Computer games to visualize music: a 270 year-old tradition for digital imaginaries

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ABSTRACT
Within the field of game studies, narratological or ludological discourses provide different lights to understand computer games. Yet the digital design space is still young and one might wonder if there are other ways of approaching the design of games? With the purpose of opening a new line of thought, this paper turns to the historic past and examines a 270 year-old tradition called "color-music." Beginning first in 1735 in France, this paper traces color-music through various turns in the 18th, 19th, 20th, and into the 21st century as designers and artists attempted to build machines capable of allowing a user to manipulation visual elements, often in some relationship with music. This paper then uses this tradition to propose a direction for the design of games in which players are given radical control over the graphics engine as they listen to MP3s.

Keywords
color-music, design, music, graphics, history

INTRODUCTION
It is tempting for game designers and scholars to think that turning to the future is the only direction in which one can find creative possibilities. In the world of game studies, for example, there is exploration of games that are deployed in wireless mobile digital networks. The general stance of 'looking to the future' treats games design as one in which the future holds all the cards, so to speak.

But if design is conceived as systematically exploring design possibilities, then we are not bound to fix our eyes to the future. Examining evidence from the past and constructing historical accounts can also open up possibilities for the field of games studies. A generation, raised on computer games, the Internet, and MP3s, will inevitably interpret the world differently than previous generations. Waiting to cross the street, the grandparents see a busy road, the parents see Frogger, and the kids see Grand Theft Auto. The past then is also a player in the world of game design. Give the new digital generation primary source evidence and ask them what they see!

In this paper, I turn to the past in an effort to open possibilities for the future of computer games. In particular, this paper constructs a historical account that can be used by game designers and scholars to imagine new design horizons in the digital space. But first, this paper examines contemporary discussions in game studies and why a new way of thinking about games may be of some use.

NARRATOLOGY AND LUDOLOY

How do we understand computer games? More specifically, what traditions are used to make the nascent field of computer games appear understandable and intelligible? This question is important because to develop an understanding about anything, we inevitably draw on traditions of understandings that predate ourselves (Gadamer 2003).

Amidst contemporary game studies, there is a search for traditions that will open up possibilities for the field. One such approach is narratology which fuses traditions of narrative, drama, and literature. Although narratological scholarship does not view computer games as being isomorphic to narrative, the central features of games are expressed in relation to elements derived from narrative frameworks. Even with some pretty dramatic differences between games and narrative (e.g. interaction, non-linearity) many scholars argue convincingly that narrative is a tradition that can accommodate games. For example, some have argued that our understanding of narrative merely has to expand to include the unique experiences provided by games (Ryan 2001), that games have narrative properties (Pearce 2004), or that games are imbued with narrative possibilities (Jenkins 2004).

A second theoretical approach seeks to retrieve the tradition of games and play as a way to understand computer games. Ludology, the study of games, veers away from literary or dramatic traditions, and focuses on games as a construct that can be understood in its own terms (Frasca 2003). Under this framework, play and games, or in more historic terms, paidea and ludus, become the conceptual starting point for analyzing computer games.

Narratology and ludology provide different ways to interpret computer games. For ludology, the theoretical focus becomes one of agents in systems of game structures that unfold in non-linear time, while narratology emphasizes characters in narrative structures that unfold in linear time. User interaction, the hallmark of computer games, is also conceptualized differently under each approach. For ludology the impetus that drives the user to interact with the computer system are goals. Such goals may be explicit, as in defeating an opponent, or implicit, as in building a simulated city. In contrast, in narratology the user's desire to advance various story structures drives interaction.

Each approach leaves some unanswered questions, however. In adopting narratology, it is unclear whether the goal of authoring a compelling set of story-rules (Crawford 2003) would in fact thwart the goal of engaging users in a meaningful interactive experience (Adams 1999). Furthermore, at an experiential level, many game players don't experience games as stories despite the presence of story elements. Games are… well… games.

Ludology has a different set of limitations. It is unclear whether ludology can point beyond what has been perceived as narrow spectrum of games. Every new generation of game seem to have a striking resemblance at a structural and thematic level, to Doom, Mario Brothers, SimCity, or other ancestors of computer games. Certainly, the games industry unwillingness to take risks is responsible for the lack of innovation in game products rather than ludologically inspired frameworks. But ludology has coupled itself to recent and existing computer games and one can wonder if ludology, as an interpretative and theoretical framework, can open up substantially new ways of understanding the digital realm.

Perhaps what people are searching for are traditions for computer games. Finding useful traditions is important. Traditions open up new ways of understanding the world we inhabit. For those interested in games, there appears to be only three choices: the tradition of narrative, the tradition of games, or some fusion of the two. And it appears that no one is committed to taking

a definitive position[1]. Amidst this state of indeterminism, perhaps there are other traditions worth considering – beyond story and beyond game – that can provide a new way of understanding and thinking about computer games.

This paper provides a historical construction of an alternative tradition that may well inform game designers and scholars. Working from this tradition, this paper claims that a new basis for user-interaction in the digital realm may be found not only in narrative or in games – but in a turn to music.

GAMES AND MUSIC

In 2001, as the 21st century unfolded, Tetsuya Mizuguchi released "Rez" (Sega). The design of Rez was inspired by the Russian artist Wassily Kandinsky (1866-1944) who a hundred years earlier had made a bold attempt to fuse sound and sight through stunningly abstract paintings. Following Kandinsky, Mizuguchi used game technology to fuse techno-music and visual-effects. As a game, Rez guides the user through a 3D Tron-like environment from which streams of enemies confront the user. The techno music is dominant in the play experience and when the player destroys an enemy, musical and visual effects are produced in synch with the beats of the music. Providing a unique mix of game and music, the trailer for Rez describe Rez as:

> The ultimate experience. Unlike anything before. Visual. Sound. Sensory. Splendor. Feel the game. Feel the music. Feel the vibration. Feel the illusion.

This self-stylized view of being "unlike anything before" is actually an underestimation of the significance of Rez's contribution to the field of computer games. By drawing on Kandinksy's goal of fusing sound and color and by attempting to do so through a mechanical design, Rez, as a contemporary computer game, in fact builds on a much older tradition that began in 1735 when a French Jesuit proposed to build an instrument that could create visual effects in relation to music.

A TRADITION OF COLOUR-MUSIC: 1735 - FATHER CASTEL

A long line of thought has questioned the relationship between sound and color. The writers of classical Greek texts, Indian Vedas, Chinese, Persian, and Arabic historic texts have considered how these two sensory modalities relate. In the scientific study of the physical relationship between sound and color, significant discussions occurred towards the end of the 17th century. The debates were chiefly a concerned with the nature and origin of knowledge (Gessinger 1996). At the time, there was speculation that both light and sound were kinds of vibrations thus making it conceivable that there was a direct correspondence between the two. The implications for the then competing theories of knowledge and art were significant.

Within these discussions, in 1704, Sir Isaac Newton released to the public his book, *Optiks*, in which he provided a theoretical basis for the relationship between the musical scale and the light spectrum. While Netwon's contribution was not the finale to the discussions, his work did help spur the imagination of a French mathematician who would make the first attempt in history to create a device that could produce visual effects on principles relating to music.

Father Louis Bertand Castel (1688-1757) was a French Jesuit and accomplished mathematician but his imagination stretched beyond religious or numerical concerns. In 1735,

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[1] http://www.ludonauts.com/index.php/2005/02/25/p208

amidst international debate about a theoretical relationship between light and sound, Castel proposed the design of a device that could render a sound-color relationship in a mechanical design space. The instrument, an "ocular harpsicord", itself was based on the clavecin, an early form of the piano. Castel describes the clavecin:

> What is a clavecin? It is a set of stretched strings which sound in their length, and in their thickness, a certain harmonic proportion. They are sounded by means of a little tangent which picks them, producing the divers tones and chords of music.

Having described this sound producing instrument, Castel continues and describes the "ocular harpsichord" as an instrument that produces color:

> Now the colors follow the same harmonic proportions. Let us take just as many of them as needed to form a complete keyboard and dispose them in such a manner that by applying the fingers in a certain way, they will appear in the same order and the same combinations as the corresponding sounds do to their own touches. (quoted in Mason 1958, p.109)

Castel proposed the creation of the first of a long line of "color-organ", an instrument that is designed to produce visual effects in some relation to music. To understand how radical a proposal Castel was putting forward, it is worth quoting his description of the ocular harpsichord at length:

> One could make a play of all sorts of figures, human and angelic animals, flying creatures, reptiles, fishes, four-footed beasts, even geometric figures. One could, by a simple play, demonstrate all the concord of the Euclidian elements. One could make a play of fantastic figures, of hippogryphs, of centaurs, etc., allegorical figures, muses, dyrads, naiads, etc. Or one could make a play of flowers, taking the rose for the color rose, the coxcomb for the purple, the violet for the violet, jonquils for the yellow, marigolds for the gold, so arranged that each stroke of the hand of the keyboard would represent a flower-bed and the result of playing would be a moving diversity of animated flower-beds…. Who would doubt then, that in place of a simple color one could place an assortment of colors, and even a complete picture, a landscape, a historic scene, a scene from comedy or tragedy, something grotesque, marionettes on a string, and other things… If all of Paris used the color clavecin, to the number of 800,000, one could, without much exercise of invention and imagination, make them so that there were not two which resembled each other, and that without costing more than making them all alike. (quoted in Mason 1958, p. 112)

In this 270 years old quote, we see a vision of a user manipulating a keyboard that controls an array of visual effects: colors, flowers, mythic-characters, and environments. At a time when tapestries, paintings, fashion, landscaping, and architecture were dominant modes of visual aesthetics, the vision Castel was proposing was a radically new visual aesthetic.

Considering that significant feats in electrical engineering would not occur for over a hundred years (and digital video boards over 250 years away) Castel was working in a severely limited design space. An exact description of Castel's machine is difficult to find, but it appears that the hardware of his initial prototypes was comprised of prisms, candles, mirrors, and colored paper (Gessinger 1996). These technical limitations of the 18th century were simply too much to realize the requirements of Castel's color-organ.

Castel's proposal instigated much debate. The proposal of a color-sound relationship challenged the epistemological and aesthetic positions of the Enlightenment. Major figures of Western culture's intellectual canon scrutinized Castel's proposal. Voltaire (1694-1778), Rousseau (1712-1778), Diderot (1713-1784), and Goethe (1749-1832) challenged the idea of a color-sound relationship. Considering the theoretical discussions of the time an unavoidable problem for the color-organs acceptance, , may have been for Castel to justify the design of the ocular harpsichord on a theoretical framework that speculated a relationship between color and light. The idea of a color-organ thereby became caught up in debates about Newtonian physics, theories of knowledge, and aesthetics (Gessinger 1996). As will be discussed later, subsequent designers of color-organs did not believe that it was necessary to have a theoretical relationship between color and sound to justify their designs; they were confident that the aesthetic value of playing color-instruments was a sufficient reason for pursing their designs.

Beyond the philosophical discussions, Castel's proposed design had followers amongst the more mechanically inclined. In 1743, Johanne Gottlob Krüger wrote an essay "On new music that pleases the eye" in which he described the design of an instrument that also controlled light. His design was modestly more advanced than Castel's in that it more drew more strongly on optics. In 1757, the year of Castel's death, a model of an ocular harpsichord was unveiled across the English Channel in London. In this newer version, the instrument consisted of "a box with the usual keyboard in front and 500 lamps behind a series of 50 glass shields which faced back toward the player and the viewer" (Mason 1958, p.115). In 1789, Erasmus Darwin (1731-1802), grandfather of Charles Darwin proposed to create such an instrument using oil lamps and glass filters.

Innovations in light-producing technology in the 19th century allowed inventors to modify the designs of color-organs. In 1869 Frederick Kastner of England developed an organ called a "Pyrophone" which used gas-powered jets to provide both light and sound. As Kastner was developing his version of a color-organ, across the Atlantic Ocean in the USA, Brainbridge Bishop was developing his own machine. In Bishop's design, a screen was attached to an organ and as the organ was played, colored light was blended on the screen. From a modern perspective, Bishop's design bears a striking resembled to contemporary music-visualizers that plug into digital music players (e.g. Winamp's AVS).

The most notable color-organ of the 19th century was patented in 1893 by Alexander Wallace Rimington (England). At a design level, his machine was powered by 14 arc lamps and stood over 10 feet tall. Rimington was convinced that there was some theoretical relationship between color and sound and he wrote on this subject extensively. Remington also helped popularized color-organs through public performances of his machine.

20th Century: Color-organs and light manipulation

As the 19th century unrolled, color-organs continued to intrigue artists and inventors. Russian composer, Alexander Scriabin's symphony, *Prometheus* was performed in Carnegie Hall. *Prometheus* was unique in that the Scriabin's composition called for the performance of a colored light projector to accompany the musical instruments. A color-organ was specifically designed for the New York performance and General Electric supplied the tungsten lamps that were needed for the color-organ (Plummer April 10, 1915).

During the early 20th century, electrically powered light was the new technology on the block. With such a new technology so widely available, designers and artists of color-organs proliferated throughout the western world. There was Mary Hallock Greenwalk (USA), Adrian Klein (England), Leonard Taylor (England), Alexandar Hector (Australia), Achille Ricciardio (Italy), Richard Loustom (USA), Zdeneck Pasanek (Czechoslavakia), Alexander Laszlo (Germany), Ludiwig Hirsch, and Oskar Fischinger. These designers were distinct from previous designers of color-organs. Unlike Castel or Remington, "most instruments built during the early decades of [the 20th] century were not intended to express direction association [between light and sound]" (Peacock 1988, p.403)

The most influential of the color organs of the 20th century appears to have been Thomas Wilfred's *Clavilux*. Like his contemporaries, Wilfred "completely rejected theories that presumed a correspondence between light and sound" (Peacock 1988). For Wilfred, the term color-music was a metaphor for his device and art. Wilfred popularized the device on a series of tours in Canada, the USA, and Europe. In the 1930s Wilfred even produce a *Home Clavilux* (Levin 2000) which bears a striking similarity to a video game console. The *Home Clavilux* appeared nearly 200 years after Castel's first proposal for an ocular harpsichord and 42 years before the first home gaming system, the Magnavox Odyssey, was released.

But the 1930s also saw the advent of broadcast television and talkie-movies. Color-organs, still a highly mechanical art, surely were no match for the creative possibilities of film. Artists such as Norman McLaren, Oskar Fischinger, and Walter Ruttman, were interested in the directly etching color-sound designs onto film itself. And as the 20th century continued to unfold, the booming television and movie industries cast a towering shadow over color-music projects.

With the invention of laser technology in the 1960s, a new means became available for coupling light producing technology to music to create a fusion of sensory aesthetics. Rock concerts and music clubs make heavy use of color-music in the throbbing light shows that accompany the shows. It is almost impossible to image mainstream concerts that do not integrate light manipulation into their performance. Color-music may not dominate the airwaves or the silver screen, but it is in the concert halls.

With the popularization of personal computers, artists began to create software programs that explored the relationship between color and music. Like previous historic attempts, these systems have concerned themselves with establishing a direct relationship between music and visual representations (Pocock-Williams 1992) or allowing the user to create visual effects that are responsive to user manipulation (Levin 2000; Mueller 1999). And now, most personal computers music players come equipped with a music visualizer.

21st Century: Computer games and color-music

With the release of Rez in 2001, the nearly 300 year-old tradition of color-music has manifested itself in the digital design space of computer games. Rez provides an example of how computer games have the potential to work from the tradition of color-music, a tradition that has

sought to give users control of visual aesthetics, often in some relationship to music. Viewed as part of this older tradition, Rez allows game designers and scholars to potentially blend three traditions to understand their field of study: narratology, ludology, and color-music.

How might one begin to work from the color-music tradition? There is a risk latent in working from color-music. Scholars may be tempted to debate the validity of a color-sound relationship while designers may be tempted to develop systems that seek a correspondence relationship between sound and color. Such projects, I believe would risk taking a tradition too dogmatically. Traditions are meant to open up possible paths for action rather than dictate rigid paths of action. A color-music tradition can simply be a guide for thinking about possibilities that may exist in a digital design space.

With such a cautionary note, a first step might be to begin by imagining how modern game designers might translate Castel's vision of a "play of fantastic figures" or "play of flowers" into the contemporary semiotics of computer games. The computer keyboard could be used to produce visual effects that have an aesthetic value in some relation to music. Without digital technology though, Castel's imagination would have been limited. One can easily draw on high-end computer graphic and sound engines to envision more creative possibilities arising within a digital design space. For example, one might imagine a user setting up a game environment with various scenes and landscapes after which they load the game with their favorite MP3s. Having setup the game world and selected their music, the user could use an avatar system to make their character morph, soar, or leap through fantastic vistas as the song reaches its dramatic peak and a controllable camera system could allow the user to swirl through the shadowy streets of a moonlight city as the song slows down. From this perspective, the central interactive metaphor that could guide design is not the structure of narrative, the structure of games, or a blend of the two. Instead, the basis of user-interaction is the player's response to music. Mainstream music meet computer graphics meet user-interaction.

What might be the role of history in game scholarship? In his conclusion of a brief review of the history of color-organs, Kenneth Peacock writes:

> Every generation, it seems, must re-discover and re-define the art of color-music for itself. And rarely does there appear to be awareness that previous activity has occurred" (p. 406).

The purpose of this paper was to provide a brief historical account of color-music and as such, create a resource of game scholars and game designers that can be used to avoid Peacock's warning of a neglect of the past. In the world of technological innovation, the past is often overlooked for a source of ideas. Yet the explicit, strategic, and dedicated use of evidence from the past is crucial for the development of any scholarly field. For game scholars and designers, history needs to be seen as a bristling source of possibilities rather than being viewed as somehow antagonistic to innovation and creativity. As has been said, creativity always builds on the past..

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