Interactivity and Music in Computer Games

Michael Liebe

Music and computer games share a long joint history. The convergence of games and music manifests itself on various levels, be it commercial, structural, perceptual or artistic. Music games create new forms of experiencing music; computer games allow for experimentation with sounds and melodies in a safely guided context with multiple forms of positive feedback. Gaming itself is supported by quests, goals, scores, interfaces, rules, and mechanics. This medial form of interacting with music is unprecedented.

Indeed the very first computer games, *Tennis for Two* (1958) and *Spacewar!* (1962), were silent. The 'mother' of all home video game consoles, the *Magnavox Odyssey* by Ralph H. Baer, as well as the *Pong* (1972) predecessor *Table Tennis* (1972), also had no sound. The director of the "Computer Games Museum" (Computerspielemuseum) in Berlin, Andreas Lange, actually assumes that this lack of acoustic feedback was one of the reasons for its economic failure. The first arcade games produced for a mass market such as *Computer Space* (1971) and *Pong* (1972) had integrated sound – albeit in a very rudimentary form (Collins 2008: 8). Yet this feature was rather relevant for the intuitive understanding and the attractiveness of the games, especially of *Pong*. The distinctive 'pong' sound of the machine marks the status of the game: i.e. the 'pong' sound is played when the ball is hit with the paddle, and the ball bouncing off the upper or lower border causes the same sound, while missing the ball causes noise. But these acoustic features are still not music.

In the course of the continuous improvement of computer technologies, the use and quality of sound in games increased. With the technological possibilities, the compositional effort greatly improved as well. One of the first games in which a rudimentary form of music (rhythm) and gameplay coincided was *Space Invaders* (1978). The alien invaders had one simple tactic: "change direction and increase speed!" (Futurama 2002) The aliens did so continuously, creating rhythmic, drum-like music. Yet the sounds of this game had more than aesthetic reasons: at the same pace as the speed of the aliens and the rhythm increased, so did the tension of the players.

Since then a lot has happened. Computer games today are fully-fledged audio-visual experiences covering a wide range of play forms from casual sport simulations to epic role playing adventures. One very specific and yet diverse genre is the music game. In the context of this text, music games are taken as computer games

P. Moormann (ed.), *Music and Game,* DOI 10.1007/978-3-531-18913-0_2,

in which music is a main factor of the way the game is experienced or played. Music can be one of the main reasons for the pleasure and fun of the game. It can be the main topic of the games' fiction, form the main challenge of the game, or be generated during playful interaction with the software, thus turning the game into a sort of musical instrument (Spehr 2011).

1 Selection of paradigmatic music games

At the "A MAZE. Interact" festival in the HBC in Berlin (2010), a selection of milestones in the history of music games were exhibited. As an introduction to the broad field of music games, I wish to give an overview, in chronological order, of the games that could be played at the exhibition. Over time, music games have created a very extensive field with numerous different game mechanics, themes and interfaces. These examples show the broad variety of how music and computer games converge, be it in aesthetical, performative, commercial or other means.[1]

Moondust (Creative Software, Commodore 64 (C64), 1983)
As a precursor to its genre, *Moondust* is a generative music game similar to *Electroplankton* (2005, see below) that combines gameplay with evolving ambient soundscapes. Jaron Lanier is one of the pioneers of digital media art as well as the open internet movements. With this game, he managed to make the most typical computer game action of collecting points synaesthetically appealing. The more successful the input of the players, the better the audiovisual feedback of the game.

Otocky (Ascii Corporation, Famicom, 1987)
Introducing music-dependent gameplay to the video game world, this shooter game lets players melodize their game actions in an abstract voyage through space. There is an additional layer of sound that is activated while shooting enemies or collecting points. The longer the players play, the better it melts in with the rhythm and melody of the background music. Its cuteness is intriguing, but at the same time – somewhat typical for Japanese console games of the period – it is rather difficult to master. It was never released in Europe.

Loom (Lucasfilm Games, PC, 1990)
Using music patterns as the main ingredient for player actions and riddles, this graphic adventure exemplifies a departure from classical control schemes in the point-and-click adventure genre. Instead of fighting their way through the

[1] The following descriptions are heavily based on the catalogue entry written by Arjan Dhupia for A MAZE. Interact (2010).

challenges, players have to learn to read music and use special tunes in order to overcome the tasks of the game.

PaRappa the Rapper (SCEE, PlayStation, 1996)
This game by Masaya Matsuura is a truly Japanese product. The Hip-Hop game stars a paper-thin two-dimensional dog called Parappa which is engaged in numerous rap battles. The gameplay is based on a call and response format: the dog raps a sequence and the players have to press the right buttons in the same order and rhythm as presented by Parappa. Accuracy is rated from "U rappin' AWFUL" to "BAD" and "GOOD". "U rappin' COOL" is only given to players who know how to freestyle.

Dance Dance Revolution (Konami, Arcade, 1998)
As part of the pioneering Benami series, *Dance Dance Revolution* brought physical dancing action into arcade halls. Just as in the later *Guitar Hero* games (2005, see below), visual signals appear according to the rhythm of the ingame music. It is the task of the players to hit the right button at the right time on sensor-equipped dance mats. Instead of the typical hand-eye coordination, this game depends on ear-feet coordination. Physical action is the key. Due to the possibilities of actually dancing on the mats and improvising movements or performances if the game mechanics are mastered well enough, whole communities with tournaments or show-playing events emerged around the game.[2]

Space Channel 5 (SEGA, PlayStation 2, 1999)
This game was initially designed to appeal to casual female gamers and promoted the use of dance music as a core element of play. The tunes and dance movements are activated through the standard PlayStation controller. The aim is to free hostages by copying the dance steps of alien intruders. A feeling for rhythm and a good memory for sound sequences are the key to success. When the choreography is mastered, the aliens disappear – a unique game concept making dancing a weapon.

Vib-Ribbon (SCEE, PlayStation, 2000)
This game is the literal meaning of the phrase 'playing a song'. Any chosen personal music track is translated into a game level of sound-related obstacles. Just pick a music CD off the shelf and insert it into the PlayStation console. Choose a song and the game's algorithms will create a unique level based on the rhythm of the track. There are four different obstacles, to each of which a button on the standard Play-Station controller provides the appropriate movement of the game figure.

[2] See, for example: DDR Freak (2011, http://www.ddrfreak.com/).

SingStar (SCEE, PlayStation, 2004)
Sony's cross-marketing of in-house music licenses turned video game consoles into karaoke machines long before the rise of TV casting shows. To many people *SingStar* does not count as a computer game. Nevertheless, the microphone and software of *SingStar* track the voices of the players and the program gives points according to the accuracy of the singing. It turns sing-along community nights into a game with the potential for competition and tournaments. New compilations for the game are still being released on a regular basis, making it a relevant distribution channel for popular music.

Electroplankton (Nintendo, Nintendo Double Screen (NDS), 2005)
Originating in an interactive art installation, this game defies boundaries between game, art and business. The player manipulates various underwater landscapes with the "Stylus" pen on the touch screen of the NDS in order to create dynamic musical compositions. There are ten different game modes, each with an individual rule-set and game mechanic.

Osu! Tatakae! Ouendan! (Nintendo, NDS, 2005)
Make people happy! The J-Pop fuelled story of a male cheerleader dance group that is rhythmically cheering for various troubled people. It is heavily inspired by Japanese popular culture containing a track list of 15 J-Pop classics. The "Hey! Fight! Cheer Squad" was localized by Keiichi Yano and his company iNiS for the western market as *Elite Beat Agents*, released in North America in 2006 and in Europe in 2007. It replaced the male cheerleaders with Blues Brothers-like special agents. Players use the touch screen to hit, drag or spin markers that surround the cheer squad. Each level is accompanied by a specific song.

Grand Theft Auto IV (Take 2, Xbox 360, 2008)
In this blockbuster title, contemporary music and subculture are the main aesthetic elements. In-game radio stations with more than 200 licensed songs composed by celebrities such as Iggy Pop or Karl Lagerfeld provide the soundscape for this critically acclaimed satire on the American way of life and catapult the players into a dismal version of New York. Moreover, cooperation with Amazon.com and later iTunes makes the game a successful marketing platform for the featured artists. It is less about playing the music, but more about playing with the cultural intersections of city life, car radios and contemporary music selections.

Patapon (SCEE, PSP, 2007)
In this mobile game, rhythm meets real-time strategy. As in archaic times, attacks are orchestrated by talking drums. In order to succeed, the players must perform an ongoing 'Patapon' (a combination of two Japanese onomatopoeia for clapping and

knocking) repeated in various rhythmic patterns. An elegant solution to the problem of how to make simple, rhythmic combinations by letting players press the left and right shoulder buttons of the PSP in order to give orders to the troops. The better the players keep up with the rhythm of the battle, the more ecstatic the little black troops get and the stronger they fight.

Rez HD (SEGA, Xbox 360, 2008)
Featuring tracks by artists such as Ken Ishii and Coldcut, this abstract shooter game weaves together mesmerizing electronica with game flow. Guided by the concept of synesthesia, rhythmical usage of the controller, successful mastering of the challenges of the game, visual appearance and dynamic musical output all merge into a holistic, interactive, audiovisual experience. Players can aim at several targets in a row to create complex chain reactions through which the algorithms of the game create extensive soundscapes. The HD version for the Xbox 360 is a pimped-up version of the original from 2001, made by United Game Artists for the Dreamcast and PlayStation 2. The designer, Tetsuya Mizuguchi, was inspired by European techno and rave festivals of the 1990s.[3]

Brütal Legend (EA, PlayStation 3, 2009)
This ultimate exploitation of Heavy Metal subculture comes with support from Hollywood actor, Jack Black, as the head-banging protagonist equipped with a powerful electric guitar. Basically, the whole game-world is the ultimate voyage into heavy-metal fantasies and seemingly endless playlists of heavy-metal classics. The gameplay itself is not especially melodic, rhythmic or musical, but, every now and then, the protagonist has to use guitar riffs in order to call for backup or order his troops to strategic positions. The guitar also counts as a special weapon for which again riffs have to be played by pressing certain buttons on the standard controller in the right order and speed.

Rhythm Paradise (Nintendo, NDS, 2009)
This being a collection of mini-games that extracts rhythmic tasks from everyday sounds and situations. Gameplay is inspired by the Wario Ware titles. It exclusively uses the NDS touch screen as the input device. The capability of the players to stay in rhythm while touching, swiping and flicking the touch pen over the screen is ranked and rewarded with additional mini-games. The game uses original music.

[3] Tetsuya Mizuguchi released *Child of Eden* (2011) after the editorial deadline of this text. But the game would have been worth analyzing in more detail. It adds the Microsoft Kinect interface to the *Rez*-like gameplay. Instead of pressing buttons as in *Rez*, the players of *Child of Eden* wave their hands and bodies to the rhythm of the game.

DJ Hero (Activision-Blizzard, Xbox 360, 2009)
This alteration of *Guitar Hero* includes almost 100 mixes from artists such as Daft Punk and DJ Shadow – all to be performed live on turntable-interfaces. It is another milestone in the commercial convergence of games and music. It opened a new distribution channel for Hip-Hop and related club music – until then not really exploited by the *SingStar* (2004), *Guitar Hero* or *Rock Band* (2007) series. The interface uses the same principles as *Guitar Hero,* where, depending on the musical tracks, the players have to press certain buttons on the plastic turntables at exactly the right time. The effective performance of the players is measured and high-score lists can be shared online.

The Beatles: Rock Band (EA, Xbox 360, 2009)
This version of the *Guitar Hero* extension *Rock Band* is the culmination of the economic convergence of the game and music industries: a life-sized plastic set of musical instruments combined with the most profitable music franchise ever - The Beatles. Using interfaces shaped as a microphone, guitar, drum-kit and a bass guitar, a group of players can play 45 of this world famous band's original hits.

2 Forms of music in computer games

As can be seen in the list of games above, the divergence of types of music games is broad. Yet, from a technical perspective, they all depend on digital computer technology based on the same structures and principles. The computer has two main characteristics on which game programmers and developers can concentrate. These are *procedurality* – referring to the ability to compute fast and efficiently – and *capacity* (or "encyclopedic scope" as Janet Murray calls it [1997: 71]) – referring to the large amount of data a computer can handle and store. Music in computer games can be generated by using two quite different methods: either it is coded in algorithms and is activated or generated procedurally in line with the gameplay actions, or it can be stored in files which are played back by the program in predefined situations.

The media philosopher, Janet Murray (1997: 71), also counts "participation" and "spatiality" as further characteristics of the medium. By the former, she means that computer games are interactive in nature and allow for the active involvement of the users with the happenings on the screen. By the latter, she implies that computer games generate spaces (realistic or non-realistic) to be explored by the players.

These four basic characteristics – procedurality, capacity, participation/interactivity and spatiality – have a direct impact on how, respectively, designers develop and players experience music in games. In contrast to other structured entertainment formats (such as literature, musicals or movies), the player has the possibility to actively control or manipulate the content. Nevertheless, this

supposed freedom is always dependent on the rules and complexity of the game. In line with these formal basics, music and gameplay is interlinked in three different ways: *linear*, *reactive* and *proactive*. These categories are based on a lecture by Georg Spehr, Dennis Mathei, and Michael Liebe at the conference:"Musik und Medien" (Music and Media), which took place on June 26th and 27th, 2010, at the Humboldt University, Berlin.

a. Linear music describes pieces which are firmly coupled to certain game-immanent elements which cannot be influenced by the players (except by aborting). The soundtracks of games such as *Command and Conquer* (1995), *Half-Life* (1998), *Heavy Rain* (2010) and *Sid Meier's Civilization IV* (2005) can be assigned to this category because the music recurs incessantly without any direct influence on the player's actions. It may change with different levels or milestones in the game, but not through the micro-actions of the players. Furthermore, the music in the introduction scenes, the login area, the load-screen, cut-scenes and the menu screens belong to this category. Music played by virtual radio stations such as in *Grand Theft Auto IV (GTA IV)*, *Quarantine* (1994) or *Burnout Paradise* (2008) belongs to this category as well. Although the player can change the radio station, the music is not connected to the actions in the game and continues independently of what happens on the screen.

b. Reactive music refers to music that is directly connected to the actions of the players. This type of game-music is triggered by specific micro-actions[4], albeit that they change location, procure a quest, overtake an opponent, begin a fight, change the radio station or the like. This type is often found in role-playing games such as *Gothic* (2001), and *The Elder Scrolls: Morrowind* (2002), or *Brütal Legend*. It is most obvious when players are attacked because they have reached a specific location in the game and the 'fight' track is activated. Music-generating games such as *Elektroplankton*, *Moondust* or *Otocky* also include this type of music. In these games, the music is entirely generated through the actions of the players.

c. Proactive music, on the other hand, prompts the players to undertake a specific action when it is played. The music does not react to the actions of the players but, instead, asks them to react to the gameplay situation. Other than in the first two categories, proactive music is an index for a game belonging to the music-game genre. Rhythm-action games especially, such as *Vib-Ribbon*, *Space Channel 5* or *Dance Dance Revolution,* in which the players must follow rhythmical patterns, are good

[4] With "micro-actions" I mean every single action the players undertake from pressing a button to swinging an axe in *Brütal Legend* or swinging the guitar to activate star power in *Guitar Hero*. Macro-actions on the other hand refer to more strategic or overarching actions that follow long-term goals, such as raiding a dungeon in *Morrowind* (2002) or upgrading a city in *Civilization IV* (2005).

examples of this type of game music. In this category, the individual music tracks are the challenges of the game. These challenges have to be completed successfully in order to get to play new music.

In the first category, the interaction builds on the overall linear progress the players make from level to level or challenge to challenge. In the second category, the micro-actions of the players become more relevant as deliberate engagement in new in-game situations, conflicts or challenges actively influences the soundtrack of the game. Yet it is not necessarily designed as such to create musical experiences. The third category is actually a mixture of the first and the second categories. The soundtrack depends on the micro-actions of the players, as the songs are only played correctly if the players interact according to the rules of the game. At the same time, the actions of the players refresh a given soundtrack. Games based on this mechanic have music as a core theme.

3 Non-gameplay related music and sound manipulators

When analyzing computer games, it is important not to neglect the fact that gameplay is the main, but not the only part of the game program. Parts of the game program are also startscreens, option menus, cut-scenes, editors and the like. In respect of the music, internal mixers should be especially included as they allow for a meta-method of actively intervening with the soundscape of computer games. These mixers are integrated into the game options and allow for regulation of the sound sources. The volume of linear music, environmental effects or voices can mostly either be manipulated or turned off entirely. By changing these parameters, the players have the opportunity to disrupt the predefined soundscape with individual preferences. In addition, some games allow for the incorporation of someone's own music into the game engine. Most car-racing games that provide a virtual radio allow for this type of modification. Yet these regulators are not interactive and are more relevant when analyzing the cultural and modification aspects of the individual game experience. In this text, I take the computer game as a designed artifact, or as "designed experience" as Miguel Sicart puts it (2009: 15), and focus on aspects of interactivity, player behaviour, interface and game system.

4 Interactivity in computer games

At this point I want to dig a bit deeper into how the game rules implemented in the digital game engine complement the players' involvement by using music. Computer games obviously share characteristics with games in general. Games need activity.

All games rely on interaction – be it with one's partner, one's opponent or with the game system itself: i.e. an action leads to a reaction followed by a meaningful reaction to the previous action (Crawford 2003: 3). Most scholars working on a definition of games such as Roger Caillois (1961: 10-11), Elliott M. Avedon and Brian Sutton-Smith (1978: 34), Katie Salen and Eric Zimmerman (2004: 96), and Jesper Juul (2005: 36) declare activity or interactivity, respectively, as a principle attribute of games. The concept of interaction is "based on the definition of 'to act upon'", as Uwe Seifert points out in his editorial article in "Paradoxes of Interactivity". "Two different things interact if, and only if, each acts upon the other." (Seifert 2008: 11) The actions of all agents, be they human, system or machine, have to influence one another in order to establish a process of interaction. Adding to the four attributes of computer games described by Janet Murray (*procedurality, encyclopedic scope/capacity, spatiality, participation*), game designer and philosopher, Ian Bogost, postulates that the added value of computation technology to computer games is the ability to store and process large amounts of information, allowing for meaningful and "sophisticated interaction." (2007: 42) Moreover, according to game studies pioneer, Espen Aarseth, "exploration" is virtually one of the "functions" of the player in a computer game (1997: 64). Without the active involvement of the players, the game space remains a meaningless collection of signs and rules.

Interaction in games is guided by rules. The encyclopedic scope of computers not only allows a large amount of content, but also a large number of and a complex system of rules. But, "computer games can paradoxically be perceived as less rule-governed, because players do not need to explicitly be taught rules in computer games, they can try numerous actions and activities and learn by experience how the rules in the game work." (Björk/Holopainen 2005: 15) This "paradox" is actually the fundamental characteristic of the medium. It marks the difference to traditional forms of playing.

One main common denominator of the convergence of computer games and music is the concept of interactivity. Although it plays a major role in both forms of entertainment, the creative processes and results of the experiences are quite different. As is pointed out in the curator's note for the "A MAZE. Interact" catalogue, on the process side, playing with a computer game means to experiment with predefined rules and structures to discover what is possible and what is not. Although there are games that allow for quite intuitive music composition, "the principles of computer games stand in stark contrast to the spontaneous, free and improvised handling of a musical instrument. Music games exemplify the generally ambivalent nature of rules: whilst restricting action space, they produce new opportunities for interacting with music." (Liebe/Wiedemann 2010: 5) As can be seen in the list of paradigmatic music games, the methods of how such games use rules and interactivity to create musical experiences can vary widely. In games such as *Moondust, Rez,* or *Elektroplankton,* the players have to navigate through paths in which the

music can flow and emerge. Yet in games such as of the *Heroes* or *Rock Band* series, the players are urged to activate certain buttons based on the rhythm or melody of pre-produced pop songs. Alternatively, games such as *Space Channel 5* or *Loom* ask the players to remember musical tunes and to repeat them accurately. In the long run, the rigid, digital framework of computer games allows for new forms of interacting with music as new algorithms, new sounds and new channels are mixed.

However, at the same time, games always include the way they are "meant to be played." (Liebe/Wiedemann 2010: 36) In particular, the empirical measurement of performance such as counting points even in Karaoke games such as *Singstar* or dancing games such as *Dance Dance Revolution* contrasts free forms of play in general, including live music performances and jam sessions. In contrast to analogue games, in which rules define what players should do, or are allowed to do, computer game programs define what players *can* do. By providing the interactive framework, they arrange a space of possible actions. In *The Secret of Monkey Island* (LucasArts 1990), Guybrush Threepwood has to win a sword fight by means of better arguments – or rather the "correct" insults to the pirate opponent. The game provides precisely five offences to choose from and one possibility to give up. The players can only act within the boundaries of the hardcoded possibilities. They do not have to remember what they are allowed or not allowed to do, or which actions are possible or not. They simply have no other choice than to interact within the given framework. Hacking and modifying is a whole new game or creates a new framework to interact with in the same way. Yet players could not do anything at all if the program code did not provide this virtual action space in the first place.

To put it short: "Rules in computer games are not a negative form of restriction, but actually constitute a positive form of enablement." (Liebe, 2008: 337) Music games, in this case, very well exemplify the generally ambivalent nature of rules: whilst restricting the action space, they foster new opportunities for interacting with music.

5 Structure of music games

In their pioneering work, Martin Pichlmair and Fares Kayali analyzed several music games qualitatively, regarding how they structure interactivity. The two scholars extracted certain typical features of games of the genre: "active scores", "rhythm action", "quantization", "synaesthesia", "play as performance", "free-form play" and "sound agents" (2007).

The result of their analysis is rather fruitful as it allows for a characterization of individual music games according to their rules, game mechanics and their main player-experience.

Table 1: Forms of interactivity X in music games (Pichlmair/Kayali, 2007: 428)

Game	Quantization	Sound agents	Rhythm action	Active score	Free-form play	Synaesthesia	Play as performance X	Number of attributes[5]
Rez	X	x	-	-	x	x	X	5
Otocky	?	x	-	x	x	-	-	4
Sim Tunes	x	x	-	x	x	-	-	4
Elektroplankton	x	x		x	x	x	X	6
Vib Ribbon	-	-	X	-	-	x	X	3
Rhythm Tengoku	-	-	X	-	-	-	-	1
Elite Beat Agents			X					1
Guitar Hero	-	-	X	-	-	-	X	2
FreQuency	-	-	X	-	x	-	-	2

The seven attributes have the following meaning:

- "Quantization" means that the game offers game modes that feature the "process of aligning a note to conform to a grid". It limits the players in their musical expression but greatly eases it, making the results aesthetically appealing as the grid provides a predefined selection of compliant tunes.
- "Sound agents" indicate the presence of specific game elements that enable interaction with sound but have a behavioural pattern on their own. Music is generated while exploring the function and characteristics of these agents.
- "Rhythm action" refers to game mechanics that ask the players to react to rhythmical sequences. The sequences form the challenge of the game and the more accurately the players manage to follow the rhythm, the more points are scored.
- "Active score" refers to a concept for a musical score that can be adapted for each performance. It creates a dynamic sound track for the game.
- "Free-form play" is characteristic for digital toys rather than games. These programs do not have a clear goal to achieve. This method is found as a special mode in many music games.

[5] This column was added by the author.

- "Synaesthesia" refers to a neurological state in which visual metaphors for audio are cued. The gameplay seeks to attract both the visual and the sonic sensors at the same time.
- "Play as performance" is a game mechanic in which the physical performance of the players is key. It allows for a wide range of expression and bodily engagement.[6]

As can be seen in the analysis of Pichlmair/Kayali, music games can emphasize quite different forms of interactivity. Yet it becomes obvious, however, that games focusing on *rhythm action* form a cluster of games that do not have as many other attributes as the games with other core mechanics. Going downwards from *Vib-Ribbon* in Table 1, all games having *rhythm action* as an attribute provide three, two, or only this one core mechanic. It is also notable that *Guitar Hero* is the only game that truly incorporates *play as performance* in the sense of the physical performance of the players as it actually is defined by the authors. I cannot explain why they have attributed this feature to *Rez, Elektroplankton* and *Vib-Ribbon,* apart from the fact that *Elektroplankton* allows gestures with the NDS Stylus pen-like interface and both *Rez,* as well as *Vib-Ribbon,* might invite players to dance along with the music. But I do not agree that the gameplay depends on physical performance – but this may be open to discussion.

What is also special about the *Guitar Hero* series is that the form of its music is a hybrid of reactive and proactive music. Players have to react to the pace of the rhythm of the game in order to make points (proactive music). But at the same time the input of the players activates the correct playback of the music-track they are playing. Failures in contrast activate nasty 'mistake' sounds. The better the players perform, the better the music sounds (reactive music). Nevertheless, if we focus on the primary tasks of the players, the proactive elements of the game are of bigger influence than the reactive elements. *Guitar Hero* makes players perform very well physically as is clearly demonstrated in the numerous fan videos available of players showing off their 'rock-star' skills in online communities: see, for example, Freddie's show entitled "How Guitar Hero was MEANT to be played (Rush - YYZ on Expert)" (2006). These performances are supported by the specially-designed interface and the rock-star dispositive that is established through the game (David Roesner 2009).

Out of the milestone selection exhibited at the "A MAZE. Interact" festival, *Dance Dance Revolution*, *SingStar*, *DJ Hero* and *The Beatles: Rock Band* share the same experience of *play as performance*. All four games have a core-game mechanic and specialized interface that needs the players to be physically active in a broader sense

[6] Citations from Pichlmair/Kayali, 2007: 428-429.

than with the abstract standard controllers. Moreover, apart from *SingStar*, all three examples also share *rhythm action* as a core mechanic.

Based on these findings, I want to establish two main categories of music games. The first being computer performance and the second player performance. What I mean by this is that it is either the physical engagement of the players in front of the screen or the virtual game engine that mark the pivotal point of the gameplay experience. Computer games are a thoroughly performative medium. Without any actions on the part of the players, nothing happens in the game. The rules of the game define the range of possible actions, but remain as a mere shell without input from outside. The system can generate complex game-worlds, but they only come to life through the players' actions. These actions are transmitted between players and game engines through physical interfaces, such as the keyboard, mouse, gamepad, remote controls and the like.

6 Computer performance

In computer games, the sounds are provided by the software and hardware, while the concurrent actions are undertaken by the players. In line with the game designer, Greg Costikyan, the *meaning*[7] of the gameplay "grows" out of the structure of the computer game. This "endogenous meaning" has first and foremost intrinsic values – what happens in the game has to be primarily valid within the game's logic (2002: 14). Although Costikyan mainly refers to the rules and actions of the game, the structure also refers to a technical level: every acoustic signal or visual presentation is dependent on the game engine and the haptics of the interface.

Sound supports the involvement of the players in the game and their understanding of this endogenous meaning. This happens through aspects of atmosphere, acoustic identity and ergo-audition. The three phenomena are often interwoven with each other. As in the examples of *Brütal Legend* or *GTA*, the audiovisual creation of the game's atmosphere can follow principles of "mediated couleur locale", by which the acoustic identities of locations or fictional worlds (i.e. New York of the 2000s in *GTA IV* or a Heavy Metal universe in *Brütal Legend*) are established through the use of typical instruments or sounds of a specific region and extensive use of musical clichés (Mathei 2011). Acoustic identities reach beyond the actual game and are also used as acoustic logos or brand creation, such as in the *Star Wars* or *Super Mario* media universes.

The phenomenon of "ergo-audition" as defined by Michel Chion (2010) involves the players the most as it relies entirely on their actions. Chion describes

[7]By "meaning" Costikyan refers to the meaning of the rules in the sense of cause and effects and the underlying interdependencies of ingame parameters, as well as the meaning of the game's story, if applicable.

the concept as the perception and joy of self-generated sounds like kicking a tin can, roaring up a car-engine or opening a champagne bottle with a loud bang. Put in the context of computer games, by performing any action, the players place themselves actively in the sound environment of the game. This notion of ergo-audition is prevalent in reactive sound structures, as described above. Games like *Moondust* or *Otocky* tie reactive sound mechanics to the actions players undertake with the avatar they control. Through acting on the avatar, the players hear directly what it is doing, i.e. what they are respectively doing. In these examples, it is moreover part of the gameplay that, in themselves, the movements and actions are rewarding because of the sound they generate. In games like *Loom*, *Myst* (1993) and *Brütal Legend*, the musical sounds that are activated by the players are an essential component of riddles, challenges and tasks. For this, they use the interactional method of "quantization". Also in music and rhythm-action games such as *Guitar Hero*, *Parappa the Rapper* or *Space Channel 5*, both the challenges and joy of gameplay are connected to the principle of ergo-audition. Provoking musical sounds and hearing the (ideally positive) results of the actions is what these games are all about.

Avoiding ergodic sounds can also be a component of the rules of the game, as in *Thief* (1998) or *Batman: Arkham Asylum* (2009), in which moving silently is the solution to many challenges. In the game *Dead Space* (2008), a vacuum in space is represented by completely turning off the soundscape. Neither the player nor the ambience or enemies can be heard in this situation, thus easily enhancing the level of fear. The role of the players in this type of computer performance and the resulting ingame ergo-audition is to press buttons on standardized interfaces. In contrast to, for example, musical instruments, it is not the interface itself that causes the sounds of joy, but the algorithms of the game engine.

7 Player performance

Music games of a different type are those that make the player perform more actively physically than virtually. *Dance Dance Revolution* is a good example of this. Instead of merely pressing little buttons on a joystick, the players have to jump around on sensor mats on the floor in order to respectively complete a level or a song. The high score is measured by how accurately the players manage to hit the right sensor at the right time. Karaoke games such as *SingStar* or its Xbox 360 pendant, *Lips* (2008), follow a similar principle. Here the input is vocal and the players have to actually sing along with the music in order to score points. These actions are not always aesthetically appealing, but the game mechanic is simple and fun.

Player performance is also essential in rhythm-action games such as *Donkey Konga* (2003) and, especially, *The Beatles: Rock Band*. In these games, hearing the material of the plastic 'instruments' annoys rather than supports the fun of the

game. As in *SingStar*, the interfaces in these games mimic musical instruments. The drum or guitar-shaped modifications of standard controllers allow for fun performances as if one was playing on the respective instruments themselves. Again, points are scored by accurately hitting the right button on the interface at the right moments in the songs. Microsoft's new non-physical interface for the Xbox 360, the Kinect (2010), allows for new forms of physical performance in front of the screen. Accordingly, top sellers for this interface are dancing games. *Dance Central* by Guitar Hero designers, Harmonix (2010), for example, is one of the games that were marketed as a bundle with Kinect. For the philosopher, Roger Caillois, "mimicry (Simulation)" is one of the "fundamental categories" of games – together with "Agôn (Competition)", "Alea (Chance)", "Ilinx (Vertigo)" (2001: 14, 19-23, 36). Each of Caillois's categories structures interaction in a more rule-based ("ludus") or free-form ("paidia") system of play. Accordingly, music games depending on player performance are games of mimicry with a strong tendency towards ludus. They not only let the players perform as if they were actually playing an instrument, but also have a strictly guided gameplay and scoring system.

8 The role of the interface

The connection between the players and the game engine is established through a hardware interface. The picture, sound and music of the computer game relate to the usage of physical interfaces. They are the transmitters of the players' performances into the game system. Today, through devices such as the Nintendo "Wii" console, Microsoft "Kinect", Sony "Move" or the specialized controllers used in games such as *Dance Dance Revolution*, *Rock Band* or *DJ Hero,* as well as through mobile platforms such as the NDS, iPhone or Android phones, gestures become more and more important for computer game interface design.

Notably, a number of specialized interfaces emerged in the genre of music games, albeit as microphones that let players engage in the act of (communal) singing, as in *SingStar*, *Rock Band* or *Lips*, or the "Kinect" camera that tracks the dancing movements of the players as in *Dance Central*, or the plastic instrument that catalyses the feeling of being a 'living-room pop star', as in *Guitar Hero* or *DJ Hero*. For touch-screen interfaces, games such as *Elektroplankton* for the NDS, *Radio Flare Redux* (2010), *Mr. Bounce* (2009) also use gestural input, but are far less performative. As with standard controllers such as a mouse, a keyboard or joysticks, there are similarly minimalistic physical actions involved.

As a conclusion, I want to give a preview of a new method of categorizing interfaces. These attributes of the computer game allow for new and individual forms of experiences. The goal of the categories is to allow for a systematic analysis of computer games in general while taking music games as an example. In the

Digital Games Research Center (DIGAREC) at the University of Potsdam, we are currently evaluating a system of categorization by which attributes of computer games can be systematically compared and analyzed in a more objective manner than through genres. Genres emerge from a complex interplay of marketing efforts, critical reviews and public understanding (Altman 1999). This system of categorization takes previous studies from the field of game studies into account, including research on the logic of game interaction, the form of presentation, choices in gameplay and the rules of the game. It is continuously tested by students on the B.A. course, European Media Studies. It has not yet been published. One of the categories relates to "object interaction". It relates to whether or not the object interacted with represents what the players can do with it or if the object is a figurative reference, i.e. to values or something else. It is either "objective" (representational), or "symbolic" (figurative) (Günzel/Liebe 2009, unpublished). To give an example: the weapons in GTA do not only look like guns, but also function as such (they shoot a lethal bullet when players use them). Their "object interaction" attribute is "representational". Yet, although the mansions that players can buy and enter into in the game look like houses or flats, they mainly function as saving points. They are figurative – referencing to an abstract mechanic in the game system, adding a value to a mansion that it normally does not have. It refers to the symbol of the home as being a retreat or refuge.

The physical interfaces and game controllers can be categorized in a similar way. The interface mainly establishes a representational or a figurative relationship between the players and the game engine, or ingame actions. Again, I want to give an example. In *Vib Ribbon*, the players have to manoeuvre a figure through a level with four different obstacles. For one obstacle, the figure has to use tall legs, for another, it has to perform a somersault roll and so forth. Each obstacle has a specific state or performance of the figure as a solution. The players have to activate this specific state with one of the buttons on the PlayStation controller. The "D-Pad Up/Down", lets the figure traverse holes, the "X Button" traverse waves, the "R1/R2 Buttons" traverse loops and the "L1/L2 Buttons" traverse walls. Neither the icons on the buttons nor the buttons themselves have any intuitive connection to the actions on the screen. The "X" represents going into the state of having long legs, thus allowing the figure to traverse sparkly waves; the relationship between the interface and the ingame action being symbolic.

On the other hand, *Guitar Hero* comes with a specialized controller shaped as a guitar. The aim of the game is to press the right button on the controller at the right time, just as in *Vib Ribbon*. Yet what players do with the controller is the same as presented on the screen. The chords or, to be more precise, the coloured buttons on the plastic guitar, are objective in the sense that the presentation of ingame actions coincides with the presentation of the interface. The "Kinect" camera of the Xbox 360 goes a step further and makes the bodies of the players the controllers of

the games. Good examples of this music genre are *Dance Central* and *Michael Jackson: The Experience* (2011). The camera tracks the movements of the players and integrates them into the gameplay. As such, physical performance is the key, making the interface not only popular for dancing games, but also well suited for sports games. (Stiftung Warentest 2011) Games in which the tasks of the players are based on gestural input are mostly objective in their interface to ingame-action relationship. As in the WYSIWIG[8] design principle, what you do is what you get (WYDIWYG): the movements of the players mimic what is actually happening in the game. A swing of hands and arms is the swing of a golf club, a dance step is a Moonwalk, and a fast movement of the turntables is the scratching of a hip-hop disc.

Using categories allows for a systematic list of all games mentioned in this text. Each individual game has a specific set of attributes. It is based on either player or computer performance, uses either objective or symbolic interfaces and has either a linear, reactive or proactive sound track.

Table 2: Categories and attributes of music games

Game	**Performance**		**Interface**		**Sound Track**		
	Player	**Computer**	**Objective**	**Symbolic**	**Linear**	**Reactive**	**Proactive**
Audiosurf		X		X			X
Batman		X		X	X		
Brütal Legend		X		X		X	
Burnout Paradise		X		X	X		
Command and Conquer		X		X	X		
Computer Space		X		X	X		
Dance Central	X		X				X
Dance Dance Revolution	X		X				X
Dead Space		X		X		X	
DJ Hero	X		X				X
Donkey Konga	X		X				X
Electroplankton		X	X			X	
Gothic		X		X	X		
Grand Theft Auto IV		X		X	X		

[8] What you see is what you get: used to describe graphical user interfaces through which the grade of abstraction between the visual representation during the design process and the results of the actions is radically reduced. Different from , for example, writing code or scripts, and only seeing the results of the creative work after the code is compiled, WYSIWIG interfaces show the creators instantly what the results of their actions look like.

Guitar Hero	X		X				(X)
Half-Life		X		X	X		
Heavy Rain		X		X	X		
Lips	X		X				X
Loom		X		X		X	
Michael Jackson: The Experience	X		X				X
Moondust		X		X		X	
Mr. Bounce		X	X			X	
Myst		X		X	X		
Need for Speed		X		X	X		
Osu! Tatakae! Ouendan!		X		X			X
Otocky		X		X		X	
PaRappa the Rapper		X		X			X
Patapon		X		X		X	
Pong		X		X		X	
Quarantine		X		X	X		
Radio Flare Redux		X	X			X	
Rez HD		X		X		X	
Rhythm Paradise		X		X			X
Sid Meier's Civilization IV		X		X	X		
SingStar	X		X				X
Space Channel 5		X		X			X
Space Invaders		X		X	X		
Spacewar!	no sound			X	no music		
Table Tennis	no sound			X	no music		
Tennis for Two	no sound			X	no music		
The Beatles: Rock Band	X		X				X
The Elder Scrolls III: Morrowind		X		X	X		
Thief: The Dark Project		X		X	X		
Vib-Ribbon		X		X			X

In the same way that Ian Schreiber (2009) explains in his online-game design course, this analysis can be used as a toolkit of critical vocabulary for designers: "Vocabulary might not be as fascinating as that game you want to design with robot laser ninjas", he explains in the introductory entry, "but it is important, because it gives us the means to talk about games. Otherwise we'll be stuck gesturing and grunting and it becomes very hard to learn anything if we can't communicate." It is a vocabulary that, in this case, focuses on categories and specific types of games, interfaces and music.

For example, through this categorization, it can be seen that three games stand out. Their combination of attributes is different from that of the other games. *Electroplankton*, *Mr.Bounce X* and *Radio Flare Redux* all use "computer performance" and "objective interface" as core game mechanics. Designers and academics can take this as a starting point for further creations or analyses of similar games. Moreover, all three are also "reactive" in their sound track, giving a hint of a possible relationship between the three categories. Moreover, in a game, pressing buttons on abstract, standard controllers refers to a symbolic interface. Acting in mimicry refers to an objective interface. Nevertheless, an objective interface does not always refer to player performance. Finding these sorts of clusters and relationships makes it easier for designers to find a game mechanic that stands out from the rest of the games in the music genre or which type of games may follow in the footsteps of a milestone or blockbuster title.

Interactivity and music in computer games have many facets. Starting with small steps over 20 years ago, music games have now become a fully-fledged genre with several clusters and subgenres. Decompiling it into concrete elements and categories is a first step in the direction of a broader understanding of its appeal, growth and trends.

9 Bibliography

Texts

Altman, Rick (1999): Film/Genre. London: British Film Institute

Avedon, Elliott M./Sutton-Smith, Brian (1978): The Study of Games. New York: John Wiley & Sons

Björk, Stefan /Holopainen, Jussi (2005): Patterns in Game Design. Hingham, Massachusetts: Charles River Media

Bogost, Ian (2007): Persuasive Games. The Expressive Power of Videogames. Cambridge/London: MIT Press

Caillois, Roger (2001): Man, Play, and Games. Urbana/Chicago: Illinois UP [1958]

Chion, Michel (2010): Le son. Traité d'acoulogie. Paris: A. Colin (Cinéma-Arts visuels)

Collins, Karen (2008): From Pac-Man to pop music. Interactive audio in games and new media. Aldershot: Ashgate

Costikyan, Greg (2002): I Have No Words & I Must Design: Toward a Critical Vocabulary for Games. In: Mäyrä, Frans (ed.): Computer Games and Digital Cultures. Proceedings of DiGRA 2002 Conference. Tampere: Tampere University Press: 9-33

Crawford, Chris (2003): The Art of Interactive Design. A euphonious and illuminating guide to building successful software. San Francisco: No Starch Press

DDR Freak (2011): DDR Freak – Dance Dance Revolution. http://www.ddrfreak.com/ [05/05/2012]

Günzel, Stephan/Liebe, Michael (unpublished): DIGAREC System of Categories. Potsdam

Günzel, Stephan/Liebe, Michael/Mersch, Dieter (eds.) (2008): Conference Proceedings of the Philosophy of Computer Games 2008. Potsdam: Universitätsverlag Potsdam

Huizinga, Johan (1955): Homo Ludens. A Study of the Play Element in Culture. Boston: Beacon Press [1938]

Juul, Jesper (2005): Half-Real. Video Games between Real Rules and Fictional Worlds. Cambridge/London: MIT Press

Liebe, Michael (2008): There is no Magic Circle. On the Difference between Computer Games and Traditional Games. In: Günzel, Stephan/Liebe, Michael/Mersch, Dieter (2008): 324-340

Liebe, Michael/Wiedemann, Thorsten (2010): A MAZE. Interact …celebrating the convergence of games, art, and music. Berlin: A MAZE

Mathei, Dennis (2011): Once Upon a Time in the Digital West: Sleuthing Traces of Popular Art in Red Dead Redemption. Lecture held on April 13, 2011, at the Gorizia International Film Studies Spring School

Murray, Janet: Hamlet on the Holodeck – The Future of Narrative in Cyberspace. Cambridge: MIT Press

Pichlmair, Martin/Kayali, Fares (2007): Levels of Sound: On the Principles of Interactivity in Music Video Games. http://www.digra.org/dl/db/07311.14286.pdf: DiGRA [05/05/2012]

Roesner, David (2009): *Performance of the Guitar Hero*. Lecture held at the symposium Bewegungen zwischen Hören und Sehen. Musik, Tanz, Theater, Performance und Film, Bayreuth 2009

Salen, Katie/Zimmerman, Eric (2004): Rules of Play. Game Design Fundamentals. Cambridge/London: MIT Press

Schreiber, Ian (2009): Game Design Concepts. An experiment in game design and teaching. http://gamedesignconcepts.wordpress.com/page/3/ [05/05/2012]

Seifert, Uwe/Kim, Jin Hyun/Moore, Anthony (eds.) (2008): Paradoxes of interactivity. Perspectives for media theory, human-computer interaction, and artistic investigations. Bielefeld: Transcript

Sicart, Miguel (2009): The ethics of computer games. Cambridge, MA: MIT Press

Stiftung Warentest (2011): Wettkampf der Spielkonsolen. http://www.test.de/themen/bild-ton/test/Xbox-PlayStation-und-Wii-Wettkampf-der-Spielkonsolen-4229545-4231968/?at=likeCountwww.test.de [05/05/2012]

Stockburger, Axel (2009): Klang-Bild-Relationen in Games. http://www.see-this-sound.at/kompendium/text/34. Hochschule für Grafik und Buchkunst Leipzig [05/05/2012]

Spehr, Georg (2011): Game Sound. Der Klang der Computerspiele. In: Positionen. Hefte zur aktuellen Musik (ed. by Nauck, Gisela) 86: Sound Studies. Muhlenbeck: Verlag Positionen: 22-24

Games

Audiosurf (2008): Ride Your Music, Dylan Fitterer, Valve, PC
Batman (2009): Arkham Asylum: Rocksteady Studios, Eidos Interactive, PlayStation 3
Brütal Legend (2009): Double Fine Productions, EA, Xbox 360
Burnout Paradise (2008): Criterion Games, EA, PlayStation 3
Child of Eden (2011): Q Entertainment, Ubisoft, Xbox 360
Command and Conquer (1995): Westwood Studios, Virgin Interactive, PC
Computer Space (1971): Nolan Bushnell and Ted Dabney, Nutting Associates, Arcade
Dance Central (2010): Harmonix, MTV Games, Xbox 360 Kinect
Dance Dance Revolution (1998): Konami, Konami, Arcade
Dead Space (2008): EA Redwood Shores, EA, PlayStation 3
DJ Hero (2009): FreeStyle Games, Activision-Blizzard, Xbox 360
Donkey Konga (2003): Namco, Nintendo, Gamecube
Electroplankton (2005): Indies Zero, Nintendo, NDS
Gothic: Piranha Bytes (2001), Shoebox, PC
Grand Theft Auto IV (2008): Rockstar Games, Take 2, Xbox 360
Guitar Hero (2005): Harmonix, RedOctane, PlayStation 2
Half-Life (1998): Valve Software, Sierra Entertainment, PC
Heavy Rain (2010): Quantic Dream, SCEE, PlayStation 3
Lips (2008): iNiS, Microsoft, Xbox 360
Loom (1990): Lucasfilm Games, Lucasfilm Games, PC
Michael Jackson: The Experience (2011): Ubisoft Montreal, Ubisoft, Xbox 360
Moondust (1983): Creative Software, Creative Software, C64
Mr. Bounce (2009), Spaces of Play, Matthias Ljungström, iPhone 3
Myst (1993): Cyan, Brøderbund, PC
Need for Speed (2008): Undercover: EA Black Box, EA, PlayStation 3.
Osu! Tatakae! Ouendan! (2005): iNiS, Nintendo, NDS.
Otocky (1987): Sedic, Ascii Corporation, Famicom.
PaRappa the Rapper (1996): NaNaNon-Sha, SCEE, PlayStation.
Patapon (2007): Pyramid/Japan Studios, SCEE, PlayStation Portable
Pong (1972): Atari, Atari, 1972, Arcade
Quarantine (1994): Imagexcel, GameTek, PC
Radio Flare Redux (2010), Studio Radiolaris, Chillingo, iPhone 3
Rez HD (2008): United Game Artists, SEGA, Xbox 360
Rhythm Paradise (2009): Nintendo, Nintendo, NDS
Sid Meier's Civilization IV (2005): Firaxis, 2K Games, PC
SingStar (2004): SCEE, SCEE, PlayStation 2
Space Channel 5 (1999): United Game Artists, SEGA, PlayStation 2
Space Invaders (1978): Taito, Midway Games, Arcade
Spacewar! (1962): Steve Russell, Martin Graetz, and Wayne Witaenem, Massachusetts Institute of Technology, PDP-1

Table Tennis (1972): Ralph H. Baer, Magnavox, Magnavox Odyssey
Tennis for Two (1958): William Higinbotham, Brookhaven National Laboratory, unique analog computer
The Beatles: Rock Band (2009): Harmonix, EA, Xbox 360
The Elder Scrolls III: Morrowind (2002): Bethesda Softworks, Ubisoft, PC
The Secret of Monkey Island (1990): Lucasfilm Games, LucasArts, PC
Thief: The Dark Project (1998): Looking Glass Studios, Eidos Interactive, PC
Vib-Ribbon (2000): NanaOn-Sha, SCEE, PlayStation

Videos

Futurama, Season 3, Episode 18, Anthology of Interest II: Hey, TiVo! Suggest this!, 2002
Freddie (2006): "How Guitar Hero was MEANT to be played (Rush - YYZ on Expert)", Youtube, http://www.youtube.com/watch?v=Ua3hZXfNZOE [05/05/2012]