Levels of Sound: On the Principles of Interactivity in Music Video Games

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ABSTRACT
This paper gives an introduction into the principles of interactivity in music video games. Music video games are an old but small genre of games. The earliest direct ancestors emerged in the 1970ies. Some recent music video games were hugely successful. Until today, there are only a few different approaches to their design. The purpose of this article is to shed light on what these design principles are, and how the player is immersed. By analysing several games qualitatively, we extracted certain typical features of games of this genre: active scores, rhythm action, quantisation, synaesthesia, play as performance, free-form play, and sound agents. All these aspects of music video games are discussed in this paper with the aim of describing how they affect the interactivity of the games. The result is a grammar of the language of music video games. Linked to adequate metaphors, this grammar can build a veritable repository for rhythm based, melodically interactive games and digital electronic instruments.

Author Keywords
Music Video Games, Rhythm games, Immersion, Performance, Synaesthesia, Instruments

INTRODUCTION

Looking at the last years of video games, there are some outstanding genres of games. MMORPGs and First Person Shooters rule the media, while very traditional genres - sports games and jump 'n runs - dominate the sales charts. Yet the one type of games that opened itself up to experimentation like no other (except maybe non-games or serious games) is the music video game. From its humble origins (e.g. Otocky, published by ASCII Corporation in 1987, or To be on Top by Rainbow Arts, 1987) to its current manifestations, this genre always refused to be uniform. Much more, some of the most astounding and surprising game releases of the last year were music video games: The mainstream appeal of Guitar Hero (Harmonix 2005) and the artful experience of Electroplankton (Nintendo 2005, see Nintendo, 2005) are just two examples. This paper aims for clarifying what sets music video games apart from other games, how they relate to musical instruments, and how they are experienced.

There are two labels applied to different audio games. They form two overlapping categories. One is the rhythm game, with FreQuency, Amplitude (both by Harmonix, published 2001 and 2003 respectively) and the aforementioned Guitar Hero as prominent examples, the other could be referred to as electronic instrument game. Popular examples of the latter category are Electroplankton and Sim Tunes (Maxis 1996), both designed by Toshio Iwai. There is also a vast number of audio art pieces that constitute themselves as games, with Fijuu by Julian Oliver and Small Fish by Masaki Fujihata among the best known. These art pieces are either installations or games that are distributed outside the commercial context of the gaming industry. Fijuu is Open Source Software and Small Fish is an interactive installation and a multimedia CD-ROM. The kind of work that Small Fish belongs to is sometimes referred to as Active Score Music[1].

On the first glance the main difference between rhythm games and electronic instrument games is that a rhythm game is primarily played by comprehending the rhythm the game sets. The player has to smash buttons in a rhythm provided by the game. As progress is made the game successively increases the speed and complexity of the rhythms. Success means that the player's actions were close to the rhythm. Thus, success can be measured, assessed, and expressed in a score. This score can be compared to that of

[1] "Active Score Music" was the name of a performance event at the Ars Electronica Festival on September 5, 2000, featuring works by Masaki Fujihata and Golan Levin, with support from Wolfgang Münch, Gregory Shakar, Kiyoshi Furukawa, and Scott Gibbons.

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a different player, allowing for competitive play. Electronic instrument games are different in all regards. The rhythm - as well as in most cases the melody - is generated by the player. She plays the game as an instrument. The game provides - or at least pretends to provide - all the freedom of expression that a musical instrument calls for.

There is a last group of musical games that needs to be mentioned: Musical puzzles or challenges in games. The Legend of Zelda (published by Nintendo from 1986 onward) is well known for its musical puzzles. Especially the sequel Ocarina of Time (1998) sported numerous musical puzzles and even features the name of an instrument in its title (Whalen 2004). The graphical adventure game LOOM (Lucasfilm Games 1990) even relied on a musical instrument as the only interface for the player. In order to interact with the game world, the player had to play tunes that magically affected the universe. Pidkameny (2002) gives a detailed overview of the history of video game music.

Before taking a closer look at music video games, an analysis of what constitutes a musical instrument and why some games are instruments in one regard or the other follows.

GAMES AS INSTRUMENTS

One could argue that an instrument is any device that produces sound. Actually, this device only gets an instrument if music is played on it. Thus, interactivity creates instruments from any physical device. Some instruments are traditional and some were newly invented in the last years. Some musicians play on devices not designed to be instruments, while others augment their traditional instruments to elicit new kinds of sound. Some instruments offer a wide array of possibilities. They can be played in numerous ways. On the other hand, some constrain the musician in a way that enforces a very specific mode of playing them. Some instruments are easy to master while others are inherently complex and require years of training before a simple melody can be played correctly. All but the most limited instruments are indefinitely masterable; most are immediately accessible (Levin 1994, p. 56). Instruments resemble toys much more than they resemble games. However, contrary to toys, mastering an instrument is part of the challenge it imposes. Many toys are played in an explorative way and instruments can be played in that way, too. According to Scott Kim, (Kim 2004) games are mere toys plus challenges and goals.

A rather naive but plausible account on differences between different musical instruments can be found in the following quote:

»A violin is less restrictive than the piano because it has no fixed keyboard; the violin can play many more notes than a piano. Yet, both piano and violin are more restrictive than a synthesizer, because they each have a distinctive sound, while the synthesizer can produce the sounds of most traditional instruments and many non-traditional ones, like sirens or wind effects. The synthesizer, more than an instrument, is a "sound processor." The synthesizer player has control over an enormous palette of sound sources, in addition to the infinite range of combinations.« (Kurtz 1998)

Kurtz mixes the capabilities of the instrument - constrained or open - and those of the interface. For games, both are important, too. The interface of a musical instrument can be limited to a fixed keyboard or other mechanisms of restriction. On the other hand, it can allow for as much freedom as it is the case in the aforementioned violin, or the electric guitar. In traditional (analogue) instruments, the interface directly corresponds to how the music is produced. Yet, in the case of electric or electronic instruments (and synthesisers can be both), these two aspects are detached. The mapping between interaction and produced output is designed and arbitrary. Tradition is more important than physics. Electronic instruments are designed to be played in a specific way. Their designers are usually influenced by prevailing instruments. This pattern of design lead to e.g. the Tenori-On, a tracker-inspired instrument by Toshio Iwai. Trackers are a type of music composition software that allows for a very fluent but constrained way of composition. Being most popular in the 1980s, Trackers are only used by a minority of composers nowadays. The Tenori-On can be regarded as the first real-time tracker hardware. While it is no game in the usual sense it does qualify as a toy and features a prime playful interface.

Playing the Tenori-On means devising a score and having it played by the instrument on the fly. The main achievement of the instrument is that it turned the score into the interactive interface to the music. The same pattern can be found in Toshio Iwai's music games Sim Tunes and Electroplankton. In Sim Tunes, the player - or composer, or musician - lays out a score on a two-dimensional surface. Then she pours so-called musical insects on the surface and these are playing the score. The insects wander across the surface and once they hit a play element, they act accordingly by altering their movement and/or emitting sound. Electroplankton consists of ten distinct musical games each named after a specific plankton (Nintendo, 2005). While most of the modes are played by directly affecting the planktons, in four of them (Tracy, Hanenbow, Luminaria, Beatnes) the player can only interact indirectly. She controls the world and the planktons react to it as to a musical score just like in Sim Tunes. Since the interaction

with the score is done in real-time, the music produced is Active Score Music.

Active Score Music

One of the ancestors of active score music was Wolfgang Amadeus Mozart. He allegedly devised a waltz game called "Das musikalische Würfelspiele" (the musical dice game) in the 18th century (Jones 1991, Noguchi 1996). Using pre-composed sequences of waltz, and random introduced by rolling the dice, a player of the game was able to compose a new waltz. While Mozart worked with traditional musical notation, composers of the last century ventured beyond what could be expressed with it. In 1959, the composer Karlheinz Stockhausen wrote the "Refrain for three performers", a piece featuring a score with a cyclic refrain and a number of transparent stripes with notes printed on them that can be attached to a pin in the centre of the score. The musicians were advised to rotate the stripes around the central axis so that the moment where the notation on the stripes interferes with the refrain's score is different from performance to performance. Stockhausen commented his departure from conventional notation:

»There was, at the beginning of every new composition, an inner vision to discover a world, which I had never experienced before. I thought, "How can I ever, with the means and with the notation and with the technique of this planet realize this?" And then it became a translation. Most of the time I have invented new notations… to approach at least to some extent what I had innerly experienced.« (Stockhausen, quoted in Duffalo 1989)

Mozart devised a concept for a score that can be adapted for each performance, turning everyone into a composer. Stockhausen composed a score that could be altered and thus differently interpreted by the musicians before the performance. Active Score Music completes the idea of the adaptive score by composing in real time. Many media art pieces feature active score music. Masaki Fujihata's Small Fish and Toshio Iwai's Composition on the Table are popular examples. Interestingly, Composition on the Table is the blueprint for the Luminaria plankton in Electroplankton.

Rhythm action

At the time Karl-Heinz Stockhausen helped laying the foundation for electronic music, new technologies like the tape recorder and the synthesiser were rapidly changing the capabilities of a composer. The tape recorder brought a development to perfection that gained widespread popularity due to the African influence in jazz music: repetition.

»Improvisation, of course, so fundamental to the very idea of jazz, is "nothing more" than repetition and revision. In this sort of revision, again where meaning is fixed, it is the realignment of the signifier that is the signal trait of expressive genius. The more mundane the fixed text ("April in Paris" by Charlie Parker, "My Favorite Things" by John Coltrane), the more dramatic is the Signifyin(g) revision. It is this principle of repetition and difference, this practice of intertextuality, which has been so crucial to the black vernacular forms of Signifyin(g), jazz--and even its antecedents, the blues, the spirituals, and ragtime…« (Gates 1988)

Today, repetition is not only the main building block of a number of musical genres - e.g. jungle, hip-hop, and techno - the careful balance of repetition and variation is also the base of most rhythm games. Yet, how exactly repetition and variation are found in a rhythm game depends. In Rhythm Tengoku (Nintendo 2006) variation means that the whole game is structured into different minigames featuring different settings, interactivity, music, graphical styles, and rhythms. Every single game is very homogenous in itself, with melodies comprised of not more than five or ten notes offering a single repetitive interactive task for the user. Elite Beat Agents (Nintendo 2006) even features only a single way of interacting with the on-screen action: tapping the Nintendo DS's touchpad at the right spot in the right instant. Both games feature a storyline, arbitrary and self-contained in rhythm Tengoku, sequential and all-important in Elite Beat Agents. In both games, the story and setting as well as the displayed on-screen action are crucial for the gameplay experience. They do not only set the frame for the interactivity, as it is the case with Rez and Electroplankton but also lure the player to the next level or the next challenge.

Rhythm games offer little freedom of expression apart from the prerogative to perform while playing. They strictly force rules on the player on how she has to react to a specific stimulus displayed on screen or communicated by sound. Unlike active score music, players are not building their own environment of sound. Players achieve a score and beat the challenges of the game. All rhythm games are linear in their setup. The player starts with a simple rhythm and uses only a fraction of the capabilities of the interface. Later, as more experience with the game is gained, new tracks are made available or the simple rhythm is anatomised into a more complicated. Progress means learning to interact faster and with rhythms that are more complex. The principles of rhythm games are in fact as old as video games themselves. The first popular known installment of a rhythm game as an electronic toy can be found in Simon, a game by Ralph Baer, published in 1978 (Edwards 2006). Interestingly, Simon is a remake of the

Atari Touch Me arcade game from 1974[2], which was released as Atari's first handheld game console in 1978. All three games were based on the same principles: The game has four buttons and four lights. Each light and button has an associated sound. The game flashes the light (and plays the sound) in a specific pattern. The player has to repeat the pattern, tapping the buttons in rhythm.

Quantisation

The basis of most rhythms is quantisation, the process of aligning a note to conform a grid. Quantisation limits the musician in her expression but greatly eases making listenable music. The technique can be found in Sim Tunes, Electroplankton, and Rez. An account on the effect of quantisation on popular culture is given in Stephen Janis text on the quantised culture:

»This means, that despite the fact that digital technology has liberated us from the synchronized rigors of the mechanical clock, we have in a sense ceded our timing to the new forms of precision embedded in the variant idioms of popular musical culture.« (Janis 2005)

Most action music games work exactly the opposite than rhythm games. Instead of requiring the player to press a button to the beat, the player can fire at any moment and the sound is aligned to the beat by the game. Rez is an easy and straightforward shooter games. The challenge is not to hit the beat but to create a steady flow of sound. The game cannot be played as an instrument in the default arcade mode, but an experienced player navigates through the musical capabilities of the game while still successfully playing the shooter presented as the surface of the game. The player acts on two levels: she plays a shooter and she reacts to the beat of the music game behind the shooter. Rez provides an immersive environment by tightly coupling visual and acoustic sensations. Every shot is a particle of sound; every beat is felt through the vibration of the controller, every enemy encountered is a reason to pump a wave of techno music into the air:

»I had many inspirations for Rez, particularly from rave culture. When I first saw a rave party in about 1993 there were many people dancing, and it was like they were jumping in time to the music. I had a big, big flash, and suddenly I just remembered about the concept of synaesthesia.« (Mizuguchi 2007)

Synaesthesia

Mizuguchi notes Vasily Kandinski as the other notable influence beside rave culture (BBC 2002). Synaesthesia is an involuntary neurological state in which different sensations are coupled (see Cytowic, 2002 for details). Kandinski reported his synaesthetic experiences himself:

»The violins, the deep tones of the basses, and especially the wind instruments at that time embodied for me all the power of that pre-nocturnal hour. I saw all my colors in my mind; they stood before my eyes. Wild, almost crazy lines were sketched in front of me .« (Kandinsky 1913, p. 364 after Campen 1997).

Levin (1994, p. 21ff) gives a detailed account on the history of technologically realised synaesthesia. While most early experiments in audio-visual instruments were challenging the problem of how to produce the fitting acoustic representation of a colour, games already established a very developed visual organisation. The problem Mizuguchi was facing was thus »... how can we create a groove interactively? This is the basic core of the game design, the basic response.« (Mizuguchi 2007). The predominant technique for embedding sound in video games is to have a layer of background music and to synchronise the onscreen action with fitting samples. Annabel J. Cohen (2000) suggests that humans perceive anthropomorphic behaviour in objects that feature motion accompanied by synchronised sound. Since this effect was first used in animation movies it is often referred to as "mickey mousing". Mickey mousing dates back to the time when pianists were accompanying silent movies. The technique does not involve samples of the physical object depicted in the game, but an imitation or exaggeration of the sound this object would produce. Mickey mousing is but one way of allowing for immersion of the player. While mickey mousing contributes to the pleasure of immersion by reliably providing feedback to the player, Rez offers an engaging but looser association between the on-screen action and the players interactivity. Douglas and Hargadon (2001) describe the principles of immersion and engagement as the key factors of player involvement, ultimately leading to a flow experience introduced by Csikszentmihalyi (1990).

Apart synaesthesia there are other ways of involving the player. The object of the game Vib Ribbon by NanaOn-Sha (1999) is to guide a female rabbit called Vibri along a line, a ribbon populated with obstacles the rabbit can pass by by pressing the correct button at the right time. The obstacles correspond to the sound track. The interesting aspect of Vib Ribbon is that the whole game fits into the RAM of the PlayStation. Through that, the player can eject the game CD-ROM and insert an audio CD. The audio CD is analysed and the level is built on base of a track. While the

[2] see http://www.atarimuseum.com/videogames/arcade/arcade70.html for details