

# Collaborative Control Gameplay

*A study on game design possibilities for a collaboratively-controlled game system*

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**Abstract** - This study will investigate techniques for developing successful collaboratively-controlled game designs. A collaboratively-controlled game, in this case, is any electronic gameplay that allows multiple players to collectively control a single entity to achieve a common goal. In this mode of gameplay an entire audience of players can collectively participate in a game. In order to achieve this objective, a collaborative control system and game will be implemented. A series of trials will be executed using this game with various player group sizes. In each trial the players' performance will be recorded. This study will investigate what correlation (if any) exists between the group size and the game performance of the players when faced with specific decision making and problem solving challenges in a collaboratively-controlled game. If such a correlation exists, it will validate the practice of testing a collaboratively-controlled game with a small group before executing it full scale.

## I. INTRODUCTION

The video games industry is in transition. While historically the game industry has brought us only a handful of game genres, franchises and control devices, a new trend is emerging in which the novelty of the game experience is one of the lures to its players. The concept of a video game is being reshaped and broadened into a new paradigm. In this paradigm, video games include an ever expanding class of entertainment-based human-computer interactions. The emergence of this new paradigm portends well for the future of the video game industry through a cathartic release of tired conventions. But the reshaping of the industry comes at a cost. To develop new ideas takes time and financial risk, and not every idea is bound for success.

This new paradigm for video games is in part a result of the democratization of game development. The commodity of game development software and the accessibility of the hardware have allowed independent developers, game players and fans to create a new family of imaginative and unusual gameplay experiences.

These changes can also be attributed to the incorporation of new control devices and technologies. Damien Marshall et al make an argument for this innovation:

[Hand-held] control schemes place barriers between the player and the game. For the casual gamer, modern controllers can be very intimidating ... Such designs also place limits on the technical and amusement possibilities of current video games. As a result, novel control schemes are now becoming more prevalent.

Rather than forcing the player to stoop to the consoles' slow and unwieldy input schemes, these new interfaces allow the player to play in a more natural and intuitive manner [8].

Motion sensors, vision-based techniques, infrared sensors and location aware portable devices are all examples of technologies used in recently developed video games.

The idea of an audience collectively participating in a video game is one idea that has been broached but never fully utilized. Developing such a game presents many challenges in design and implementation. In many situations where a game is being developed for use by an audience, the exact circumstances of the final product cannot be recreated during production, making it difficult to test the game's effectiveness as an audience-controlled game. This lack of knowledge also makes it difficult to know how potential players will respond to the introduction of the new game and whether a market will develop for it.

This study will examine ways to create enjoyable and usable collaboratively-controlled games. For the purposes of this study a game is considered usable if the players are reasonably capable of playing and winning the game without explicit instructions. A game's enjoyability is determined through player feedback.

By having various-sized player groups play the same game, observers may see a trend emerge in their game-playing performance. If such a trend exists, this will suggest that it is valid to test a game design's effectiveness with a small group size before executing the full scale implementation. This study will also investigate what degree of difficulty is reasonable for a collaboratively-controlled game.

## II. TERMINOLOGY

### A. Collaborative Control

Collaborative control refers to a mechanism that allows multiple users to control a single game entity. A game entity in this case includes things such as characters, creatures, pong paddles, or even a simple ball. When this entity is an alter ego of the player it is commonly called an avatar. To better define this concept, it is important to differentiate it from a common multiplayer experience. In a conventional multiplayer game, each player has at least one entity that they alone control. By contrast, a collaboratively-controlled gameplay requires that multiple players provide a collective input to an entity or system. Thus a group of



Fig. 1. The *Cinematix Interactive Entertainment System*® [3]

players must work simultaneously and in concert with each other to achieve their intended goals. This idea has been implemented in various forms and venues (consider the 3-legged-race).

A collaborative control experience is not limited to gaming. For example, the Interactive Dance Club which was demonstrated at the 1998 SIGGRAPH allowed for a myriad of users to interactively and simultaneously create sounds and imagery through the motions of their bodies and the manipulation of various inputs [3]. Although the Interactive Dance Club was not a game (it did not impose any objectives on the participants), it is still a collaboratively-controlled musical experience shared by the patrons of the club.

#### B. Many-User System

A many-user system is a system that takes input from an audience sized group of participants. Games developed for a many-user system will almost certainly need to be collaboratively-controlled.

A typical single player or multiplayer game uses a hand-held controller or mouse and keyboard as input to the game. A many-user system on the other hand typically utilizes a vision-based technique to track an audience's actions. This allows for a large and arbitrary number of players to participate in a game.

The *Cinematix Interactive Entertainment Systems*® created by Rachel and Loren Carpenter is a good example of a many-user system. In this system, players hold up a paddle with red and green sides to cast their input vote to a game. Several games were developed for the *Cinematix*® system including a flight simulator and a pong style game, both of which were collaboratively-controlled [3].

#### C. Continuum of Game-based Human Interaction

Game play experiences cannot be divided simply and cleanly into categories such as single player, multi-player and collaboratively-controlled. It is more appropriate to define games on a continuum of player-player interaction

ranging from strictly single player games to collaboratively-controlled games.

For example, *Spore*™ from Maxis is fundamentally a single player game in which the player creates and manages an alien civilization. The game utilizes information loaded from a web-based server that stores a library of alien creatures created by other players. These races then become incorporated into the player's own gameplay experience. Although players do not directly compete or interact their activities have an influence on each other and thus the game is somewhere between a single player and multiplayer game.

Further on the scale we can find *Guitar Hero*® published by Red Octane. *Guitar Hero*® allows for up to four players to competitively or cooperatively participate in a musical performance. When the players participate cooperatively, only the collective success or failure is meaningful in the context of the game. In addition, the players' actions must be synchronized and collaborative; however, each player's controlling actions are isolated to their own avatar. This places the game somewhere between a multiplayer and collaboratively-controlled game.

### III. GOALS AND OBJECTIVES

In terms of design, the most successful many-user games are those that are easiest for the players to understand and use, while the more convoluted and difficult game designs are less enjoyable. However, a well designed game should ramp up difficulty as it progresses. This gives players a sense of accomplishment and keeps them engaged in the game for a longer period.

In this study, the performance of a player group in a game will be measured and recorded for a particular group size. The primary objective is to establish the correlation (if one exists) between the number of participants and their game performance. A secondary goal of this study is to identify what degree of difficulty is reasonable for a collaboratively-controlled game. Essentially, the question is, "How much is too much?"

### IV. RELEVANCE

Electronic games have become a pervasive part of modern society. As the market appeal of games expands, electronic games reach a steadily swelling domain of demographics and embed themselves even deeper into the American lifestyle. Consequently, games have come under intense and often hostile scrutiny. This is nothing new. Even before electronic games, in the early 20th century, the mechanical amusements of the penny arcades were seen as satisfying only those with prurient interests:

In spite of their huge and immediate popular appeal, penny arcades were often considered morally questionable, accused of being breeding-grounds for vice and even for infectious diseases. Penny arcades attracted a socially mixed crowd, including women. They were seen as dark and gloomy [6].

Still today, video games are considered by some as the source of many social problems including teen violence and anti-social behavior. In an interview with CBS News Jack Thompson, a strong opponent of violent video games argues:

From a psychological perspective, to act out of virtual violence in a virtual setting is far more damaging than just viewing it. You enter into the violence, you become the protagonist. These are murder simulators. *Manhunt* has been called the video game equivalent of a snuff film. I am working with an Oakland, CA prosecutor in a murder trial in which the older gang members used [*Grand Theft Auto 3*] to train teens to do carjackings and murders. The Army uses these games to break down the inhibition to kill of new recruits [3].

The effect of gaming on society does not need to be bathed in blood. Current research indicates that a blanket reputation is undeserved and has only broached the topic of the positive effects of video games. For example, cognitive developments such as improving spatial reasoning abilities have been shown to have a strong correlation with playing video games [10].

The recent innovations in video games have helped to make them agents for socialization and camaraderie among players. Game concepts such as *Dance Dance Revolution™* from Konami and consoles such as the *Nintendo Wii™* are two excellent examples. This novel gameplay has benefited the game industry in at least two ways. First, they have drawn new demographics into the gamer community. Gamers are stereotyped as young males but in 2008 the gamer community consisted of 40% women and 26% persons over the age of 50 [5]. Second, while some games may (and probably do) have negative social effects, this does not need to be the standard. Creating games which are physically, mentally and socially beneficial to the players puts the industry in a positive light. The market success of these new achievements in game technology suggests new opportunities for game designers and the continued vitality of the game industry.

Collaborative control games up the ante on this trend for socialization among players. Collaborative control could be considered the next step in this emerging trend of socially encouraging games. The potential knowledge gleaned by this study will equip the creators of these games to make essential game design decisions allowing them to create fun, usable, and scalable gameplay experiences.

## V. PRIOR WORK

Although there are a multitude of studies and books on gaming and game design, there is very little specifically on effective design for a many-user game system. Nevertheless, there is wisdom to be gleaned from the history of the video game industry, as well as the practical experiences of the creators of existing systems.

## A. Video Game Industry History

The history of the video game industry has a diversity of stories that range between glowing successes and miserable failures. From late 1977 to 1979, the video game industry faced its first major crisis. The market for home console games took a large hit as game sales plummeted. Looking back, this reaction from gamers is not so surprising. The games being produced for the three main game consoles of the day (the Channel F by Fairchild, the Studio II by RCA, and the Atari 2600) were mostly variations on a small handful of game concepts. Manufacturers were marketing their products simply by technological advancements rather than investing in new, more innovative game designs. As a result the game market was saturated with hardware but had a shortage of software that kept players engaged [7].

Whether the game industry has truly learned from their mistakes is debatable. Nevertheless we can follow a clear trend in the history of the game industry where the most well designed games quickly became the most successful and profitable and not necessarily the games with the most technological advancements. For example, *Pac-Man*, which was developed by Namco in 1980, was popular in the US and Japan. Quite notably, it was the first game to draw a female demographic to the arcades. Its design combined bright cheerful colors, quirky characters, breaks between levels and a simple four direction input to create a positive atmosphere. This attention to designing a cohesive game experience was well worth the investment. In 1981 over 100,000 arcade machines were sold. It was not long after that a myriad of sequels and knock-offs were created [7].

In 1985 Shigeru Miyamoto developed the first of many sequels to the game *Mario Bros.* called *Super Mario Bros.* *Super Mario Bros.* was an innovative game design in several respects. First, the game was stylized to look like an interactive cartoon. It was also the first game to scroll both left and right as well as up and down and boasted a series of unique level and worlds with different objectives, enemies and music. The main character of the game -- Mario -- was a fully developed hero with a family, a profession, and a princess for a love interest. Again, the attention to details by designers gave the game depth that created a more involved and engaging experience for players [7].

The volume of games being produced in recent years has reached a dizzying pace. Several game concepts still stand out because of their effective design and/or unique gameplay experience. The popular *Half-Life* series - although it fits neatly into the traditional first person shooter (FPS) genre - affords a complete and thoughtful game design experience. By combining rich visual and aural details with an elaborate storyline, the game creates a powerful game experience that utilizes modern technology rather than relying on technological gimmicks to create a successful game design.

The popular series of *Guitar Hero®* and *Rock Band®* games have each earned over \$1 billion for their respective creators. These games both use a guitar (and drum set) style

controller as input rather than a more traditional controller. Earlier games have been introduced which fall into the same genre of rhythm games; however, the novel controller plus the collaborative nature of the gameplay has set these titles apart and most likely has been the driving force behind their success.

History suggests that the most successful model for the video game industry combines technological advancement, fun and innovative game designs and novel but visceral control methods. Keeping with this wisdom, recent game development has created a broad diversity in gameplay technology and an even wider variety of game genres.

### B. Existing Collaboratively-controlled Experiences

#### *Squidball*

There have been surprisingly few implementations of many-user systems since the *Cinematix* presentation at SIGGRAPH 1998. A more recent example is *Squidball*, a massively motion-tracked gameplay experience developed for the 2004 SIGGRAPH. This is an excellent example of a collaborative control gameplay where many players are collectively trying to achieve the goals of a game instance.

In *Squidball* the participants hit helium filled weather balloons into the air at virtual targets. The position of the spheres are then tracked in 3D space and used as input positions to a 3D game world represented on a projection screen. The creators of *Squidball* faced numerous challenges in implementing a system of this scale. The practical knowledge they gained is beneficial to this study. In addition to the technical challenges, the creators had to design a game that was enjoyable and easy for participants to learn and play.

The first issue the *Squidball* creators faced was how to educate the game participants on how to play the game. No instructions were provided to the audience members. The game began with 24 balls being dropped onto the audience. In their SIGGRAPH paper the creators say:

Several specific design choices were made to facilitate the discovery of rules. First, we had to establish a one-to-one connection between the balls in the physical space, and their representation as virtual objects on screen. ... we chose to represent the balls as colored spheres on screen, and to attach visual and audio trails to the objects to help communicate the spatial trajectories of the balls. This visual one-to-one correspondence was intended to help players understand the link between the physical and virtual representations of the balls, and to lead them to understand that action taken with the balls in the real world space translated into action taken within the virtual game space [2].

The creators also faced a legitimate concern that the participants would be more interested in playing with the balls rather than focusing on the objectives of the collaborative control game. The creators noted that

participants did tend to start by haphazardly (and selfishly) playing with the balls. As the game progressed and more and more participants came to understand the game's nature and goals, their actions became more coordinated. In order to reinforce the game aspect of the system, the creators gave clear goals for each game, put a time limit on each level, and provided audio and visual feedback regarding the audience's success or failure in the game. The creators noted, "This transformation from audience member to game player happened consistently within the first four minutes of the game, and players that made the connection began to shout out this understanding to other players, acting as agents of the game rules [2]."

*Squidball* also implemented several aspects to manage game difficulty. The system was designed such that the difficulty could be adjusted during gameplay. This concept is called Dynamic Difficulty Adjustment (DDA). First, the duration of the previously mentioned time limit provides a simple variable that changes game difficulty. Next, the *Squidball* games required the participants to hit virtual targets with the balls. The sensitivity of these targets was also made a dynamic component of the game. Finally, in order to provide an opportunity for success in the game, the creators gave several chances (lives) for each level of the game before a final failure condition was reached.

*Squidball* encountered several issues that the creators either did not consider in the design phase or were unable to resolve. For example, the participants' ability to interact with the system was hampered by the fact that they had to watch both the game screen as well as the physical balls to play effectively. The creators contend, "It requires some ergonomic ingenuity to look up and forward at the same time, which was one of the weaknesses of the current design. As a result, some players decided to only watch the screen. Others ignored the screen and simply pushed the balls towards the center of the room [2]."

A second oversight in the system was the creators did not anticipate that some executions of the game would lack a full 4,000 person group of players. As a result, targets over mostly empty sections of the audience became difficult to reach.



Fig. 2. The Squidball game at SIGGRAPH 2004 [2]



Fig. 3. The Interactive Dance Club at SIGGRAPH 1998 [12]

### Interactive Dance Club

Some additional practical knowledge was acquired by Ryan Ulyate and David Bianciardi who have submitted a research paper in relation to the creation of an interactive dance club for the 1998 SIGGRAPH. Their efforts to create a dance club that allowed participants to generate music through their actions and motions gave them a wealth of knowledge in creating unique interactive and collaborative experiences. In their research paper *Avoiding Chaos in a Multi Participant Environment* they offer 10 commandments of interactivity:

1. Interfaces and Content Should Encourage and Reward Movement
2. Participant's Actions Elicit an Immediate and Identifiable Response
3. No Instructions Allowed
4. People Do Not Need To Be Experts to Participate
5. No Thinking Allowed
6. Actions Receive Aesthetically Coherent Responses
7. Keep It Simple, Immediate, and Fun
8. Responsiveness Is More Important than Resolution
9. Think Modularly
10. Observe and Learn

Although these ideas were intended for an interactive dance club, many of them are applicable to a general multi-user system or collaborative control game. For example, the researchers recommend that the interactive system make it clear to the user(s) how their actions influence the system. In general, these guidelines point to the importance of the activity over the technology (e.g. Responsiveness Is More Important than Resolution, People Do Not Need to Be Experts to Participate, and Keep It Simple, Immediate, and Fun). Most of these guidelines hint at the importance of creating a visceral experience for the user.

### Audience Participation Study

The most relevant research on audience controlled games is the work of Dan Maynes-Aminzade, Randy Pausch, and Steve Seitz. Together they prototyped three different methods of inputs for collaborative control gameplay and then compiled the results and lessons learned



Fig. 4. Missile command using beach ball shadow tracking [9]

from these trials. The three implemented methods allowed audience members to give gameplay input by (1) leaning left and right, (2) batting a beach ball into the air and using its shadow on the game screen as input, and (3) pointing a laser pointer dot at the projected game screen.

The primary purpose of the study by Maynes-Aminzade et al was to find effective methods for an audience to provide game input. For a collaboratively-controlled game the input method is an important consideration although for this study the focus will be specifically on making a successful game design. Nevertheless, their work provides a good departure point. As a byproduct of their work Maynes-Aminzade et al offer these guidelines for designing the game system as well the games:

#### Guidelines for an Audience Participation System

- Focus on the activity, not the technology.
- Make the control mechanism obvious.

#### Guidelines for Effective Game Design

- Vary the pacing of the activity.
- Ramp up the difficulty of the activity.

#### Social Factors

- Play to the emotional sensibilities of the crowd.
- Facilitate cooperation between audience members.

From these guidelines we find several useful suggestions that will directly apply to this study. First, the authors reinforce the point that the technology is only incidental to the success of the game design. Although an entire audience playing a video game is a relatively novel idea it is only interesting as a gimmick for a short while. Second, the point is made that if the audience members are not sure that they are actually controlling the game they quickly lose interest. This agrees with the rule stated by the creators of the *Interactive Dance Club*.

Next the authors make a case that varying the pace of a game is more effective than maintaining a constant demand on the attention of participants. Giving short reprieves in the game give the players' a chance to react to a recent success or failure:

Pong provides sudden deadlines separated by rest periods; race car driving requires a more sustained behavior to keep the car on the road. The punctuated deadlines give the audience a chance to succeed or fail; the rest periods give them a chance to cheer, applaud themselves, and prepare for the next moment of tension [9].

Also, the authors suggest that the difficulty of the game is increased over time. This reinforces the knowledge acquired by the creators of *Squidball*. Starting the difficulty very low allows the players a chance to learn the basic rules of the system early on. In this way, if only a few participants understand what is happening in the first round, their efforts can carry the group. Later, as more and more participants come to understand the rules, the group begins to act more cohesively and effectively as a team allowing for more difficult gameplay.

Finally, the authors consider the social components of a collaborative gameplay experience. They make the point that building camaraderie among the participants is a primary factor for creating a successful gameplay experience. In fact, even with gameplay concepts such as the beach ball the researchers report that, "...the lottery effect ("I might be next!") and the cheering or booing of one another fully engages all of the members of the audience, even though technically only one or two out of 500 people were directly participating [9]." The creators of *Squidball* made a similar observation, "The role of spectator was engaging in and of itself, due to the spectacular nature of the balls moving around the large auditorium and the energetic pandemonium that ensued once the balls were introduced into the space [2]."

## VI. METHODS

For this study an experimental approach will provide the most conclusive answers to the research question. As mentioned, a simple many-user system and a collaborative control game will be used to carry out the experiment trials. Trials will be executed using various sized groups of 1, 2, 5, 10 or 20 players. With each group size, three trials will be executed. Players will also be distributed to the trials as evenly as possible according to their general video game experience.

The game - which will be divided into stages - will *not* end upon failure to complete a stage. In each trial, the participants will play every stage of the game and their margin of success or failure in each stage will be recorded. Other data that will be collected includes a video recording of the experiment and/or screen captures of the game as it is played. In addition to this data, after the game is completed the trial participants will be given a short survey where they will provide feedback on their game experience. This survey will be the main tool for measuring the game's enjoyability.

### A. Laser Cursor Tracking System

The many-user system that will be implemented is based primarily on the work by Ahlborn et al [1]. The system uses a web camera, a projector, several laser pointers and a

名前	30分間の論文 (120分)	読者の総数 (120分)	読者	読者の数 (120分)	
				読者の数 (120分)	読者の数 (120分)
読者	11	10	0	4	0
読者	8	0	0	3	1
読者	8	5	1	2	2
読者	3	2	17	0	2
読者	8	2	8	2	0
読者	4	0	1	2	0
読者	0	2	0	2	3
読者	8	0	5	0	1
読者	8	2	0	4	1
読者	10	16	20	5	3
読者	1	6	1	3	2
読者	1	0	5	2	2
読者	1	3	5	2	2
合計	72	48	78	31	23

Fig. 5. Laser tracking system implemented by Ahlborn et al [1]

computer with a multi-core processor. Each player provides input to the system by pointing a laser pointer at the projector screen. The system uses capture frames from the web camera to identify the position of all laser dots in the screen space. Only the positions of these dots will be meaningful to the system. This input method will be referred to as a laser-cursor. Gestural movements can become difficult to analyze with a larger number of players and thus will not be considered meaningful to the system.

The system relies on a single high resolution HD camera calibrated for thresholding, and lens distortion. The video feed processing will be handled by the DirectShow tool set. Each frame of video is processed to derive the locations of all laser-cursors in the image space of the video. This position is then transformed back into NDC using a homographic transformation to obtain meaningful application input. The concept for this system has an obvious limitation when multiple laser-cursors are being tracked. Two coinciding laser-cursors will look like a single dot to the camera and it will be difficult for the tracking program to differentiate them. However, given the nature of the gameplay - and the fact that a cursor does not need to be correlated one frame to the next - a laser-cursor that disappears for a frame or two will not have a significant impact.

### B. Laser Soccer Game Design

The collaboratively-controlled game that will be implemented for this study is called "Laser Soccer" (working title). In each stage of the game the player(s) will be required to push one or more balls into a goal before the time limit runs out. They will use their laser-cursors to push a ball into a goal. A stage is failed when the ball does not reach the goal before time runs out.

Each player's input to the game is a short-range pushing force around their laser-cursor. This force is attenuated with distance and is divided by the total number of players in the game. These forces created by players' input will be accumulated on the ball to propel it through the

stage. This way the collective force of all players will be able to propel the ball much faster than an individual player's efforts. A coordinated team will perform far better compared to a single player who is trying to carry the team.

Each stage of this game will provide challenges to the player(s) in a unique way. After the player(s) complete a stage of the game there will be a brief 15 second pause. This gives them an opportunity to rest, organize and strategize before the next stage begins. The early stages of the game will have very simple objectives. The solutions to these stages will be straightforward and absolute. This should allow any size group to coordinate the solution as soon as they understand basic gameplay mechanics. As the game continues the player(s) will be challenged to finish stages with increasingly arbitrary solutions, difficult problem solving tasks, and obscured goals or solutions. The design of the "Laser Soccer" game will likely need to be adjusted during development as specific strengths and weaknesses are discovered.

#### VII. EXPECTED RESULTS

The expected outcome of this study is that a trend will emerge between group size and game performance. This trend will be partially dependent on the decision making qualities of the game stage. For example, stages that have arbitrary solutions will be more difficult for participants who are collaborating in larger groups compared to smaller groups or single-players. This is expected because a game with arbitrary solutions will create more division between players in large groups. Players must coordinate their efforts to achieve their goals in a collaborative control game. The only way this is possible in a game with arbitrary solutions is if a leader emerges from the group and the players all maintain an open line of communication. Achieving this degree of coordination among players presumably becomes too difficult as the group size increases.

Similarly, it is expected that stages with clearer goals and solutions will be easier for larger groups compared to stages with arbitrary solutions. Although divided decisions still occur in a stage with partially absolute solutions, there is a tendency for players to choose the "best" solution, and it will be easier for a confident player to take a leadership role.

#### VIII. REFERENCES

- [1] Ahlborn, Benjamin A, et al. *A Practical System for Laser Pointer Interaction on Large Displays*. New York, NY : ACM, 2005. Proceedings of the ACM symposium on Virtual reality software and technology. pp. 106-109.
- [2] Bregler, Christoph, et al. *Squidball: An Experiment in Large-Scale Motion Capture and Game Design*. 2005, In INTETAIN, volume 3814 of Lecture Notes in Computer Science, p. 23.
- [3] Vitka, William. Chamberlain, Chad. *CBS News GameSpeak: Jack Thompson*. 2005. <http://www.cbsnews.com/stories/2005/02/24/tech/gamemecore/main676446.shtml>
- [4] Cinematrix, Inc. *Cinematrix: Interactive Audience Participation Technology*. 2001. [www.cinematrix.com/whatis.html](http://www.cinematrix.com/whatis.html)
- [5] Entertainment Software Association. *2008 Sales, Demograph and Usage Data, Essential Facts about the Computer and Video game Industry*. 2008.
- [6] Huhtamo, Erkki. "An Archaeology of Arcade Gaming." [book auth.] Joost Raessens and Jeffrey H Goldstein. *Handbook of Computer Game Studies*. Cambridge, MA : The MIT Press, 2005, pp. 3-21.
- [7] Malliet, Steven and Meyer, Gust de. The History of the Video Game. [book auth.] Joost Raessens and Jeffrey H Goldstein. *Handbook of Computer Game Studies*. Cambridge, MA : The MIT Press, 2005, pp. 23-44.
- [8] Marshall, Damien, Ward, Tomas and McLoone, Seamus. *From chasing dots to reading minds: the past, present, and future of video game interaction*. 2006, Crossroads, pp. 10-10.
- [9] Maynes-Aminzade, Dan, Paush, Randy and Seitz, Steve. *Techniques for Interactive Audience Participation*. New York, NY : ACM, 2002. ACM SIGGRAPH. pp. 257-257.
- [10] Sandra, Calvert. "Cognitive Effects of Video Games." Raessens, Joost and Jeffrey H Goldstein. *Handbook of Computer Game Studies*, Cambridge, MA: The MIT Press, 2005. 125-130.
- [11] Snibbe, Scott S and Raffle, Hayes S. *Social Immersive Media - Pursuing Best Practices for Multi-user Interactive Camera/projector Exhibits*. New York, NY : ACM, 2009. Proceedings of the 27th international conference on Human factors in computing systems. pp. 1447-1456.
- [12] Ulyate, Ryan and Bianciardi, David. *The Interactive Dance Club: Avoiding Chaos in a Multi-Participant Environment*. Singapore : National University of Singapore, 2001. Proceedings of the 2001 conference on New interfaces for musical expression. pp. 1-3.