–paragraph text with a condensed version of the *Background* section of this chapter is displayed. It is to note that the spectator is confronted with the text before entering the room.

To this site only one person at a time is allowed to enter.

If the interactor decides to take the lighter and light it, the photo – in the area corresponding to the position of the lighter onto the image – begins to burn, disappearing, turning black.

But it is impossible to burn the image completely: a short time after an area is burnt, it reconstructs itself, allowing the image to reappear, not letting it ever fade completely.

Figure 13 – Simulation of burning

The relationship between the spectator and the image is drastically re–signified, by making explicit the underlying interaction between the graphic representation and its consumption.

By allowing the spectator to try burning the image, the piece suggests that there are always people who will burn it (an evident metaphor). The artwork suggests that in a certain way, we all are, or can be, the burners. Moreover, the piece poses that the perception of any cultural phenomenon is never apolitical.

But, in spite of its burning, analogously to the expedient submitted to the Justice, the image persists, resurges, perhaps by itself.

Figure 14 – *Nibia*, as installed in 2010. Still from video documentation.

Technical details

The construction of the piece presented three specific technical difficulties: the detection and tracking of the lighter's fire, the burning simulation and the image reconstruction.

All the software programming was done in C++, using OpenFrameworks (version 0.0.61), a C++ framework for "creative computing" [94].

Tracking of the lighter

Two solutions to the detection and tracking of the lighter were implemented: the first uses a Wii Remote controller (a device for videogame control produced by Nintendo, Inc.), and the second one uses a Sony PlayStation Eye (see Figure 19).

The Nintendo Wii Remote includes an infrared camera that filters out visible light. The Remote's hardware also includes a four–point infrared light detector. This is originally used to track the "sensor bar" (see Figure 15), a device with infrared LEDs that is used by Nintendo to determine the position of the TV used to play with the console.

Figure 15 – Nintendo's SensorBar as seen by a IR sensitive camera.

The Remote implements Bluetooth connection, and it is possible to connect it to a computer and to obtain, in real–time, the information it would send to the console. This information includes the position within the camera's CCD of up to four infrared sources, such as the installation's lighter.

A second solution was implemented, specifically to avoid the need of recharging the batteries if the Wii Remote. This second solution utilizes a RGB camera and segments and tracks a bright light with corresponding shape. This was implemented using OpenCV's built in blob detector.

Even if in the first case the detection is performed by the dedicated hardware device while in the second it is performed by our software running in the computer, both solutions perform up to the needs of the installation, being impossible to tell their behavior apart.

Both solutions were implemented as stand–alone applications that communicate with the installation's main application via TCP/IP using Open Sound Control protocol (OSC), a "protocol for communication among computers, sound synthesizers, and other multimedia devices that is optimized for modern networking technology". OSC provides an URL–like addressing system and "high resolution time tags" [153].

Burning simulation

The burning simulation is performed by manipulating the pixel values using an algorithm similar to the burning effect that appears on image manipulation software like Adobe's Photoshop, and by attempting the simulation of the quasi–random upwards motion of the flame on a burning sheet of paper.

The pixel manipulation algorithm profits from the monochromaticity of the picture, and works by per pixel blending the brush image with the photography.

The per–channel manipulation is as follows:

$$temp = \max\left(255 - \left((255 - old) * \frac{255}{brush}\right), 0\right);$$

$$new = old + (temp - old) * k$$

Figure 16 – Per–pixel dodge burning pseudocode.

Where *k* is a constant, *new* is the new channel value that substitutes *old*, and *brush* is the value at the corresponding pixel in the brush image.

The blending is applied on the photography, on every pixel in an area the size of the brush, centered on the pixel being burnt.

Figure 17 – "Brush" image.

This simple blending algorithm needs to be applied in a way that mimics the ascending motion of vertically oriented burning paper. After trying many simulation techniques, we created a pseudo random upward motion constructed by randomly mixing several motion paths pre–recorded using a standard drawing tablet (Wacom's Bamboo tablet). Two of the resulting paths are shown in Figure 18.

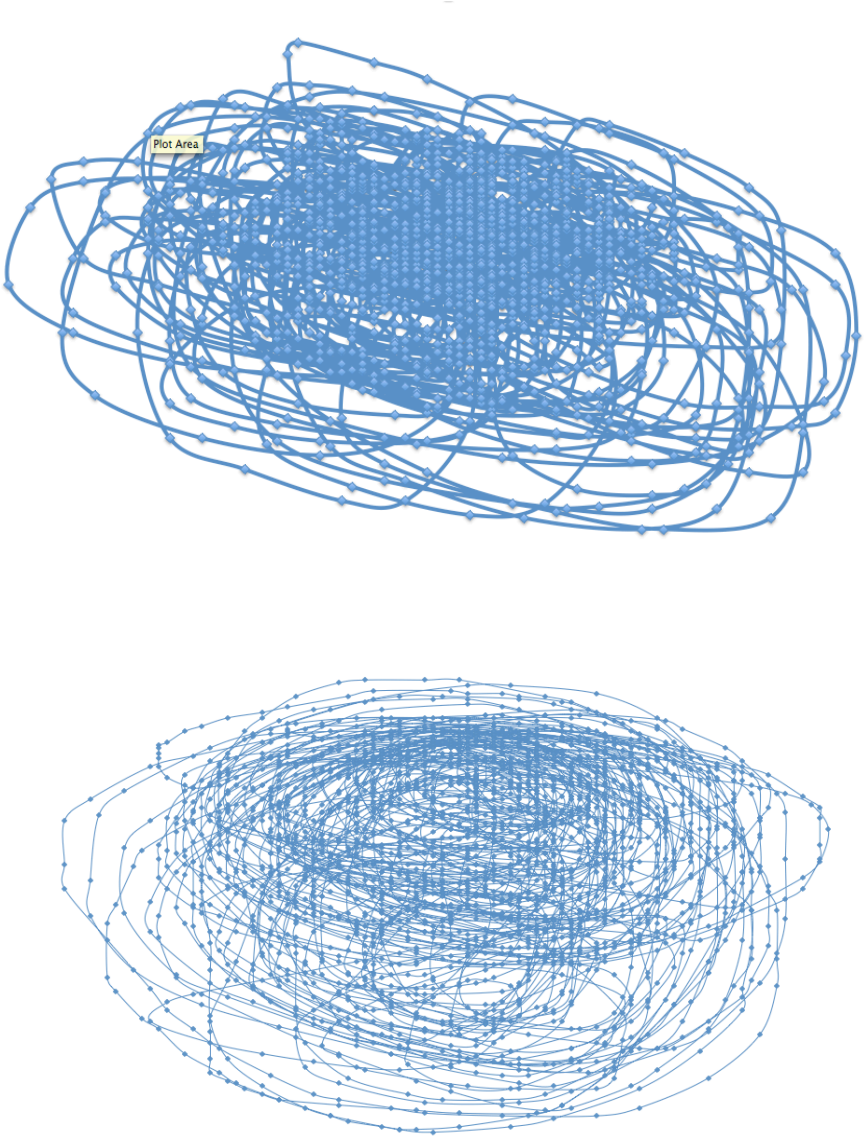

Figure 18 – Two recorded motion paths

When a burning interaction is detected, the system starts following a path produced by randomly mixing the recorded paths, starting on the burnt pixel.

Image reconstruction

Our first idea consisted on time–stamping the burnt pixels and having them recover their original color in reverse order. However, we found that this tends to shift the cognitive locus increasing the perceived

importance of the specific movements – the specific path of burning – performed by the interactor.

As a solution to this, the reconstruction is done more directly: after a certain amount of time without interaction, the pixels gradually recover they original color, all of them at the same time.

Figure 19 – Nintendo's Wii Remote (left) and Sony's PlayStation Eye (right).

The ludic component

Much has been said in the literature about the artistic component of videogames and the influence that they may have in different more established art forms, with the question "are videogames art?" having been asked many times in the last decade [110].

However, in the analysis of videogames–as–art the playing–as–consumption is implicit. That is, the only possible interaction with the artwork includes and implies a ludic interplay.

This is intensified by a common overlapping between games and other media, where is easy to find, for example, movies that embody into their narratives or style the conventions of video game language.

This happens in films like Groundhog Day (Ramis, 1993), Run Lola Run (Tykwer, 1998), Being John Malkovich (Jonze 1999), The Matrix (The Wachovskis, 1999), or Toy Story (Lasseter, 1995).

Figure 20 – *Nibia*, as installed in 2010. In this still of the video documentation, the room's lights are on so that the stool, camera, and interactor can be seen. In the installation, the lights are off, being the projection the only source of light.

This (bidirectional) remediation conveys an interpretative framework that *situates the spectator in a ludic attitude*. This is especially true for interactive art pieces: the user of the art piece expects to play with the piece, usually trying to figure out how it works (as Norman puts it: people are explanatory creatures [114]).

In Bittanti[83]'s words, there is a "dynamic process in which one proposition, the film, is matched against another, the video game, to bring a third, combinatory proposition into being. In this relationship, the function and importance of the two propositions – film and video games – vary significantly." [10]

[83] Mateo Bittanti is an Italian artist and lecturer. He is an Adjunct Professor in the Visual Studies Program (Undergraduate) and Visual and Critical Studies (Graduate) of the California College of the Arts. He currently teaches "Eye Openers: introduction to Visual Studies," "GameScenes: Art & Videogames," "Perceptions" and "Advanced Visual Studies". Before joining CCA, Bittanti worked at Stanford University as a Social Science Associate Researcher and at UC Berkeley as a postdoctoral researcher,

However, the "explanatory playful" attitude towards interactive artworks may or may not be consonant with the artist's intention. In the latter case, one question remains: *what characteristics an interactive art piece needs to have in order to be engaging yet not playful?*

Even if we do not propose a theoretically–complete answer for that question, we argue[84] that in *Nibia*, such engagement is achieved by a combination of factors: the piece's political background, the introductory text, the aesthetic setup, and the ambivalence of the affordances.

The first two factors are very straightforward: the piece's socio–political background is such that, especially in a context where Sabalsagaray's history is well known, it situates the spectator in a more reflective state.

This is reinforced by the text that is shown by the entrance of the installation, which minimizes the uncertainty of the artist's conceptual framework.

However, this is to be understood in a "conceptualist environment". We understand that a political view of the art is consonant with the naturalness of the inclusion of politics into the geopolitically peripheral artworld.

Similarly, the aesthetic setup – a dark room, Sabalsagaray's picture floating in the middle of the room – naturally conveys images of shrines and, in the context of a museum, situates the spectator in a reflexive, contemplative state.

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[84] It is to be noted that no formal quantitative research has been performed; instead, this conclusion is based on informal interviews carried on, and on the observation of the audience at the exhibition of the piece in two Uruguayan Museums in 2010 and 2011.

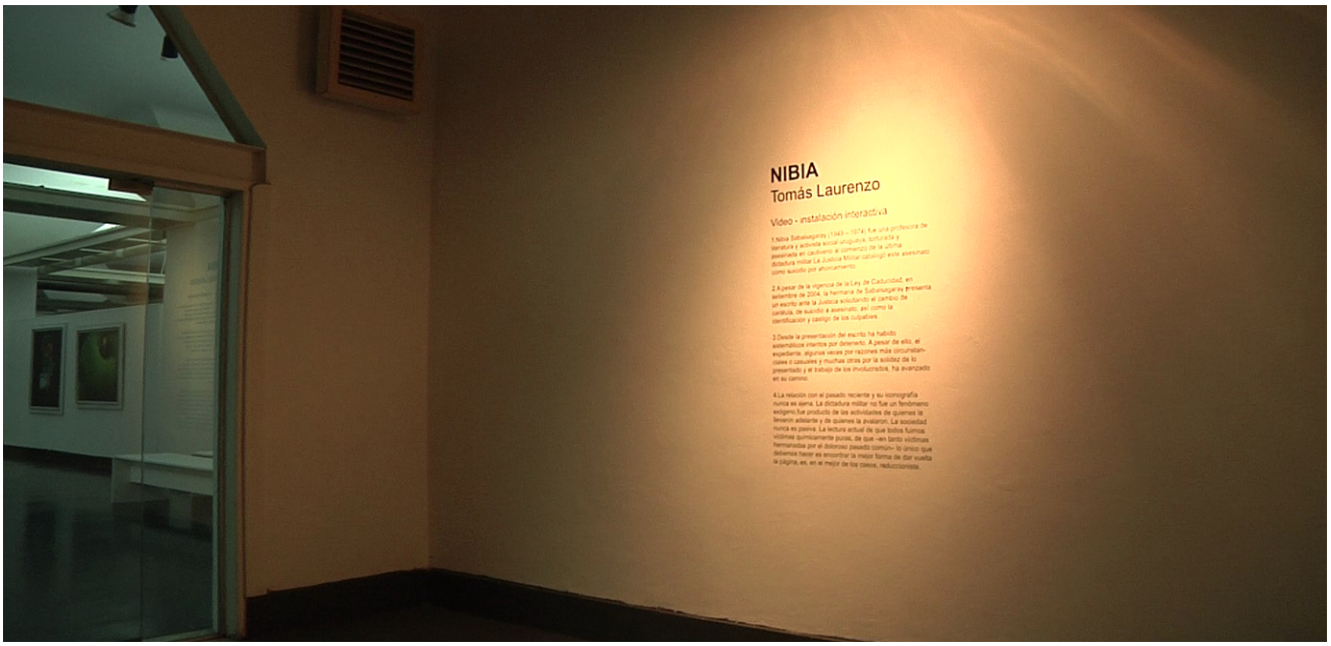

Figure 21 – The text as shown at the Subte Municipal Museum, Montevideo, 2010.

However, none of these factors tackles the interactive aspects of the piece, and it is in the interaction setup where the fine line between engagement and playing is drawn.

In *Nibia*, in consonance with the role that society has played in cases such as Sabalsagaray's, everything is intrinsically ambivalent.

Interactive artifacts' affordances invite interactors to use them. In *Nibia*, the artifact – the lighter – is situated on top of the stool, with no predictable connection with the rest of the piece. In addition, its unnatural situation creates a tension – what is it doing there? Is the user expected to use it? – that calls for the spectator attention. Yet, it sill is the image's extremely powerful presence what dominates the scene.

This ambivalence is also present in the stool[85], where its affordance is very clear, but its unnatural situation and the role it plays in the piece are not.

And again, the contemplative and reflexive, shrine–like, state initially proposed by the piece, collides with the lighter's affordance calling for action.

When – or, better, if – the interactor decides to use the lighter, the direct–manipulation quality of the piece's response generates two different, yet simultaneous, effects in the user: the amazement at the *magical* reaction is subdued by its naturalness. The simulation of the image's burning is convincing enough *for the user to forget the technical aspects, focusing on the meaning of the interaction.*

The disappearance of the interaction artifacts, the sensation of reality in the burning makes it necessary to reflect on why, instead on how.

Celebra

The second artwork that we will present is Celebra, a massive, interactive, site–specific and remote installation and performance tool. Celebra comprises a suspended network of two hundred balloons. The balloons have a diameter of one meter and are lit from the inside using LEDs.

The installation presents an organic aesthetic that combines the grunginess and do–it–yourself (DIY) style of the underlying electronics with an elaborate visual output and interaction scheme.

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[85] The stool was chosen partially because this ambivalence, and in part because it is a type of stool typical of Universidad de la República's School of Architecture, where Sabalsagaray's life partner was studying at the moment of her death.

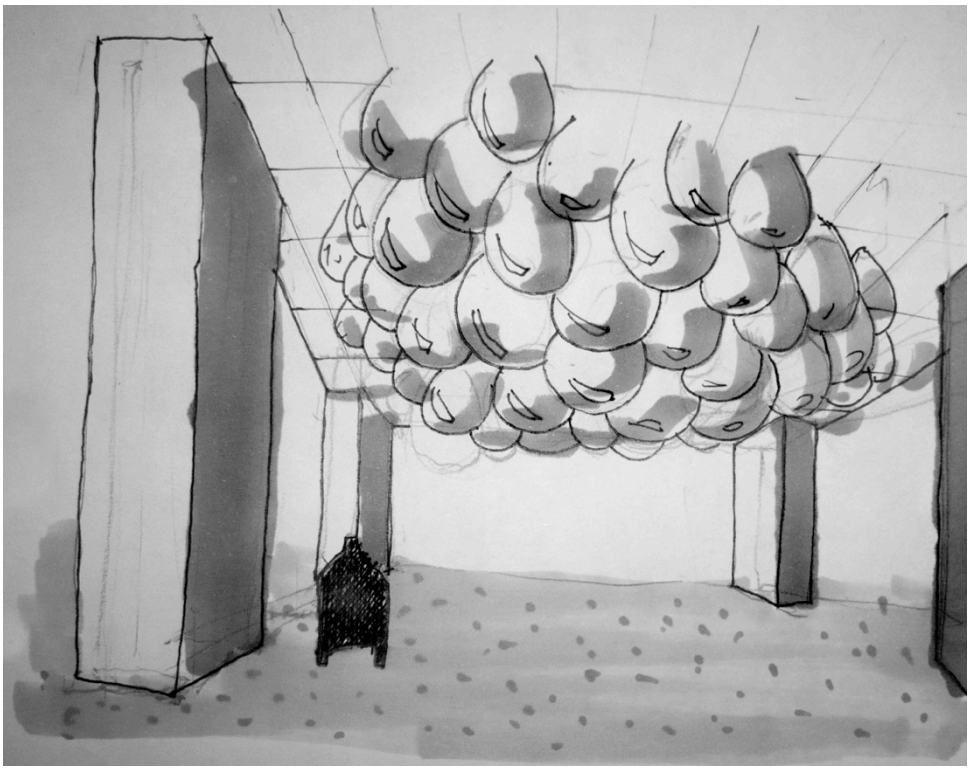

Figure 22 – *Celebra*'s first sketch. Drawn by Fabrizio Devoto.

Prior, related work does exist; lanterns have been used for almost three thousand years, while artificially illuminated balloons can be traced back to the Chinese Kongming lanterns (sky lanterns) from around 200 AD.

In addition, LED–lit balloons have been used in a number of artworks, being perhaps the most well known being Open Burble, created by Haque et al. for the Singapore Biennale in 2006 [64]. There is also a number of commercially produced LED–lit balloons for sale, as well as many online tutorials on how to assemble your own.

The piece

Celebra consists of a network of two hundred, one–meter–diameter balloons, cables, LED–controlling boards, LEDs, computer power sources, computers and software.

According to the definition suggested in chapter 2, *Celebra,* like *Nibia,* is both implicitly and explicitly interactive, and any analysis of its artistic proposal should consider this.

Figure 23 – *Celebra* as installed at EAC, Montevideo, Uruguay. Photo by Guillermo Berta, 2011

Celebra's aesthetic characteristics unfold over two dimensions: its physical appearance and its behavior.

Grunginess and explicitness

Celebra embraces two aesthetics that can be seen as contradictory: on one hand, much effort has been put into the design and construction of its very refined control interfaces, interaction schemes, and visual output; on the other, it embraces a rough aspect that arises from its components and their interconnection, and lends it the *grunge* appearance of many DIY projects.

All the physical functional components of *Celebra* are visible, and its spectators can trace the flow of data from the computers to the balloons, following the cables and seeing how the controllers group sets of balloons. When necessary, the circuit boards are covered with transparent protection (made out of recycled plastic bottles), thus maintaining the visibility of all parts.

Figure 24 – Detail of *Celebra* as installed at ISEA, Sydney, Australia, 2013. Photo by Tatjana Kudinova, 2013

Figure 25 – Smartphone application screenshots

The inclusion of technology in the aesthetic proposal is intentional, and this intentionality is based on two aspects: first, in the traditional style of the readymade, by recontextualizing the object, its aesthetic qualities are reclaimed; second and more important, many of these objects are functional components created by the artists. Again, by incorporating them into the piece, technological production is inscribed into the art

production. *Celebra* is explicit about its media appropriation, re–stating that technology creation is part of the new media art discourse.

Effectively, the piece does not only involve a substantial amount of original technology, but also exposes it and makes it immediately perceivable, in an overt attempt to reaffirm that it is not only pertinent, but also intrinsic to the aesthetic proposal.

Media appropriation occurs both in the expansion of the functional spectrum, and also at a pure aesthetic level.

Celebra's elaborate visual behavior somewhat collides with the aforementioned "grunginess" of the installation, creating a tension that is left for the public to resolve, a tension that becomes central to the artistic proposal.

Figure 26 – Still from *Celebra*'s video documentation, as installed in Sydney. Recorded by Tatjana Kudinova.

Interaction and explicitness

Celebra, like all artworks, is implicitly interactive; its audience can walk into the network of balloons, touching, moving and perceiving them.

However, the piece is also explicitly interactive and admits several distinct forms of interaction: it reacts to participants (both present and remote), and to ambient sound or music.

Figure 27 – Still from *Celebra*'s video documentation, as Installed in Sydney. Recorded by Tatjana Kudinova.

These two interaction modes are *local*: some balloons react to stimuli close to them; while other are *global*: the behavior of the installation as a whole is also reactive.

The local interaction channels are aural and visual. We use depth cameras and microphones distributed throughout the installation, and each sensor's data is usually configured so that it affects only the balloons in its surroundings.

In addition to this local response, the whole installation reacts to ambient sound, creating different visual styles or "moods".

The piece also allows for remote interaction via both web and smartphone apps (we implemented versions for Apple's iOS and Google's Android) that reproduce in real–time the light patterns of the piece, and allow users to interact with it. Currently, the only interaction implemented allows users to "paint" the balloons using a color palette, but other interaction schemes may be added for a particular future installation of *Celebra*.

Figure 28 – *Celebra* as installed in Sydney, Australia, 2013. Photo by Tatjana Kudinova.

Facilitating remote interaction uncouples the experiencing of the artwork from its physical immediacy; by reaching beyond the geographical borders of the installation, we propose to reflect on modes of artistic consumption, as well as on the role that participants play in the completion of an artwork.

Simultaneous interaction with an artwork by two or more individuals transforms the piece into a form of interpersonal communication tool. Exhibition spaces may exist not only to facilitate art consumption, but also to favor art–mediated human interaction; allowing remote interaction extends and interpellates these spaces and their relation to art production.

This interweaving of local and remote control also adds an interesting element of playful uncertainty, as participants may wonder about how the installation is controlled, why do certain patterns appear, and how many people are interacting – locally or remotely – with the work. The artwork's responses to their movements and sounds can be perceived not only by those interacting locally with the work, but also by remote participants; thus, again, *Celebra* effectively extends beyond its immediate perception.

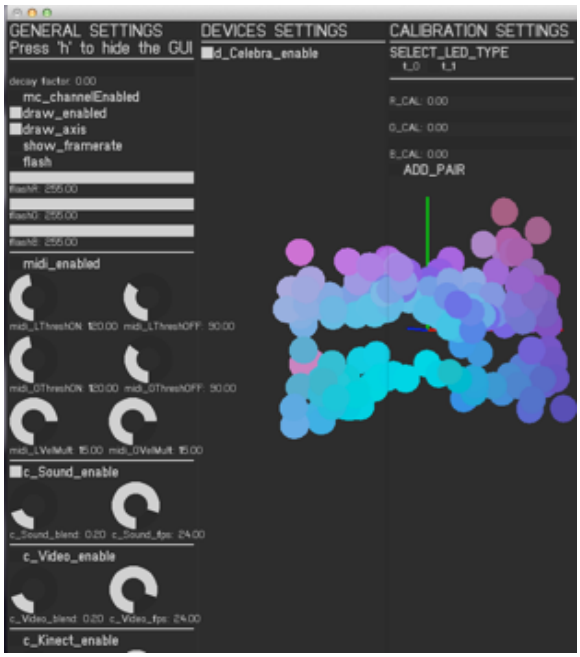

Figure 29 – Screenshot of the *Celebra*'s server.

Celebra as instrument

The installation is also able to work as a multi–user visual instrument, supporting an arbitrary number of concurrent performers.

In this configuration, one performer controls the server (the central computer that handles most of the computing requirements), which blends the input from an arbitrary number of *clients* (devices, computers, or pieces of software that connect to the server).

Celebra's architecture allows for different configuration involving many clients, computers, and devices. These clients can be operated by one or more simultaneous performers, sharing the physical space or performing remotely.

The clients are stand–alone pieces of software that communicate with the server via a network (the Internet or a LAN). They all offer interaction via the computer's peripherals (keyboard and mouse), and accept MIDI input; performers can choose their preferred MIDI controller and map it onto each client's parameters and controls.

Figure 30 – *Celebra* as installed at *Facultad de Ingeniería*, Montevideo, Uruguay. 2012.

Every client allows for real–time control of their parameters, triggering immediate responses from the server, and therefore, from the installation.

We will list now the clients already implemented. It is worth noticing that on any *Celebra* installation, every client can be instantiated an arbitrary number of concurrent times.

Video. In this client, video sources – both live and pre–recorded – are mapped onto the balloon cloud, turning it into a low–res deconstructed screen. Each video client supports up to three simultaneous alpha–blended videos, selected from an (user–configured) arbitrarily large video library. The client offers the performer some traditional tools of VJing, such as scratching, mixing, pausing, and controlling the reproduction speed (see Figure 31).

Sound. A configurable number of virtual illuminators orbit the installation and react to different (configurable) frequency ranges. The performer can modify the number of illuminators in real–time, and how they react to the sounds.

As they orbit they illuminate the balloons, creating effects of synesthetic waves of color.

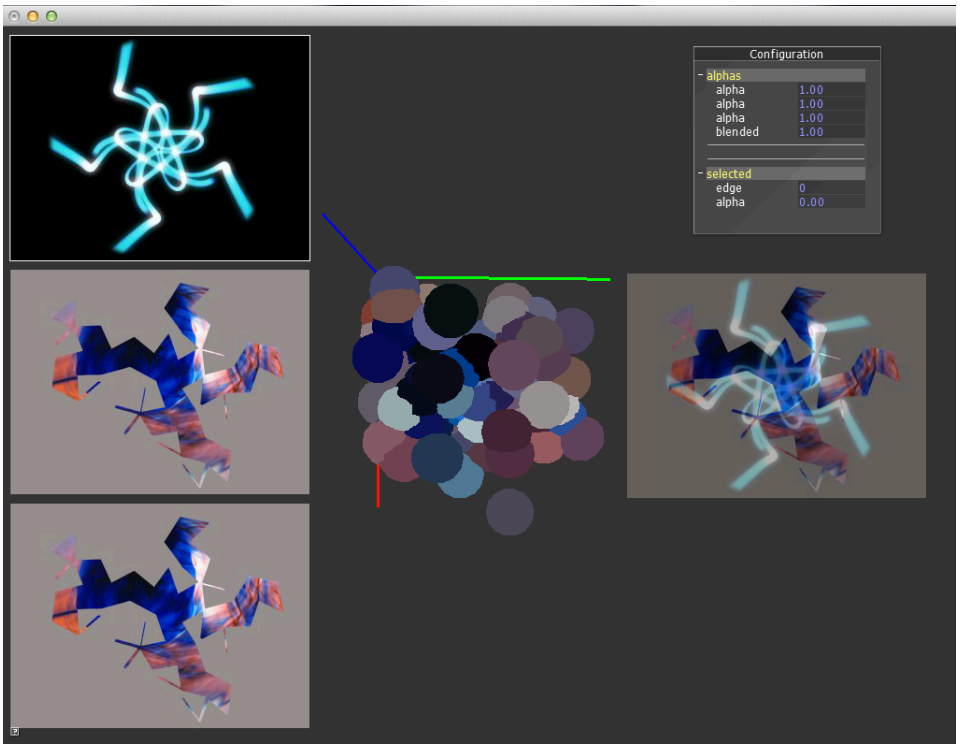

Figure 31 – Screenshot from *Celebra's video client*. On the left the three videos being blended; on the right, the result of the blending; on the center, a 3D representation of the installation with the videos mapped onto it.

Noise. The client maps Perlin noise onto the cloud. The performer can assign different noise generators to different global parameters. This client can be used to "salt" other clients, subtly modifying their behavior by altering the global appearance.

Local sound. The balloons near a microphone react to the sound. Different pre–created patterns can be triggered, and different frequencies can be mapped onto different parameters.

Kinect. Each Kinect client is able to track nearby interactors' locations and their skeletons. This information is mapped onto different behaviors that can also be manipulated in real–time. By default, users trigger and modify illumination patterns on the balloons near them by waving or shaking their hands. This client can also be used to allow one

or more performers to manipulate global parameters using hand gestures and body movements.

Direct control. The performer can change any set of balloons to a given color, make it to oscillate between several colors, trigger and loop pre–stored animations, among other similarly simple behaviors.

Web and smartphone. These two clients implement the remote interaction by obtaining commands from a queue that is managed by a web server. This server publishes a web application that performers can interact with, and listens to the commands sent by the smartphone apps.

The installation allows for both direct control of the balloons' colors (via the *direct control* and *video* clients), and a higher–level control in which the performers affect the parameters of a more autonomous behavior.

The two modes, interactive and performative, are not exclusive: local and remote spectators can experience the piece and interact with it while one or several performers play. The piece then creates a joint performance in which the roles of performer and spectator are blurred and challenged.

Site specificity

Celebra was originally created under a commission by the Uruguayan Government as part of the celebrations for Uruguay's bicentenary. We chose to use two hundred balloons as a direct reference to the country's age.

The piece is conceived as a communication and connection tool. It brings together local and remote participants, spectators and performers. The work's potential is highlighted and enhanced when the work is experienced by several persons at the same time; they collaborate with it both implicitly and explicitly, and the piece *exists* in this real–time collaboration.

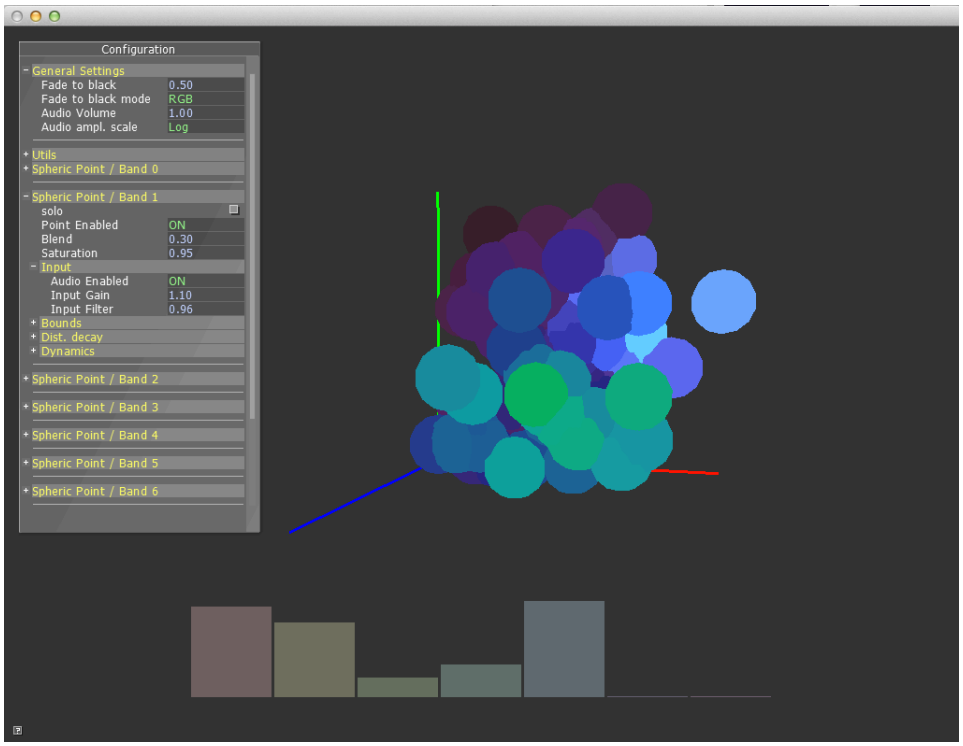

Figure 32 – Screenshot from *Celebra's sound client*. The configurable parameters are shown on the left; on the center the resulting illumination pattern of the balloons is drown; underneath the distinct band's intensity are drawn.

In its first installation, within the bicentenary celebrations, *Celebra* was shown at *Espacio de Arte Contemporáneo*[86], a public museum in Montevideo, Uruguay, located in a converted prison. The piece was installed on the former prison's patio. By installing this playful piece, a history–related artwork, the historicity of the prison space is again reclaimed, and a reflection on the country's recent history is proposed. By allowing interaction with the remote audience, the prison walls are perforated; the artwork expands itself, transcending its physical immediacy.

Subsequent installations have allowed us to focus more on the relationship between work and the space where it is shown. As a blunt example, indoor and outdoor installations differ significantly: outdoors,

[86] http://www.eac.gub.uy, in Spanish.

the wind–induced movements of the balloons becomes a feature of the experience.

In a parallel and consonant way with the electronic setup, *Celebra*'s structural solution is also explicit, and it is easy for its spectators to follow and understand. Its rooting into the physical space is evident, and becomes part of the work.

Technical details

As we have seen, *Celebra* implements a client–server architecture, in which one computer – the server – controls the work's hardware by following commands coming from several clients.

Each client runs at an independent speed (frame rate), and sends frames – that is, complete specifications of all the balloons' colors – to the server. The server, in turn, mixes all the inputs to determine the final balloon color configuration.

The parameters that govern how the server mixes the different sources are controllable in real–time, being some of the main parameters controllable by performers.

The piece uses Macetech's Octobar boards as LED drivers, each controlling, by means of eight A6281 chips, eight RGB LED modules, nominally 12V at 100mA per color channel. Each channel has an independent 10–bit PWM, for a total of 24 channels of PWM LED control. Octobars can be daisy chained (power and data) and thus they can control a very high number of LEDs [96]. Our server and all the clients are constructed so that instances of *Celebra* can involve an arbitrary number of balloons.

Connected to the server is an mBed board, a multi–purpose programmable 32–bit micro–controller with a built–in Ethernet interface and an implementation of the UDP stack protocol. The mBed is a relatively cheap microcontroller using an ARM Cortex–M3 microprocessor (32 bits at 96MHz), 512KB of flash memory, multiple interfaces, including Ethernet, USB host/device, CAN, SPI, I2C, USART,

and analog and digital I/O with PWM. It also has the unusual (and annoying) feature of having its development environment on the web [105].

We run our collaborator Pablo Gindel's custom code on this device, which implements the behavior of a standard DMX512–A controller, and fully implementing the Art–Net protocol [6] [51].

In *Celebra*, the mBed acts as an interface between the low–level light system and the interaction software, receiving Art–Net packets from the interaction software and translating them into TTL (transistor–transistor logic) signaling, which is understood by the A6281 chips of the Octobar.

We use 3W RGB LED modules and standard PC power supplies to power the Octobars and mBed.

Figure 33 – *Celebra* as installed in *Facultad de Arquitectura*, UDELAR, 2013. An audiovisual performance was conducted.

Software

As previously mentioned, *Celebra* implements a client–sever architecture (see Figure 36). One central computer (the server) is fed by multiple clients that instruct it on how to light the balloons. The server performs all the communication with *Celebra*'s hardware. At any given time, an arbitrary number of clients can be running, and clients can be added and removed as a function of the installation requirements.

The communication between clients and the server uses an ad hoc application network protocol over two communication channels: a TCP

channel for control, and a UDP channel for transmitting frames to the server.

Figure 34 – *Celebra* as installed in *Facultad de Arquitectura* during our audiovisual performance. Musicians shown (left to right): Diego Rebella Guillermo Berta, Tomás Laurenzo and Christian Clark. Photo by Marcela Abal.

During the handshake, the server informs the new client on all aspects of the current installation (number of balloons, their three–dimensional locations and identification numbers, location of some sensors, UDP port and so on), and starts listening on a per–client UDP port. The protocol allows for binary and XML based communication, and the communication speed is negotiated and renegotiated in real–time by the server and its clients.

The server was developed using openFrameworks, an open source framework for creative computing.

Celebra implements different clients; some of them (sound, Kinect) were created using Java and Processing – a library for creative computing in Java – [127], while the video client was created using C++ with openFrameworks [94], and the web client using Java and Python.

Web and smartphone clients

To enable web interaction, two–way communication is needed between the server and the devices. The server must send the smartphones the installation data and frame coloring information, while *Celebra* needs to receive the commands sent by the devices.

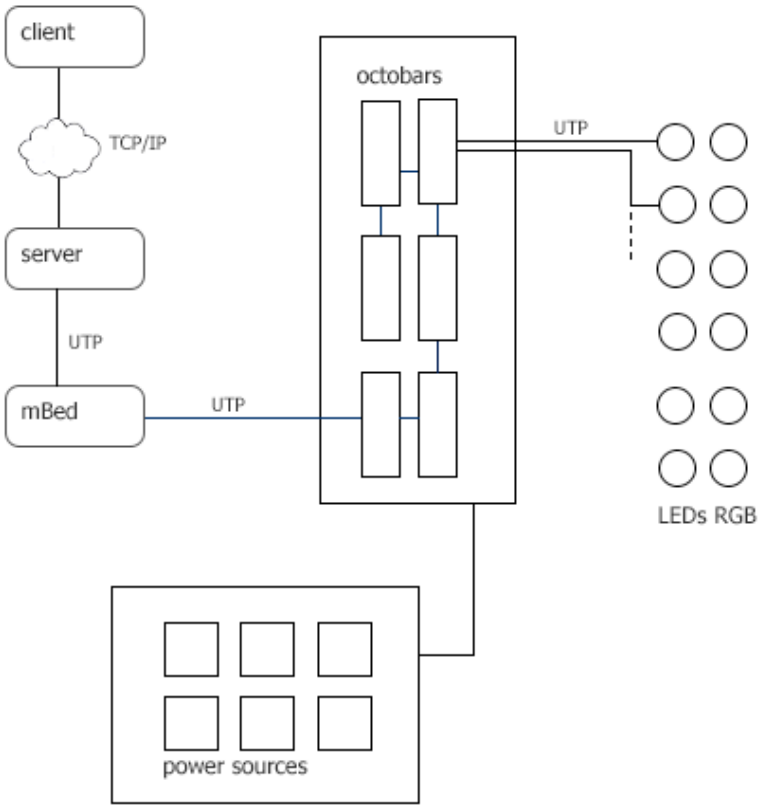

Figure 35 – *Celebra*'s physical components schema.

In our setup, smartphones communicate with a web application using standard HTTP messaging, and immediately obtain all the setup information (balloon positions, identification numbers and communication parameters). This web application is hosted on the cloud (using Amazon Web Services [4]), and not at the installation site.

After obtaining the parameters of the data feed, the smartphone either starts listening for data on a specified UDP port (which works extremely fast, but has the disadvantage of not performing well on some Internet

connections), or opens a WebSocket connection to a web server on the cloud.

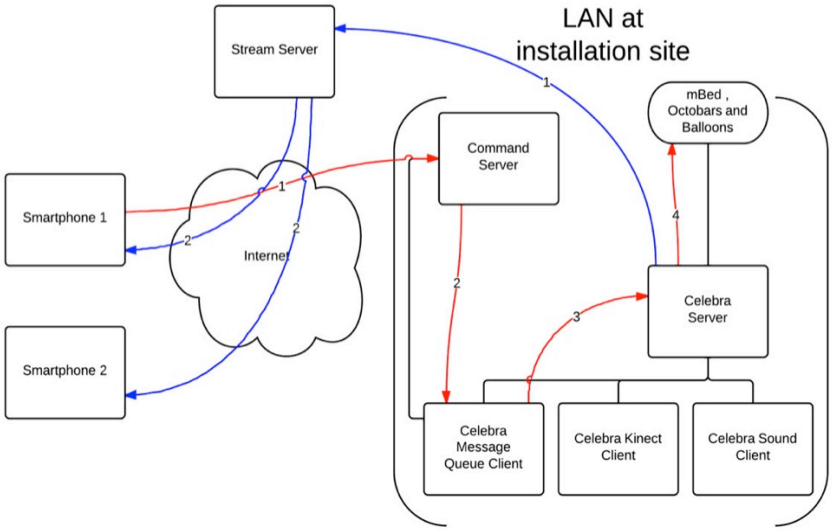

Figure 36 – Network scheme and data paths. In red: connections from the smartphones to the server. In blue: from the server to the smartphones.

This data stream is established on a per client basis, and is generated by *Celebra*'s server, which, in addition to feeding data to the actual hardware LED components, also uploads a single data stream containing the current frame color information to our *stream server* hosted on the cloud.

The stream server, with a high–speed uplink connection, replicates the single data stream into multiple point–to–point streams, one per connected smartphone. All the data transmission is delegated to the stream server, which allows Celebra to work with only a standard ADSL Internet connection.

As we have seen, the smartphones also need to send data to the server, consisting on simple lightweight coloring commands. This commands are sent, via HTTP messaging, to a second web server: the *command server*. This server is set up in the same LAN as *Celebra*'s server, and exposes the message queue to the clients (see Figure 36).

Finally, the two–way connection is completed by the *web and smartphone* client that translates commands from the message queue into colored frames.

Preliminary discussion

With *Celebra*, we found a new solution to a previously tackled technical problem: using LEDs and balloons in a massive interactive installation. This could have amounted to little more than a technological anecdote or an engineering exercise; however, we conclude instead that it has become something much richer, an artwork in which the artists appropriate the work's medium to build a new relationship with technology. This allows a search for new aesthetics, and the proposition of new dialogues and new solutions. Site specificity, for example, becomes relevant not only in the layout of the work, but also in the lower level aspects, and also the purely technical decisions.

In this way, the artists are concerned not only with the general aesthetics, but with all components of the work.

Media appropriation offers a new sensation of freedom, a widening of the spectrum in the search for solutions, and new aesthetic and technological alternatives.

With *Celebra*, we found, this also had an impact on the appearance of the artwork: we decided that the functional components (boards, cables, controllers, computers, switches, power sources) should collaborate in *Celebra*'s appearance, and assisting our claim that the underlying process of design and construction of the piece, and its context, are integral parts of the work.

Or, at least, we intended *Celebra* to suggest that there may be a reason behind its appearance. Even if it is obvious that there is an aesthetic reason behind the avoidance of a sterile refinement, we present the installation to suggest that there is also a narrative that we believe relevant.

Celebra is intended as both a dialogue with its environment, and a proposal for dialogue with its public, with other artists and with ourselves; a humble tool for discussion, one with lights, interaction, music and balloons.

Barcelona

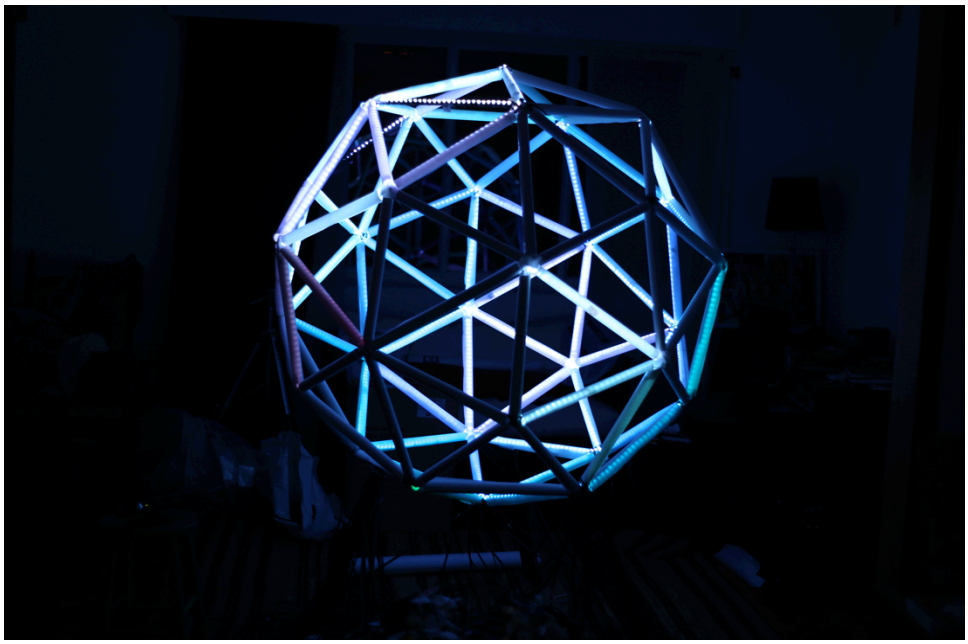

Figure 37 – *Barcelona*. Photo by Tatjana Kudinova.

Barcelona is another explicitly interactive installation. Its interest within this research program resides not only in its aesthetic proposal, but also in that it showcases that media appropriation may allow artists to evolve or iterate on their own technological production. The aforementioned freedom intrinsic to the appropriation manifests itself on the possibilities of artistically *and technologically* reflecting on already constructed pieces.

The piece consists on two–meter tall iron–made pentakis dodecahedron[87], with each edge independently illuminable using LED strips (see Figure 41).

In *Barcelona* we used twelve new LED drivers located on a table at the bottom of the dodecahedron. Ninety cables connect the drivers to every edge of the polyhedron. The dodecahedron is an iron structure consisting of twelve pentagonal pyramids, which, when coupled together (we used plastic bands to tie them together), create the Pentakis dodecahedron. On each edge there is a RGB LED strip (consuming approximately 7W of power), surrounded by a cylindrical diffuser made out of paper (these diffusers were built by hand, one by one). In addition to this, we used four PC power sources, which provided energy to the entire piece.

Barcelona is explicitly interactive: the piece reacts to spectators' movements and sounds, and also to ambient sound or music. As with *Celebra* it can also be considered an instrument –a tool for artistic performances – admitting one or several, local or remote, performers.

Effectively, the piece's aesthetic proposal also has much in common with *Celebra*. Every functional component in *Barcelona* is visible and contributes to its appearance. However, the cabling within the dodecahedron is concealed. Spectators can follow the data path from the controllers to the piece, but not inside of the structure. This is aimed at reinforcing the organic perception of the piece, where all the edges are lit in a synchronized form, allowing the installation to behave as a whole. This, compared to *Celebra*, can be achieved with perhaps greater impact, because *Barcelona*'s geometry is perfectly well known and unmodifiable.

---

[87] In geometry, a pentakis dodecahedron is a Catalan solid. Its dual is the truncated icosahedron, an Archimedean solid. It can be seen as a dodecahedron with a pentagonal pyramid covering each face; that is, it is the Kleetope of the dodecahedron.

Figure 38 – *Barcelona's* metallic structure, LED stripes, cables, LED drivers, and power sources.

This allows to create new interactive behaviors. For example, interactors can energize the piece by holding their hands close to it, or trigger patterns with whole–body motions.

The piece follows the same client–server architecture, with many clients that are orchestrated (by performers or by a preset configuration) determining the installation's behavior.

All of *Celebra*'s clients were ported: video, sound, local sound, Kinect, web, however, their behavior is different and takes into account *Barcelona*'s geometry.

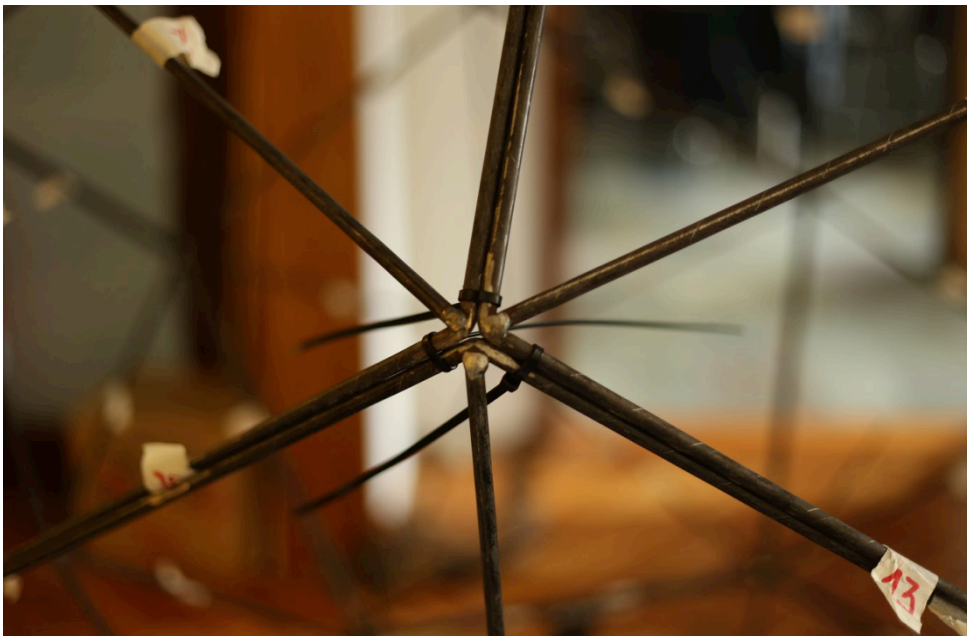

Figure 39 – Detail of *Barcelona*'s iron structure. Three pentagonal pyramids joined by plastic bands. Also seen are some labels with the edge's id numbers.

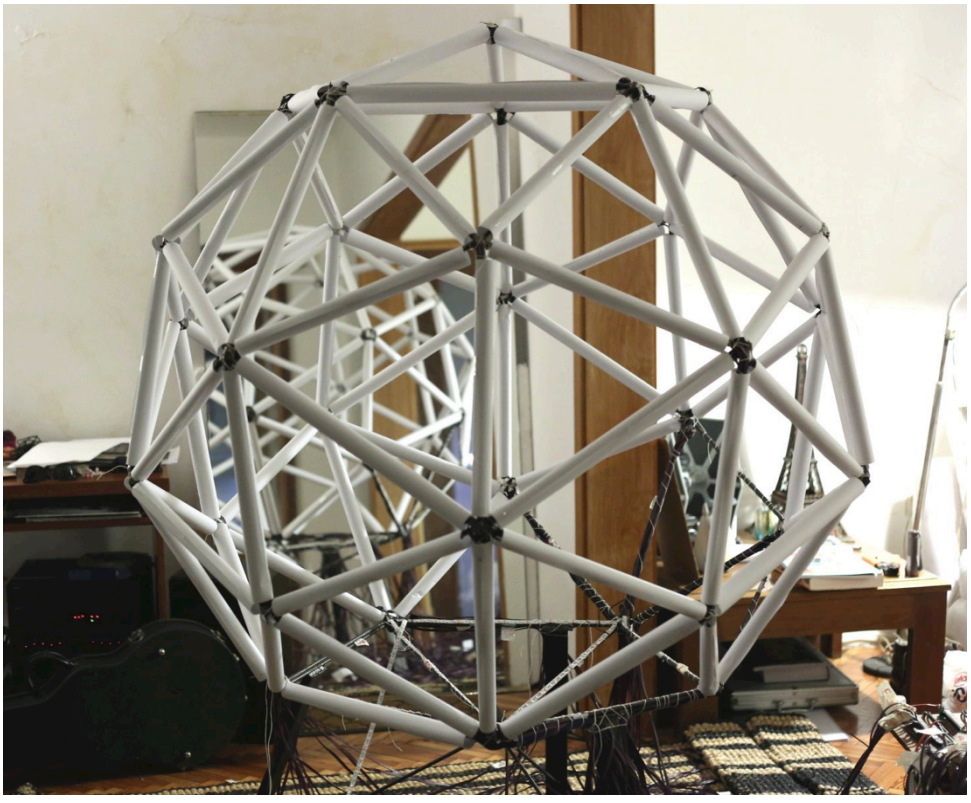

Figure 40 – *Barcelona*'s structure with the paper diffusers in almost every edge.

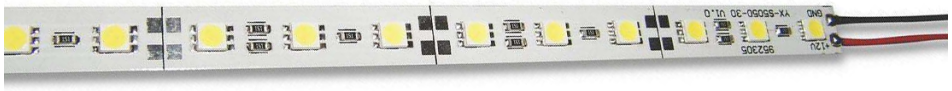

Figure 41 – A LED strip.

Although the underlying technology is similar to *Celebra*, *Barcelona* leverages it and leaves out some of the third–party components.

In this manner, Macetech's Octobars were replaced by more powerful LED and power drivers created by us[88].

Figure 42 – *Barcelona* on the background. On the foreground the smartphone app can be seen, while on the right, there is a laptop running Barcelona's server. Photo by Tatjana Kudinova.

Traces

Traces is an interactive installation, part of a series of artworks that explore the use of facial gestures as input for interactive artworks. These

[88] This particular development was, again, led by Pablo Gindel.

pieces investigate on how can we use face tracking to transmit emotional states to others, ourselves, things, or places.

To experience *Traces*, the interactor arrives to the gallery space, specifically a corner or other rather isolated space. In a wall, there will be several faces projected on the walls. Every face with its eyes closed.

After a short time, when the interactor blinks, the installation will detect it and will take one snapshot of the interactor at the time of blinking. It will then process the image (extracting the face out and then converting it into gray–scale and slightly blurring it) and will add the interactor's face to the existing collection. The spectator then becomes part of the installation.

Figure 43 – Close up of a *Traces* prototype as installed at Microsoft Research, Redmond, WA, USA. 2012. Subsequent versions of *Traces* separate more the faces in order to minimize overlapping.

The artwork becomes, then, a testimony of the visitors to the room, inhabiting it but not seeing it. In *Traces* visitors become subjects of the room, recipients of the spatial communication.

Traces reflects on the relationship between people and the spaces they inhabit: is a space changed because we have been there? Do we leave any trace on the places we have been to?

The piece also questions what do we actually see and experience from a specific space. *Traces* is a log of people *not seeing* the space where it is exhibited, a rendering of some traces we might be unaware that we leave behind.

Traces also becomes a communicational vector between different visitors, as every spectator contributes – albeit passively – to how the piece looks at any time. However, the piece is always changing, and every interactor contribution, *every trace*, fades out with time.

The piece stores every participant's faces, becoming a witness of all its visitors in the moment of helplessness that their momentary blindness generates.

Technical details

Traces is composed of, depending the specific space where it is installed, one or various depth cameras (Microsoft Kinect sensor), one or various projectors, a computer and custom software (see Figure 46).

A third party face tracker (Microsoft Kinect Face Tracking SDK [108], see Figure 44) is used to obtain the spectator's face and eye position within the three–dimensional scene.

After one spectator has being tracked for thirty seconds, the installation enters into blink–detection mode for that spectator. When a blink is detected, the system extracts a bitmap corresponding to the user's face. It then desaturates and slightly blurs the image, which is added to the collection of faces that is projected. If there are more than a certain threshold of images – dependent of the specific gallery space – the oldest projected face is slowly faded out.

Our custom blink detector utilizes a computer vision library (OpenCV [72]) to extract one RGB bitmap per eye and raise a blink event when the bitmap changes more than a certain threshold. Change is measured by

binarizing the images, applying a Sobel filter[89], and verifying that the resulting images shows no more than one continuous blob (see Figure 45)).

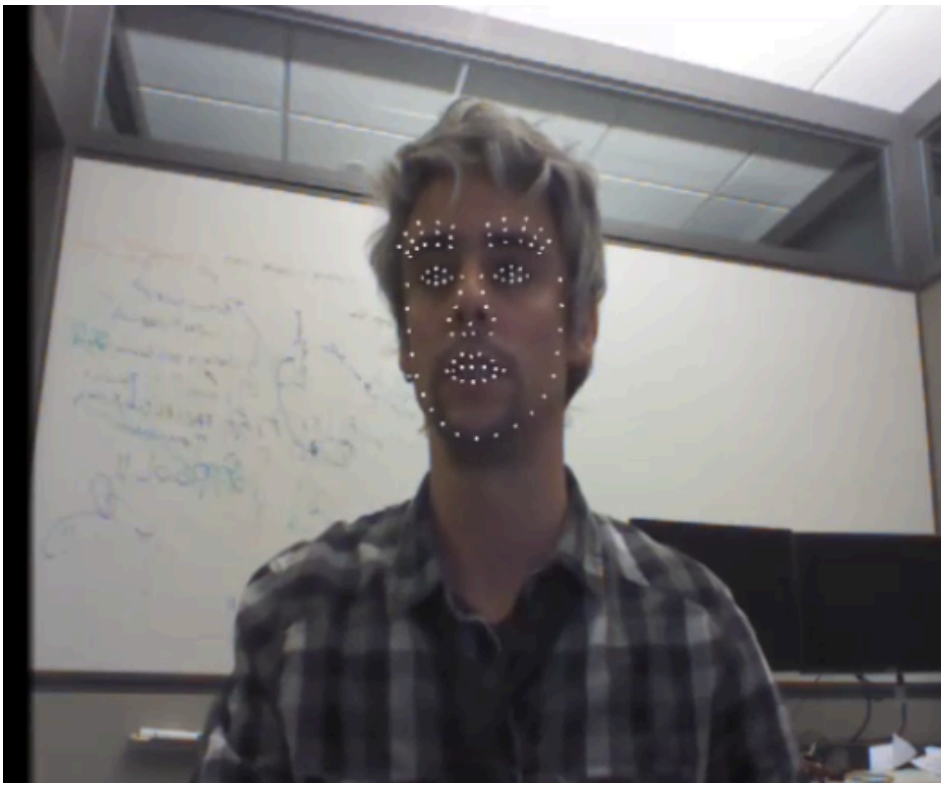

Figure 44 – Microsoft Face Tracker tracked points drawn on top of the acquired image.

The collection of faces stores the extracted images, and displays them trying to reflect the original user's position as much as possible but separating them enough so that they are distinctly readable. The size of the projected faces is configured depending on the installation space.

[89] The Sobel operator performs a 2–D spatial gradient measurement on an image and so emphasizes regions of high spatial frequency that correspond to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input gray–scale image.

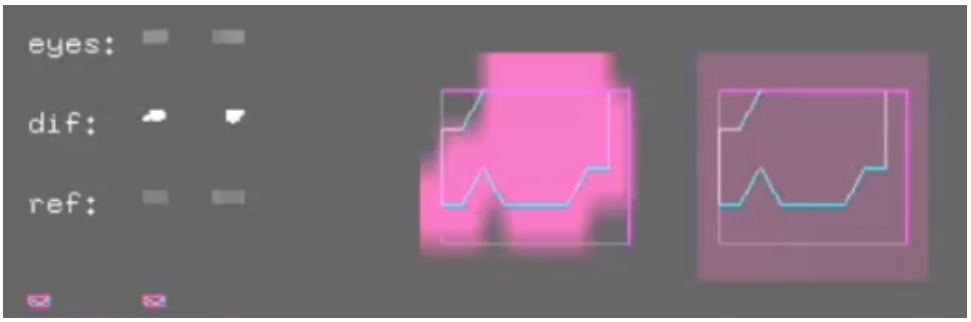

Figure 45 – Our custom blink detector. On the left the extracted eyes are drawn. On the right the detected blob is drawn, signaling the detection of a blink.

Also based on the installation space the maximum amount of projected faces is selected. When the limit is reached, the oldest face slowly fades to black, and is then removed from the collection (however, new faces appear suddenly, immediately after the blink detection).

Walrus

> *I am he as you are he as you are me and we are all together.*
>
> John Lennon, lyrics to The Beatles' song "I am the walrus", 1967.

We present here *Walrus*, a fourth interactive installation that works as a "magic mirror" that only reflects the interactor's face on an oval frame. The reflected image is substituted in real–time for a previous interactor's face in similar position and facial expression. The installation aims at reflecting on self–perception, artistic exhibition, surveillance, control, and public entertainment.

The system, for every frame, captures and stores in a database the user's face. It then searches for a similar pre–stored face and displays it instead.

Using again a Microsoft Kinect and Microsoft's Face Tracker, *Walrus* creates and manages a database of faces where each frame is catalogued according to its three–dimensional rotation, plus some gesture descriptors. This depiction of the stored faces allow for the

substitution so that, every frame, the user is reflected with a face corresponding to a different person.

Figure 46 – Screen capture of Traces' software, showing an acquired face and running information and parameters.

Walrus attempts to create a sense of awe that arises from the fact that even if the facial features in the mirror are completely different to the interactor's, the identification with the displayed image is natural, unavoidable, and immediate. The unnatural fact of a mirror that only reflects the face and does not obey optics rules creates a tension that interactors systematically alleviate by selecting a "physically correct" position.

"Magic mirrors" (also called "augmented–reality mirrors" or "mixed–reality mirrors", among other similar names), that is, computational mirrors that behave in creative ways are very common in new media art, and with the advent of depth cameras a resurgence of this ever–present type of installation has been seen, with perhaps Chris O'Shea's *Body Swap* [116] being the most closely related work.

Technical details

Walrus is composed of a Microsoft Kinect Sensor, a computer running custom software, a projector, and an oval–shaped picture frame.

As with *Traces,* we utilize the depth camera to track the interactor's head, and Microsoft's Face Tracker to locate the face and extract some gestural features: mouth openness, rising of eyebrows, mouth shape, among others.

The computer stores each new face and its associated data into a database, and returns an existing equivalent one from the database. We organize the database as a hash table, with similar faces stored under the same hash entries. Face similarity is defined by a $L\infty$ norm of the head rotation plus similar gestural features.

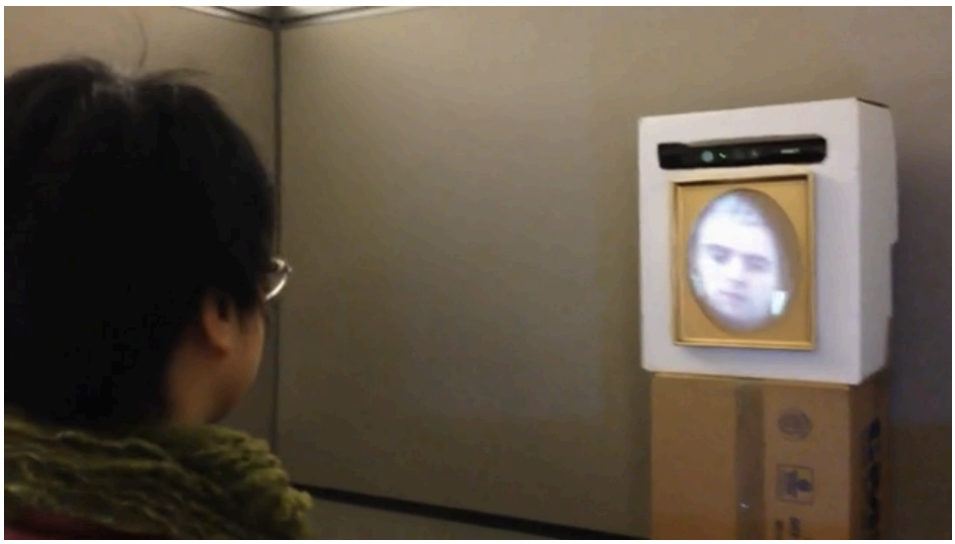

Figure 47 – A prototype of *Walrus*, as installed at Microsoft Research. Redmond, WA, USA. 2012.

When a new face is detected, it is stored into the hash bucket with the most similar representative. To avoid running out of storage, we cap a maximum size of each hash entry, and randomly kick out an existing entry when this limit is reached. We then randomly pick another face from the same hash entry. This can be seen as a cheap way of finding similar faces to the input via hashing.

The projector is mounted either on the ceiling or on top of a tripod that allows the returned face to be projected onto the oval picture frame without the interactor casting a shadow onto it.

Other artworks

Several other artworks that reflect on the same axes were created within this doctoral program. We will briefly describe four of them in this subsection.

Son

Son is a second "magic mirror" where users are rendered with a particle system. The installation uses a Kinect camera to perform "skeleton tracking" of the interactor (using OpenNI, an open–source SDK for 3D sensors [121]). Users joints are used as "targets" of a custom particle system, with every joint accepting a pre–defined maximum number of particles.

Also, hands and knees positions are fed (via OSC) to a custom Reaktor patch that generates sound in real–time (Reaktor is a graphical modular software synthesizer developed by Native Instruments [112]).

The particles are rendered using alpha blending (a standard computer graphic technique) and their size is modified by the intensity of the sound emitted by the application, thus reinforcing the relation between graphics and sound.

Figure 48 – *Son* as installed at *Museo Nacional de Artes Visuales*, Montevideo, Uruguay, 2011.

Son proposes a playful reflection on the self and on our relationship with others as the particles that comprise each figure can be shared between participants. The mirror becomes alive thanks to its sound and graphics and interactors engage in a ludic search for specific reactions.

The piece was programmed using Java and Processing.

Facing interaction

Facial Pentatonic and *Face Sounds* are two musical instruments that map the user's tracked face (using Microsoft's Kinect and Face Tracker), onto sounds.

In *Face Sounds* the user's head orientation and facial expression are mapped onto continuous parameters of a MIDI synthesizer instrument running in Ableton Live (a digital audio workstation specialized in real–time operation [1]).

Users trigger the sound by opening their mouth. The instrument embodies a virtualized voice that is controlled by the head's orientation.

Faces Pentatonic is a similar musical instrument, also trigged by the users mouth, with the difference that the interactor's head orientation is

used to directly select the note being played instead of modifying timbral parameters.

The system allows the user to select one note of the *A minor* pentatonic (five notes per octave) scale, which comprises the notes A, C, D, E, and G.

The user head's *pitch* selects the octave, while the head's *yaw*[90] selects the note within the scale (see Figure 49).

The system provides real–time visual feedback, showing the selected note. Its hands–free interaction allows the user to play another instrument at the same time (again, it becomes a virtualized, always–on–tune voice, see Figure 50).

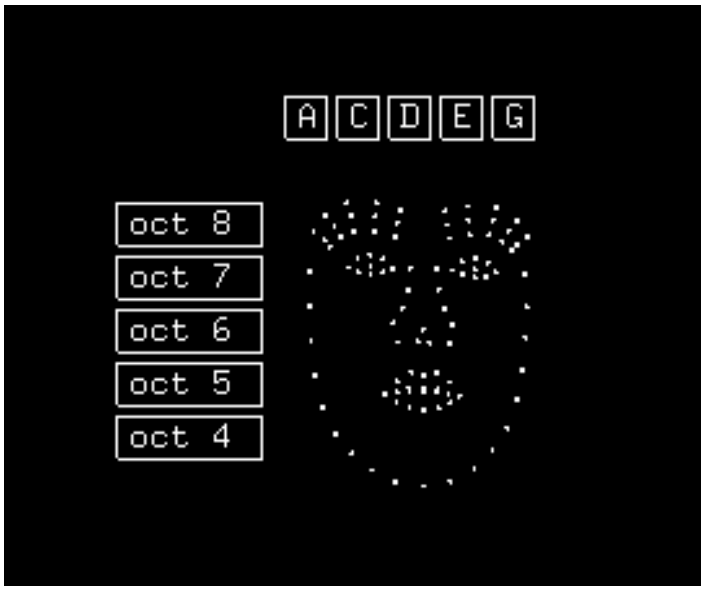

Figure 49 – Screenshot from *Facial Pentatonic,* showing the tracked face and the selectable octaves and notes.

[90] Pitch corresponds to left–right rotation (as in the western "no" gesture) and yaw corresponds to up–down rotation (as in the western "yes" gesture)

Look at me

Another line of work consisted on investigating vibration as feedback. Vibrating motors are very cheap and easy to control and provide an opportunity for appropriation.

Look at me is an exercise: a small installation that forces its user to look at it. When the user starts looking away it lights a LED up and emits a soft high–pitched tone. If the user looks further, it vibrates in annoyance.

The installation subverts the power relationship between the observed and the observant, between consumer and product.

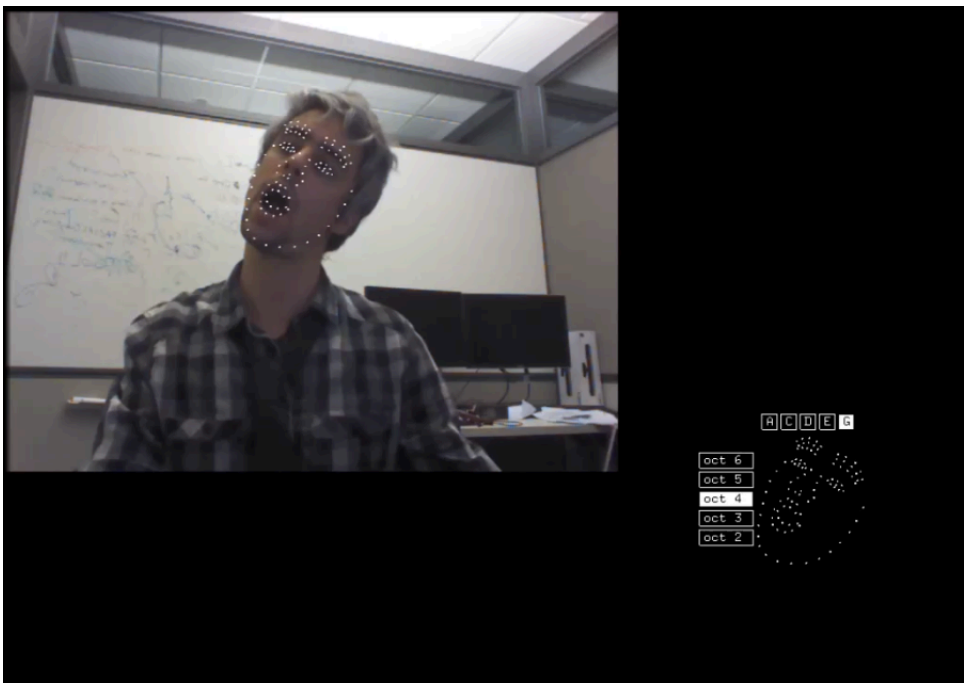

Figure 50 – A user performing with the *Face Pentatonic*, with the G4 note selected.

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7 CONCLUSIONS

Figure 51 – Bruce Wayne (Batman) and Jezebel Jet shown in Batman Incorporated #656. Written by Grant Morrison. Image © DC Comics.

Introduction

> *The machine itself makes no demands and holds out no promises. It is the human spirit that makes demands and keeps promises.*
>
> Lewis Mumford[91], 1934. [21]

This thesis has presented a novel characterization of an extremely dynamic contemporary art genre – new media art – together with an exploration of some key aspects of its practice.

[91] Lewis Mumford, KBE (1895 – 1990) was an American historian, sociologist, philosopher of technology, and literary critic. Particularly noted for his study of cities and urban architecture, he had a broad career as a writer. Mumford was influenced by the work of Scottish theorist Sir Patrick Geddes and worked closely with his associate the British sociologist Victor Branford.

This characterization and the following discussion have been constructed from a hybrid perspective unfolded in two orthogonal, coherent, axes.

The first hybridity resides in the very constituent characteristic of new media art: media appropriation. In order to construct an analysis of new media art, knowledge of its materiality is needed. However, new media art's materiality is unspecific, for the art practice occurs when the knowledge crystallized in technological artifacts and processes is appropriated.

The second hybridity appears in this thesis' methodological stance. We followed a hybrid research–practice path, and therefore this dissertation is also presented as an exegesis accompanying the artworks created. In consonance, the artworks also adopt a dual role: they are presented as pieces for their "pure" artistic consumption and analysis, but also as discourse tools that reflect the concepts presented in this document.

In this last chapter of the thesis we will summarize the dissertation's proposals and we will analyze the relationship between them and the accompanying art pieces.

Thesis summary

This dissertation begins with a new characterization of new media art as a distinct art genre: we propose that new media art *is* artistic media appropriation.

With media appropriation we refer to the dialectal inscription *into* the art practice of the knowledge that allows for some particular technological production.

The relationship between art and technology is as old as any of them; however, media appropriation transforms technology into a raw medium, allowing for the appearance of the artistic practice of technology production.

This practice is by no means tied to the digital. As we have said, new media art is unspecific on its materiality, on its media. However, the digital computer became the natural vehicle for new media art, and software evolved into the common denominator of new media production. In addition to this, the systematic remediation characteristic of the digital realm, has led to a state where software became intrinsically connected with almost every cultural production.

New media art's relationship with other cultural and artistic genres and methods is, truly to its appropriating nature, one of omnivorousness. As Steve Dietz[92] once put it, new media art is "just like anything else, only different" [57].

The difference resides on media appropriation. Media appropriation generates a qualitative difference in the relationship with the technological substratum, with the artworld, and with the technology production environment. Effectively, new media art's appropriations subvert many of the assumed stances in the relationship with technology.

An example of this subversion is provided by new media art's reclaiming of the aesthetics of the computer interface.

A long–standing desire of HCI has been the disappearance of the interface. New media art instead, by creating an artistic language *from* and *with* some technology (or, rather, from some technological knowledge, some *applied scientific text*), has many times worked on making the interface *explicit*, on reclaiming it as an aesthetic subject, on creating the art of the interface, the art of interaction.

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[92] Steve Dietz is an artist and curator. He has taught about curating and digital art at California College of the Arts, Carleton College, the University of Minnesota, and the Minneapolis College of Art and Design. He is the Founder, President, and Artistic Director of Northern Lights.mn. He is the former Curator of New Media at the Walker Art Center in Minneapolis, Minnesota, where he founded the New Media Initiatives department in 1996.

This explicitation, we have shown, appears systematically in new media art, and plays a significant role in the creation of new media art's language.

New media art transfers not only adopts technological knowledge, but also *explicits* procedures, technologies, and techniques already present in traditional art practice. This transference from an implicit realm to an explicit one allows for the construct of an artistic language that uses this knowledge as a constitutive part.

When Zicarelli[93] says "I would only observe that in most high profile gigs, failure tends to be far more interesting to the audience than success" [23], he is, at least in part, referring to this explicitation. Part of the appeal of the aesthetics of error and glitch resides on that they do explicit the underlying technological substrate.

New media art's media appropriation also entails its constant change. Being technology extremely dynamic, new media art, as Ippolito[94] poses, is "like a shark" for it "must keep moving to survive" [73], that is, new media art's condenses itself in artworks of an ever–changing nature.

The defining role of knowledge in new media art is not casual, for new media art is intrinsically conceptual: there cannot be new media art that

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[93] David Zicarelli is an American software designer. He is the founder and CEO of Cycling '74, a software company that maintains and develops the Max graphical programming environment. The company has introduced Max extensions for audio (MSP) in 1997 and video (Jitter) in 2001. Before starting Cycling '74, Zicarelli worked on Max and other interactive music software at Opcode Systems, Intelligent Music, and IRCAM, and earned a doctorate from the Stanford Program in Hearing and Speech Sciences.

[94] Jon Ippolito is an artist, educator, new media scholar, and former curator at the Solomon R. Guggenheim Museum. Ippolito studied astrophysics and painting in the early 1980s, then pursued Internet art in the 1990s. His works explore digitally–induced collaboration and networking, a theme that is prominent in his later scholarship. He is an Associate Professor of New Media at University of Maine.

is not conceptual art. And it is this conceptual quality of new media art what converts it into an art genre as opposed to an anecdotic technical exercise.

Our characterization of new media art and its language propels, in this thesis, three different lines of analysis: the humane aspects of interaction, the future of new media art, and the relevance of the geopolitical context.

H stands for human

Chapters 3 ("users") and 5 ("context") of this dissertation focus on some of the humane aspects of new media art and human–computer interaction from within two complementary points of view: the roles that interactors play in new media art, and the relationship between new media art's practice and its sociopolitical setting.

In chapter 3 we focus on interaction, and thus we conceptually stand in the intersection between HCI and new media art.

We argue that HCI practitioners usually operate by *designing a negotiation* between the affordances of the appliance and the context where it is used. Context plays a defining role in HCI.

Our notion of context transcends the immediate surrounding of the designed interactive product to include the political environment of the interaction. We propose that interaction design is a political activity, for, as Ricœur states, there is no praxis without ideology.

We analyze the *politicality* of HCI using Flusser's theory of the black box: the characterization of users as functionaries results useful in understanding the power asymmetries between makers and users of tools. We propose that it is not accidental that this asymmetry and these roles are actively interpellated by new media art, for it often encompasses a political praxis that adds transparency to the interactive apparatuses.

This can also be seen in the blurring of the frontier between users and programmers. To model this we propose the assumption of a user–programmer continuum, where the *attitude* behind the self–location (within this axis) plays a *defining role* in the conceptualization of the new media artist's practice.

This conceptualization is constructed from a conceptual stance – the attitude – with a frequent aid of tools and frameworks specifically constructed to help traversing this continuum.

Within the new media art practice, this attitude is found to be relevant, as the artistic media appropriations often relate to the conceptualization behind the artwork. In this way, media appropriation systematically subverts the pre–established roles of instrument players – users – as opposed to tool creators, to give way to the more holistic métier of the new media artist.

The analysis of the ideology and its relationship with new media art is continued in chapter 4, where we introduce *the perceptual cloud*, a new paradigm of human–computer interaction.

To shape the perceptual cloud we identify two discourses that situate us in a "post–" stage: post–digital and post–capitalism. These discourses argue that the ubiquity, immanence, and incontestability of computer–based interaction and capitalism conform the reality *from which* one must operate.

This, together with the decoupling of the interactive and computational layers of technology (both in geographical and computer–architectural senses) lead us to a near future where every object is a potential computational interaction device.

The decoupling of the interaction and computational layers, plus the increase of perceptual prowess of computational systems configures a new reality where *every affordance is potentially real*, and – in a true to post–capitalism fashion – merchantable. The notion of *affordance as a service* appears.

The perceptual cloud resides in the double decoupling of the perceived interface support from the actual interactive device, and the perceived computing support from the actual computing device.

In this forthcoming reality, the politicality of new media art becomes particularly relevant. Especially when new media art's explicitation operates on the sociopolitical knowledge as it does with any other knowledge: appropriating it *in the construction* of its artistic language.

As we showed with the two examples presented – S.M.T.H. and Fan Check Machine – not only some ideological aspects become explicit (or *explicitable*) in the perceptual cloud's HCI and new media art, but also the political implications of the interaction design become more evident.

It is indeed interesting that the usual narrative on the HCI discourses does not involve politics. Effectively, in spite of it being "one of the most powerful practitioners of the neo liberal agenda" [74], the tech culture often adopts a post–capitalism discourse.

New media art, on the other hand, has been active on the inclusion of political and ideological factors on its discourse. This addition, however, tends to be done with a narrative politically centered in the core states and in their interests and realities.

By reason of this, in chapter 5, we construct a deeper analysis of the relationship between new media art and its political context, using cognitive capitalism and Marx's general intellect as the analysis' frameworks, we utilize Latin American conceptualism to reflect on the political language of peripheral new media art.

Cognitive capitalism provides a characterization of the roles that knowledge operators play in contemporary society, where knowledge creation and operation adopts the form of virtualized labor that is able to replicate the labor theory of value by the introduction of artificial conditions of scarcity (for example, longer intellectual property and copyright laws).

Even under the assumption that all cultural activity is political, it is easy to observe ontological differences between artworks explicitly and implicitly political. However, in the cases where central new media art has been explicit in its politicality, it has systematically worked on some specific civic, economic, and social interests. Among these interests which we highlight privacy, ownership, perceptual real–estate, and control, all constructed from a centrally–conceived narrative.

If we are to discuss cultural production outside the core states, postcolonial theory has been instrumental in understanding cultural production in the periphery, reclaiming narratives that have been neglected by historically dominant discourses. However, it has not successfully modeled new media art's processes.

Latin American conceptualism, meanwhile, *naturally includes* many sociopolitical interests that are characteristic of its context. Effectively, many of the analyses of political art that focus on the detrimental effects of an eventual lack of uncertainty are not applicable to Latin American art, as its politicality is as natural as unavoidable.

To this observation, we must add the enormously relevant fact that *new media art's relationship with technology in the periphery can never be apolitical*. Its media appropriation, when located in the periphery, becomes a relevant political act, entailing a political discourse.

Coincidentally, media appropriation undermines some of the basic process of cognitive capitalism, for the knowledge's role in art creation and consumption frontally collide with some techniques of artificial scarcity.

We argue that there is a necessity for a peripheral new media art constructed from a non–hegemonic discourse. In effect, there is a need for an artistic language that reflects the contextually–dependent characteristics of the relationships between art, society, and technology.

Knowing that new media art's language is constructed from within these characteristics, we conclude the need of a meta–appropriation, that is,

the inscription of the processes of construction of knowledge into the sensible.

The politicality of both HCI and new media art shapes and influences any model proposed. Even concepts as globalization and the central–periphery dichotomy reflect conceptions that entail exogenous concepts of modernization and progress.

Simón Rodríguez claim for originality – we invent or we are mistaken – is deeply consonant with the need for meta–appropriation. It is this appropriation of knowledge what will allow for the creation of contextually–relevant artistic languages. Languages that are to be created *from* the understanding of the political stance that practice unavoidably entails.

Our artworks

As we stated before, we propose this thesis as a hybrid dissertation–exegesis. During this doctoral program several artworks have been created and we will now briefly discuss how they relate to the already presented conceptual framework.

Probably the first thing to notice consists in that all the art pieces presented are explicitly interactive installations.

The first piece, *Nibia*, is eminently end evidently political: its subject is a political history.

In this installation, the natural insertion of political themes of Latin American conceptualism is present (and an eventual lack of ambiguity, result of its direct proposal, does not conform – as per our understanding – a quality–diminishing factor).

New media art's explicitation clearly appears in the installation. *Nibia* not only is an artwork explicitly interactive but also in its interaction the artistic proposal resides (therefore, the *aesthetics of the interaction* does play a determinant role).

Other themes of this thesis' conceptual framework are equally present; for example, the perceptual cloud appears on the artwork's ability to understand the location and meaning of the lit lighter, while the stool and picture appear in the tradition of ready–mades and found art.

However, as we have repeatedly stated, what makes *Nibia* a new media art piece its media appropriation. The *possibility* of the piece's construction entails an important amount of knowledge creation, which became an integral part of the piece. The artwork could not exist without the software created and the artistic appropriation of the hardware used.

Explicitation also appears in its relationship with the geopolitical context. Being a political artwork, its proposal (as it is evidenced by the text displayed at the room's entrance) questions the role that society plays in political developments and their posterior historicity.

Consistent with our definition of new media art, media appropriation is also present in all the artworks presented. At the very least, all the installations involve the ex professo creation of original software. Some of the pieces, especially *Celebra* and *Barcelona*, also involve the creation of hardware, and show new media art's the flexibility on its materiality.

Both *Celebra* and *Barcelona*, in addition to being explicitly interactive present a dual role of installation and instrument, with the latter – thanks to media appropriation – also being part of the new media art practice.

The instrument creation constitutes an integral part of the artistic fact and which implies the appropriation of the technology of HCI, for it entails the design of its operation.

As part of their aesthetic proposal, both pieces display their inner workings, allowing interactors to trace the flow of data and control within them. It is important to note that this explicitness about the hardware appropriation conforms a political discourse, for it renders the artwork–apparatus less opaque.

As we have stated, media appropriation in the periphery always entails a political significance, and these two pieces explicitly show it. This politicality is amplified in *Celebra*, which – as *Nibia* also does – presents a relationship with its context that is undeniable and explicitly political.

The perceptual cloud is also present in every piece shown. However, different aspects can be observed in different artworks.

The virtual representation of both *Barcelona* and *Celebra*'s lighting pattern in real–time, together with the pieces' ability to "perceptually understand" the movements and sounds of the interactors are clear examples of perceptual cloud phenomena, where the differences between actual and virtual interaction are mixed and blurred.

In addition to this, both pieces allow for remote interaction, also channeling a possible indirect interaction between local and remote interactors.

In *Traces* and *Walrus,* the perceptual cloud is perhaps more visible. In addition to the pieces being able to perceive interactors' movements and facial gestures, the results of this understanding are projected back onto the world, augmenting it.

Walrus, in true perceptual cloud style, spatially augments the empty oval frame *turning it* into a mirror: the mirror affordance present in its shape is *invoked* onto it.

This augmentation is also presented in *Nibia,* where the spatial augmentation of the projection is the key factor that enables its manipulation (its burning) by the interactor.

However, what turns *Nibia* into a paramount example of the perceptual cloud is the realization that a normal, physical lighter *affords burning a digital image.* Moreover, this invocation of the affordance occurs in a seamless, natural manner.

In effect, at the end of chapter 4 we reflected on new media art in a post–technical–awe state. *Nibia* shows that the "*wow reflex*" linked to

every early media appropriation does not constitute a prerequisite for successful new media art proposal.

Postlude

Every concept that we have discussed throughout this thesis is present in the accompanying artworks. It is a true privilege of the hybrid dissertation–exegesis approach the possibility of constructing a theoretical rhetoric while creating artworks that both reflect and interpellate it.

As it was indicated in the prelude to this thesis, the artworks accompanying the dissertation are framed on our longstanding artistic production, and future works will continue exploring interactive new media art from both artistic and HCI points of view.

For example, we will go on investigating on the creation of tools for artistic expression – we are already working on new capacitance–based interaction schemas – with emphasis on new interaction schemas.

We will also continue with some of the research lines posed during this thesis, especially those related to the perceptual cloud and the politicality of new media art.

The perceptual cloud presents an extremely interesting opportunity for both the creation of artworks within its new reality and the elaboration of the rhetoric that analyzes it.

Particularly interesting is the research on the relationship between computational perception and art. We will continue working on face–based interaction, as well as on new modes of representing information.

Similarly, our interests on the politicality of both new media art and interaction design are to be present in future lines of work. We have a particular interest on exploring global processes *from* a peripherally constructed rhetoric.

Ultimately, it does not suffice to say that only new media art "must keep moving to survive", for it is us, artists and researchers, who, in constant movement, attempt try new approaches to the incognizable reality.

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Montevideo, October 2013

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