Allegheny College
Department of Computer Science

Senior Thesis

Emotion Commotion: A Study of How the Presentation of Video Games Affects Player Interactions in Collocated Gameplay Environments

by

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Abstract

The Emotion Commotion project consists primarily of two parts: a study on the ways in which the presentation of games influences how players communicate and act while playing multiplayer video games in collocated environments, as well as the development of the game Emotion Commotion in Unity2D. This work is heavily influenced by many works by researchers such as Cheung, Chang, and Scott; Breuer, Scharkow, and Quandt; Tse, Greenberg, Shen, and Forlines and many more. The study for this project was done using Super Mario 3D World, though it would have included research on Emotion Commotion itself, had the COVID-19 pandemic not become so major a situation. That said, the study focused on groups of three players, each group having received a slightly different presentation of the game to encourage competitive play or cooperative play, while inferring neither for a control. This study found that players are somewhat more aggressive towards each other in competitive play, though this tends to be somewhat hidden, with much of their gameplay appearing amicable, while players in the cooperative grouping were consistently friendly, leading to high scores, but slow completion times. That said, there was a lack of answers as to how the experimental presentation changes that would have been featured in Emotion Commotion affect players, as the game was intended to prime players in the competitive grouping to fight players, while priming players in the cooperative grouping to fight NPC's. Overall, much was learned, despite the few questions the research has left unanswered, though this is where future research can be aimed. Emotion Commotion is also planned to continue development beyond this project with direction given in part due to the study done on players of Super Mario 3D World.

Acknowledgment

There are many people I need to thank for the support, assistance, and feedback they gave to me throughout the creation of this game, and the completion of this overall project. I especially need to thank Professors Janyl Jumadinova and Aravind Mohan for being my readers on this project, as well as the rest of the Allegheny College Computer Science Department for helping me to build the skills I needed to complete this work. I also need to thank Zachary Leonardo for his many peer reviews that pushed me to better my writing each step of the way. Thank you to Abhi Mayadam, as well, for his help in making sure that my proposal was satisfactory, and letting me know if there was anything awkwardly worded that I'd missed. Thank you to my wonderful girlfriend Gwen Snyder for always supporting me and keeping me from getting overloaded as I worked so tirelessly to complete this project throughout the Spring 2020 semester. I wish you could have been with me as I worked on it this during the whole coronavirus situation. Thank you to Mike Eltman and Linh Nguyen Mai for generally being great friends, and keeping my spirits up as I worked through this project and some less than fun life events, as well as a little extra to Mike for offering me his musical library. I cannot thank enough all of the members of LAG, ARGO, Comics Club, and the Allegheny College Bucktails Overwatch team for dealing with my frequent ramblings about my game, especially those wonderful people who made up the "Watchin' Stuff" chat, and those who lived in and visited the CoCo Bungalow. It's also necessary that I thank each and every one of the people who agreed to be in my study, and even those who reached out, but were unable to join. I literally could not have done it without you. Thank you to the subscribers of my DurchBurch YouTube channel, who put up with me streaming the spriting process of several of my characters with so little information on the game. Thank you to Star Harrison for making sure that my designs were cute enough, and for having been so supportive of my early work on this project, despite our later falling out. One last thank you goes out to my family for being there for me as I worked so many hours on this project, both on campus and at home.

Abbreviations

C#	C Sharp
COVID-19	novel coronavirus
FIFA	Fédération Internationale de Football Association
GIMP	GNU Image Manipulation Program
GNU	GNU's not Unix (Recursive)
NPC	non-player character
OBS	Open Broadcaster Software
P1	player 1
P2	player 2
P3	player 3
UI	user interface
USB	universal serial bus
UX	user experience

Glossary

Couch Co-op	Another term for collocated or local multiplayer in video games, albeit a more colloquial one.
Gemote	Crystallized gems of pure emotion, and the primary collecible within Emotion Commotion; directly tied to player score.
Player 1	The player who sat leftmost at the table from my camera's viewing angle; in-game player 3.
Player 2	The player who sat centered at the table from my camera's viewing angle; in-game player 2.
Player 3	The player who sat rightmost at the table from my camera's viewing angle; in-game player 1.
Time Units	The units of time in Super Mario 3D World. While roughly equal to one second, in-game systems that pause or even increase the timer make it disingenious to call them seconds, as time units passed does not equal seconds passed.

This thesis is dedicated to all of the wonderful people in the Legion of Allegheny Gamers who've been with me through my time at Allegheny College.

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Chapter 1

Introduction

Social interaction amongst humans: it's something that pervades nearly everyone's daily lives. There are countless ways in which humans interact socially, though few are quite as large as the medium of interaction that is the video game. Video games are becoming more and more ingratiated into society at large, and as a result, are having more and more influence over social interaction. Multiplayer games, especially, are making quite the influence. That said, there has also been a dramatic shift in recent years towards online multiplayer games, rather than collocated, or local multiplayer, games. As a result, there's been a lack of modern research into such games.

Figure 1.1: The planned playable characters of Emotion Commotion. The top row (from left to right) are Risio, Furia, Tristitia, and Dormio, the Aspects of Happiness, Rage, Sadness, and Exhaustion, respectively. The bottom row (from left to right) are Dilectio, Verecundia, Invidia, and Mercuria, the Aspects of Love, Anxiety, Jealousy, and Luck, respectively. The latter four were cut to conserve time. Each has a different ability from the others.

This is where the Emotion Commotion Research Project comes into play. The project is a piece of research for understanding just how players communicate while

playing collocated multiplayer games, allowing for greater understanding of local multiplayer, overall. This research has helped to lead to the creation of the game Emotion Commotion, where the project gets its name.

The project, uses research on local multiplayer interactions to help determine the direction of Emotion Commotion, and to offer a study into how players interact while playing local multiplayer games when given different directions on how to play. The study features 3 different groupings as a result, and utilizes a game with limited direction as playstyles go to avoid confounds. There are two experimental groupings, one with a more competitive playstyle encouraged, and one with a more cooperative playstyle encouraged. The third group is a control group with no real encouragement to do anything other than play the game.

The Emotion Commotion game, at least as built within the scope of this project features a large map, viewed from above, where all four players are spawned in separate corners. Each player must gather "gemotes" to earn points. Gemotes are spawned by breaking boxes, defeating enemies, and when hit by an enemy or a player, lowering one's score them around for collection. The game's characters each represent a different emotion or otherwise mental concept, such as Risio, the Aspect of Happiness, or Tristitia, the Aspect of Sadness. While each looks different, they each play slightly differently, as well. To continue with the examples above, Risio can run slightly faster than other characters, and Tristitia can slide using her tears to move even faster than Risio, but with no ability to change direction or halt a slide to avoid hitting something until the slide naturally ends. These differences allow for players of varying play styles to enjoy the game in their own, most comfortable ways.

1.1 Motivation

As mentioned prior, video games have risen to be quite the entertainment medium since their inception. It has reached the point where most people in the developed world have played a video game at some point in their lives, either casually, socially, or competitively, propelling the gaming industry into one of the largest in all of modern entertainment. In many cases, games lead to unforgettable social experiences, all of which leave lasting impressions on their players. From World of Warcraft to Pokémon, Dark Souls to Undertale, video games have shaped and driven the social lives of many individuals around the world in countless ways. Though many primarily or solely singleplayer experiences can be enjoyed in social contexts, such as the latter of the two games listed above, the social aspects of games shine in the cases of games driven by multiplayer like the former two games listed. Multiplayer allows for players to share the experience in a direct way, rather than through the vicarious means presented by discussing, streaming, or simply watching singleplayer experiences.

Multiplayer gaming experiences take many forms. Some are symmetrical, meaning that all players have a very similar experience, and others are asymmetrical, where one player or some players may have one experience, and others may have another. Some games take this asymmetrical design to another level with their collocated multiplayer, where the screen may split or each player may be given a separate screen entirely, though some games will ensure that players have the same view of the game. Many

games also include some form of online multiplayer, where each player may be anywhere in the world, and often, where each player has a wholly distinct view, though some replicate the viewpoints of local multiplayer experiences by giving all players the same viewpoint.

1.1.1 The Death of Collocated Multiplayer

Multiplayer experiences have, as of late, been leaning more and more into online systems. The pervasiveness of the internet in the developed world allows for online multiplayer games to unite distant people in singular, shared experiences. This can often lead to somewhat easier money for video game corporations, as a global playerbase is easier to acquire through online multiplayer than local multiplayer. This has lead to a shift in many larger game corporations away from collocated multiplayer, in favor of high-profit online experiences or purely singleplayer experiences that entice online influencers to share their experiences as a form of what's basically free advertising.

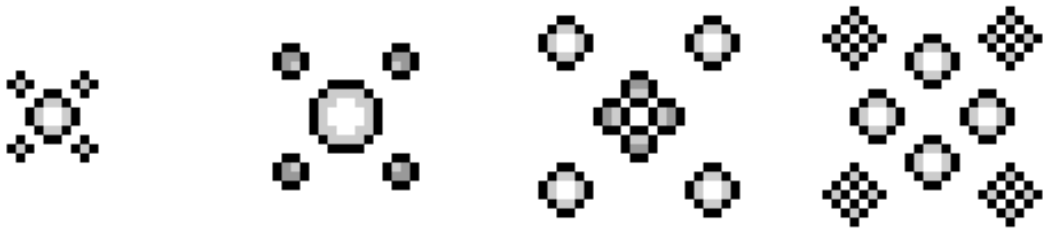

Figure 1.2: The death effect for the Nullos non-player characters in Emotion Commotion.

This, however, isn't to say that offline multiplayer experiences aren't worthwhile or engaging. The ability to play a game from the same room, or even couch leads to a level of direct interaction that is far more difficult to achieve through online multiplayer. Allegheny College's Legion of Allegheny Gamers is a testament to this fact. It's a lively club full of people wanting to enjoy the social experience of playing games in the same room. The ability to play locally has shaped many a friendship within the club's memberbase, and that's partially to do with the fact that local multiplayer is a very personal experience. It's for this reason that the shift towards online gaming has left many people who play video games wanting more in the way of local multiplayer games. Such close, personal interaction, in the words of Draigh Ricketson, member and Vice President of the Legion of Allegheny Gamers for the 2019-2020 academic year, "butters those wheels," [15] greasing the social machinery that delivers such cherished bonds as friendships. The club's largest event every year is the Super Smash Bros. tournament that it holds on campus, and it is a solely local multiplayer experience, with 44 participants from the college campus in the 2020 run of the tournament.

Despite the value of local multiplayer experiences, research has shifted in the same direction that many of the world's game developers have, one aimed more towards the ever-expanding market that is online multiplayer. This shift has left the field of local multiplayer neglectfully under-researched in recent years, leaving a noticeable lack of

contemporary research in the field. This lack of research could prove to be limiting, potentially hampering the growth of the field of collocated multiplayer development, feeding into the cycle that has left online multiplayer as the primary focus of game companies and researchers, further exacerbating the divide, as research and development teams see less and less data on its merits.

1.1.2 Hope for the Future of "Couch Co-op"

Research could prove invaluable to the field of collocated multiplayer gaming, potentially leading to more efficient game design that would boost the users' experiences with the games greatly. Improved experiences could help to revitalize interest in local multiplayer, which could, in turn, bring more balance back to the table of game design, working to end the cycle of the underutilization of local multiplayer experiences across the realm of video games.

There's a certain charm found in collocated multiplayer that can be difficult to find in any other gaming experience. It's hard to describe, but it's clearly present, making almost any multiplayer experience even more impactful.

Figure 1.3: The three primary destructibles initially intended to be found across the builds of Emotion Commotion, player statues (competitive), crates, and non-player statues (cooperative). Now, all destructibles are present in the final build.

1.2 Current State of the Art

The current state of the art of local multiplayer games is somewhat lacking. Beyond independent developers, few major publishers and developers are focusing very heavily on the collocated experience of their games. As a result, games with a primary local multiplayer focus are becoming less common as the years go on, and many of the largest games in recent years are either singleplayer experiences or games that focus almost solely on their online multiplayer aspects.

In Chaim Gartenberg's "The future of gaming is lonely (and online only)," he discusses his disappointment with the then upcoming Halo 5's lack of local multiplayer. Describing that, "Most of my fondest gaming experiences aren't of beating a boss or one-hundred-percent-ing optional collectables. It's losing to my brother at Madden,

running through Halo campaigns with my friends, and late night Smash Bros. tournaments with my roommates when we probably should have been studying" [11].

Similarly, Paul Tassi of Forbes discusses this problem in his article on the death of collocated multiplayer games, noting the irony that as TVs are getting larger, splitscreen play is becoming rarer, saying, "The thing [his new TV] is beautiful. It's bright, it's clear, it's big, and it got me thinking about how absolutely absurd it is that we have almost no split-screen console games any more" [17]. He admits that there are arguments to be made against the idea of adding local multiplayer to a game, but that doesn't make it a worthwhile feature to cut in his eyes.

There are certainly some companies, or at least development teams, that see the value in collocated multiplayer. As local multiplayer experiences from major companies go, some of the largest games have been published by Nintendo, with such multiplayer titles as Mario Kart, Super Smash Bros., and Pokémon, though all of these games also feature some degree of focus on online multiplayer. Some other companies such as Activision and Warner Bros. Interactive Entertainment have published well-received games with local multiplayer, such as Crash Team Racing: Nitro-Fueled and Mortal Kombat 11, respectively, though, as with the games listed above, these are also games that have large focuses on their online multiplayer. That said, all of these games are typically best known for their collocated gameplay whether that gameplay be casual and with friends or at large tournaments with thousands of spectators.

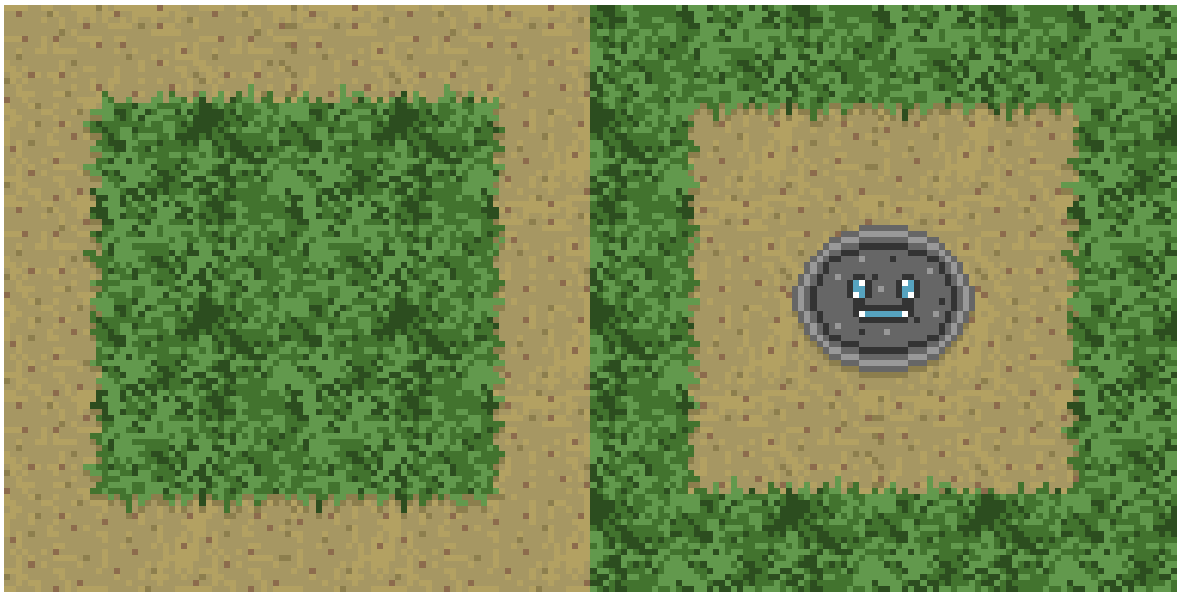

Figure 1.4: The tileset used for the creation of the map. The circular object on the right side is the spawn point, placed here for clarity.

1.3 Goals of the Project

1.3.1 Major Goals

The goals of the Emotion Commotion research project are primarily focused on the research. There is much to learn about how communication plays into local multiplayer gaming. As there isn't very much contemporary research into such collocated gaming-influenced communication, this is a relatively untapped field, at least as modern research goes. Knowing how players communicate while playing collocated multiplayer games is essential to building optimal local multiplayer games. As a result, this research project has the goal of improving the understanding of how to design local multiplayer gaming experiences, and thus lead to the better local multiplayer experiences in future titles.

The other major goal of the Emotion Commotion project are focused on the game itself. There is much that can be influenced in the development of a new game by research done in tandem with development, and it is my hope that such integration with research and development will work to build a worthwhile local multiplayer experience.

1.3.2 Minor Goals

Other more minor goals existed, as well, though they all had to be shelved or limited for the development of the project to not outgrow its time constraints.

One of the more minor goals, was tied into the goals of the development of the game itself was to obtain useful feedback that would have allowed for the creation of a full-fledged game. This would have been a rewarding end to the game creation process, though the development took far too long to get feedback on a finalized version of the game, especially as the game was overall less important than the research itself. Nonetheless, it would be nice if, at some point, after the completion of the game, such feedback could be acquired to be used in the polishing of the final version of the game.

One goal was to have created a polished character selection menu that could communicate in a clear fashion what character the player was picking, as well as what that character could do. Another was to provide eight total playable characters, all with subtle differences, but all balanced enough to neither be too strong nor too weak. The idea that was behind this was that it would have worked to allow players to pick a character that would have suited their play style, and, if their best option was taken, that would have ensured that they could still have picked another option that was equally suitable, or, if that wasn't possible, only slightly less suitable.

1.4 Thesis Outline

1.4.1 Related Work

There's a wide array of work from a number of researchers, all of which hold some degree of connectedness with the Emotion Commotion project. From Cheung, Chang, and Scott's "Communication channels and awareness cues in collocated collaborative time-critical gaming," which focuses on how players communicated in collocated multiplayer

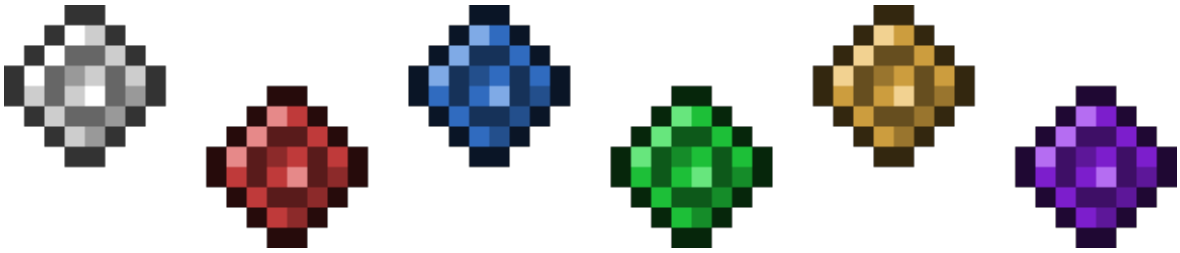

Figure 1.5: Gemotes, the primary collectables in Emotion Commotion. From left to right, the values are 1, 5, 10, 25, 50, and 100 gemotes in value.

scenarios [9], to Noz and An's somewhat odd "Cat cat revolution: an interspecies gaming experience," which highlights the pervasiveness of video games' ability to be social experiences that increase bonds, even beyond just humans [14], there is a wealth of research that holds some meaning for this project. In the second chapter of this thesis, such related works of research are extensively explored.

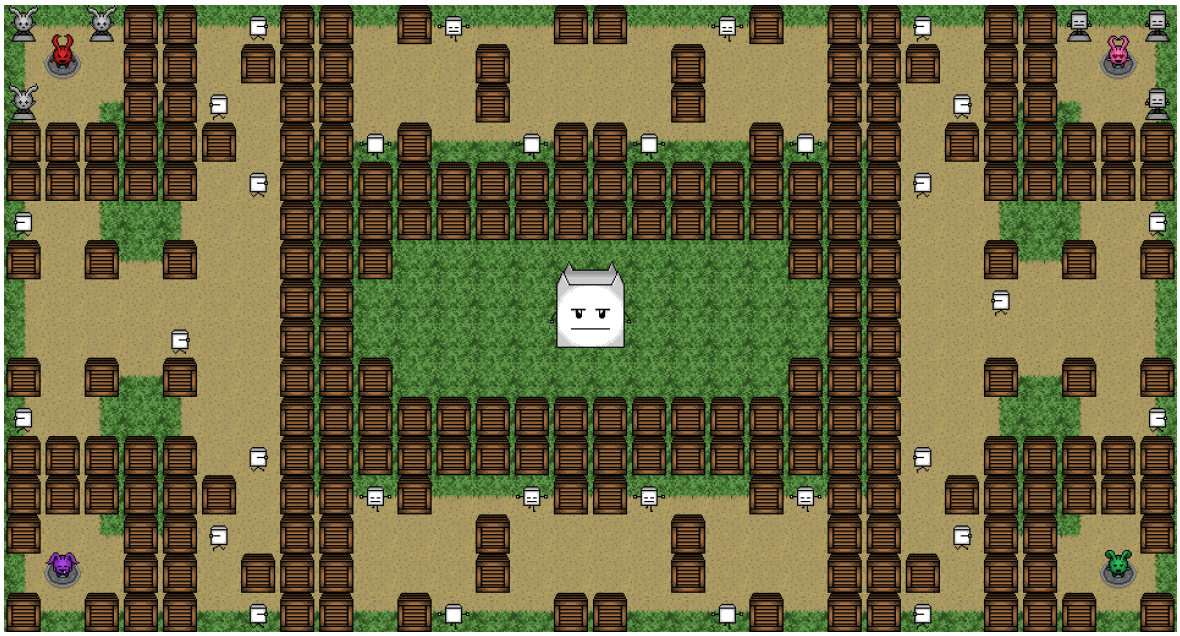

Figure 1.6: A mock-up map of Emotion Commotion. The top-left corner represents what would have been the layout for the competitive grouping, while the top-right would have been the cooperative, and the bottom two, the control grouping. Also featured is Crudelis, the "boss" character cut from the game due to time constraints.

1.4.2 Method

The methodology behind the Emotion Commotion project is rather particular, but this is what saw to the fact that the project could run at its smoothest and most efficient pace. Many pieces of software were utilized to bring each and every part of the game to life, ensuring that study could be done. The study was run to feature groups of 3 members each in one of three groupings, "cooperative," "competitive," and a control,

playing Super Mario 3D World [12]. The third chapter of this thesis elaborates on these methods, as well as each of the tools utilized.

1.4.3 Experiments

Over the course of the study, footage was gathered. This footage was later analyzed to understand how the different group presentations influenced how the players played. The results of this analysis can be found in the fourth chapter of this thesis.

Chapter 2

Related Work

While much of the current research is heavily focused on online gaming, there is still a wealth of information related to local multiplayer gaming. There are still numerous articles that could be said to be heavily related or influential to the shaping of the Emotion Commotion project, and there are plenty of others that, while not as strongly related, help to illustrate the benefits of the research that the Emotion Commotion project has allowed for. As such, the related works have been split into "significant" and "semisignificant" sources.

Much of the significant sources have had a heavy influence on the Emotion Commotion project overall, having shaped it from its conception to its completion. The semisignificant sources have done far less to shape the project, though they do strengthen the foundations upon which the Emotion Commotion project stands.

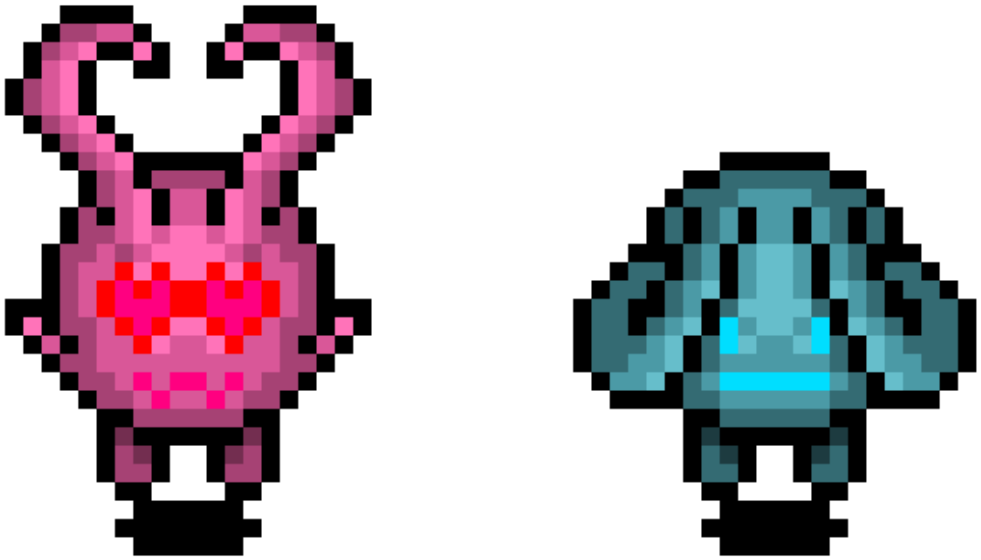

Figure 2.1: Dilectio and Verecundia's attack frames. As twins, they represent two distinct but related concepts, love and anxiety.

2.1 Significant Sources

2.1.1 Communication channels and awareness cues in collocated collaborative time-critical gaming

The first article that had a major impact on the Emotion Commotion project goals was a paper by Cheung, Chang, and Scott [9]. Their research was focused on the ways in which people communicated while playing first person shooter games in local multiplayer environments. Its heavy focus on local multiplayer was the initial hook, but it was the methodology that really influenced this project. The researchers made use of a camera mounted behind the players of the game in their research, and they manually reviewed the footage extensively to gain an understanding of the ways in which players chose to communicate. This method is noticeably similar to the methods utilized in the Emotion Commotion research project. The results of Cheung, Chang, and Scott's research were that players made use of many means of communication, from verbal communication to in-game and physical gestures [9]. This research matters because smart game developers will pay attention to the ways in which players communicate to foster more communicative gameplay, with increased ease of communication, both in game and in person.

This research leaves a clear and distinct mark on the Emotion Commotion project, despite the deviations between this project and Cheung, Chang, and Scott's. The methods they utilized in their research were extremely influential. The camera captures the people from the front, in the Emotion Commotion research, leaving the game to be captured with screen capture software. This allows for the capture of certain body-language indicators that Cheung, Chang, and Scott couldn't have referenced in their research, as well as clearer footage of the game to prevent any possible difficulties in interpreting what was happening in the game from the screen not capturing well on a camera.

2.1.2 Sore losers? A reexamination of the frustration–aggression hypothesis for colocated video game play.

The next most valuable article to this project was Breuer, Scharkow, and Quandt's paper "Sore losers? A reexamination of the frustration-aggression hypothesis for colocated video game play" [7]. This paper discussed how different types of interaction in a competitive setting would lead to increases in frustration and aggression in players. Their methods involved having a skilled confederate play FIFA against research subjects, using one of two different means of communication, snide comments and friendly remarks. Then they utilized a test of aggression to see whether the game sessions increased the subjects' aggression. This paper found that snide comments were not enough to significantly increase aggression in a player, though losses in the game did increase aggression in a small, but significant way. This research has a value to the industry, as frustration in gaming is often thought of as coming from how the players communicate, with the idea of a source such as simply losing being left on the metaphorical backburner when it came to the development of non-frustrating games.

This article is relevant to this project as it influenced what it would be examining.

The idea of using a competitive game to increase aggressiveness was intriguing, and led the plan for this project to a path focused on how competitive and cooperative gameplay affect the players' communication choices. Do they swear more frequently when in competitive environments? Do players still play aggressively against each other when guided to play together? These are the questions that this paper inspired as this project was being worked towards its final direction. Without this paper, the research would likely have gone in a more set direction, lacking at least one of the experimental groups, leading to less complex data with less possible comparison points, and less possible new questions posed from the data itself.

2.1.3 Multimodal multiplayer tabletop gaming

Another major work that inspired this project in some way is a paper by Tse, Greenberg, Shen, and Forlines [18]. This paper was focused on the creation of local multiplayer experiences with unique control methods; however, they didn't work with multiplayer games, they worked with singleplayer titles. They made use of a projected screen that allowed the players to interact with the game by gestures and sounds, rather than just by use of a mouse or controller. This required the players to have the same viewpoint, as they were effectively a team controlling one in-game player. The results of the paper were optimistic about unique game control methods, and the games successfully translated into tactile and verbal experiences, despite their lack of such mechanics by default. This work should be of high import for game developers looking to create unique and engaging experiences, though maybe not to the degree that these games utilize.

This research has impacted the Emotion Commotion project by influencing game design concepts. It encouraged the concept of symmetrical map building, ensuring that all players had a near identical experience with the game, with the only game world differences being location of initial spawn. Tse, Greenberg, Shen, and Forlines also influenced the idea of having a static camera to require that all players utilize the same viewing angle, further emphasizing the symmetry and allowing for easier map awareness for the players.

2.1.4 Aggression, competition and computer games: computer and human opponents

Also relevant, despite its writing in 2002, is a paper by Williams and Clippinger [19]. The paper is focused on the difference between aggression spurred by competitive games when facing human opponents as compared to computer opponents. They tested this by using a computer version of Monopoly, and having the participants play against either a computer or each other for about 20 minutes. They found that players would become more aggressive when playing against computer opponents than human opponents, theorizing that this was due to "[t]he playing situation and the identity, and perhaps the proximity, of the opponent [having] an impact on the feelings of aggression and hostility associated with playing the game" [19].

This built up some expectations for Emotion Commotion, primarily that players would be more aggressive when commenting on their actions towards the NPC's, rather

than the other players, even in the more oppositional tests, where players were playing against each other. Sadly, as Emotion Commotion itself was unable to be directly studied, this behavior couldn't be observed in its context, and, in the study I was able to run, no players were particularly aggressive towards the NPC's, mostly dispatching them quickly.

2.1.5 The many faces of sociability and social play in games

Stenros, Paavilainen, and Mäyrä's paper on social play in games is also particularly relevant to the structure of Emotion Commotion's research [16]. In their paper, they discuss the main types of multiplayer: competitive, cooperative, and collaborative. They described competitive play as when players are "directly antagonistic" [16] towards each other during play sessions. Cooperative play is described as when players will willingly temporarily assist each other, despite not being required to. Collaborative play was where players are required to assist each other throughout much of any given gameplay session.

This is very similar to the structure of the Emotion Commotion project's research. Looking at the three research groupings for Emotion Commotion, there's the competitive grouping, the cooperative grouping, and the control. This covers two of the three different types of gameplay listed in the article. This fact raises a new question about whether or not players in the competitive grouping will cooperate at times, and, even more interestingly, whether any of the cooperative groups will genuinely make the game collaborative, refusing to intentionally harm each other. Overall, it was encouraging to know that the groupings utilized in this project were supported by prior research, rather than being arbitrary and in need of better definition.

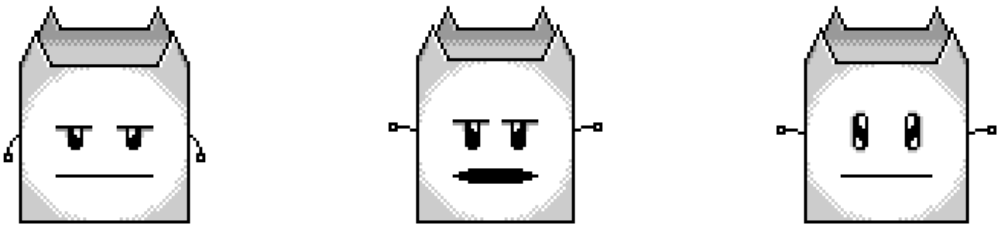

Figure 2.2: The most significant non-player character in Emotion Commotion. Crudelis is the Aspect of Emotionlessness. His hulking frame would have dominated the center of the map, had there been the time to fully implement him.

2.2 Semisignificant Sources

2.2.1 Supporting free play in ubiquitous computer games

While less directly related to the goals of the Emotion Commotion project, Mandryk and Inkpen's article "Supporting Free Play in Ubiquitious Computer Games" touches on some interesting points that further allude to the value in collocated multiplayer gaming experiences [13]. In their section on collocated games, they discuss how there were more benefits from collocated gameplay experiences than from online multiplayer, which, even as early as 2001, was already a heavy focus for a lot of gaming experiences. In this section, they also discuss the fact that collocated gameplay is a far better way for children to enjoy a free play experience, as they could communicate far better with each other in person.

This helps to show that the Emotion Commotion project has the potential to further the study of a valuable field in game design. That said, it should be noted that since 2001, the ability to communicate over the internet has been greatly increased, both through in-game means, and through outside applications. However, this doesn't mean that collocated communication is less effective than online in the modern era. Technical difficulties can limit the effectiveness of online communication, and there will always be a latency on communications that use the internet for their transmission, meaning that direct, interpersonal communication will always be more efficient for video game play.

2.2.2 Interactive human communication

In Chapanis's 1975 article on human communication, he discusses the way different modes of communication can reduce or increase the time required to solve a problem as a group [8]. Primarily, he describes that rich communication environments, such as those that would be seen in collocated multiplayer gaming, are the best at leading to functional cooperation and fostering efficient teamwork.

This raised a question for the Emotion Commotion project, as it suggested that, especially in the cooperation-centric grouping, the collocated multiplayer aspect would allow for increased capability to find success as a group. While this is mainly discussed later (in chapter 4), this was something also shown in my study. Both the cooperative and competitive groupings were vocal in ways that promoted assistance and success overall. This also harkened back to the influences of Mandryk and Inkpen's paper, highlighting the value of direct interpersonal communication, despite the fact that Chapanis wrote his paper well before the internet had had a chance to shape society to the extent that it now has.

2.2.3 Cat cat revolution: an interspecies gaming experience

In the rather interesting article "Cat Cat Revolution: An Interspecies Gaming Experience", Noz and An outline that the benefits of collocated multiplayer experiences in gaming can clearly be seen, even beyond human to human interaction [14]. In their experiment, they created a video game that cat owners could play with their cats, leading

to some cute, but genuinely interesting results. They found that the pet owners felt like the gameplay had fostered a healthier connection between themselves and their pets. Some participants even noted their surprise at the fact that the cats effectively learned to play the video game, and how powerfully it worked to increase the bond between the cat and the owner [14].

While this is clearly outside of the species-specific scope of the Emotion Commotion project, it illustrates how powerful collocated multiplayer experiences can be, even to less intelligent social animals like cats. If less intelligent animals can utilize collocated gaming as a means to bond, it is all the more clear that humans receive such benefits. Humans may be more complex as minds go, but if this phenomenon exists beyond humans, it shows that the phenomenon's persistence across species is the result of how social animals, well, socialize.

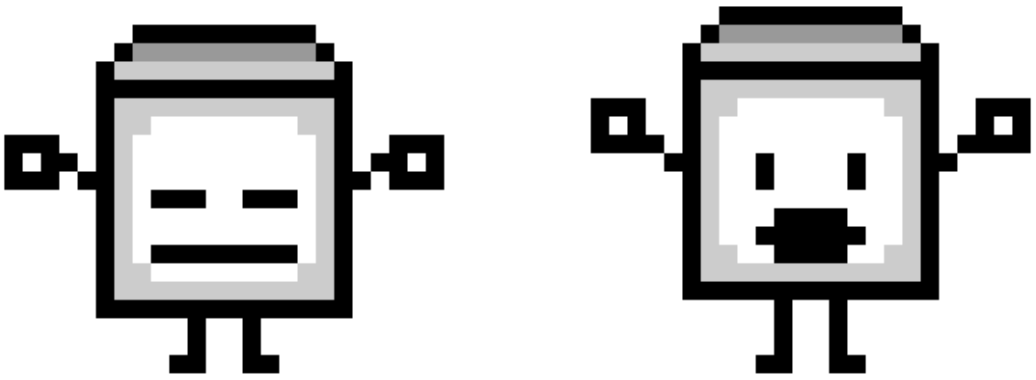

Figure 2.3: The small, numerous non-player characters in Emotion Commotion. Nullos are the Aspects of Apathy. They run around, without a single care in the world.

Chapter 3

Method of Approach

With the Emotion Commotion project, much work needed doing, and that work required careful methods to ensure completion. There are two parts to the project, namely the research study and the development of the game. The study had many intricacies in methodology, such as the design of the research study and the design of the analysis of the data gathered in the aforementioned study. Development also required extensive work on many fronts, from assets, such as sprites and sound effects, to the construction of the game itself in Unity2D.

3.1 Research

Research for this project took a time-constraint forced turn, as game development was just simply too long to allow for both the completion of Emotion Commotion, and the use of it for a research study that would take place prior to Spring Break. That said, the research can be done in some other games, just less favorably. As a result, Super Mario 3D World [12] was used for the sake of research, and as a tool to inform the future design of Emotion Commotion.

3.1.1 Method of Research

The methodology of the research was to first run a study where groups of three players were placed into experimental groupings to play the Super Mario 3D World stage "Really Rolling Hills," then to run an analysis of the footage to understand how the players played.

Study Design

For the study, nine participants were gathered to play Super Mario 3D World in the aforementioned groups of three. These groups were randomly assigned with the use of the randomizing app, Random UX [3]. Using its number randomizer, I generated numbers between one and three, with no repetition, to assign each of the first three participants to a group, then repeated the process twice to assign the other six participants to their groups. This ensured that three groups of three individuals were formed.

Group 1 became the cooperative gameplay group, Group 2, the competitive group, and Group 3, the control.

Each group was called in one at a time to enter the room where the study was to take place. In this room, there was a table with three controllers and a microphone placed across from the desk where my capture computer and camera were positioned. The game was run on a projector in the corner of the room, where the participants could all have a clear view of what was happening. Once the players were seated, I asked them to check their emails for the newly sent out consent forms that they would find there. Once consent forms were signed, I informed the participants that I'd be beginning the recording through OBS shortly, to ensure that they were fully aware when the recording would begin [5]. I then gave a countdown from three, starting the recording at zero.

After this, I told the group what I'd be having them do. In the case of Group 1, I told them that they'd be trying to get the highest possible total score. I told Group 2 that they'd be playing to get the highest possible individual scores. Group 3 was only told that they'd be playing through the level. Once that explanation was given, the group was free to start playing whenever they were ready. Once they began the level, I stepped out to let them play without feeling quite as observed as they probably would have if I was still in the room while they played.

Once they'd completed their gameplay, they would come to let me know that they'd finished, and I'd re-enter the room. Once I was returned, I sent out a new email with the post-gameplay survey, and then informed them that it would be in their inboxes. While they worked on the survey, I sent out the debrief form. When all of the surveys were in, I asked them to read over the debrief, and that they not share any of the details of the debrief with the participants who were waiting to play to prevent any confounds to the research.

Once all of the footage was gathered, I ejected the USB flash drive it was saving to. This drive was then stored in Professor Jumadinova's office to keep the data secure. Each recording was named after the group number and experimental grouping (formatted as NUMBER - GROUPING).

This USB had to be retrieved early, however, due to the COVID-19 pandemic leading to the requirement that the rest of the work be done from my home. As such, I retrieved the USB flash drive before leaving campus, and instead kept it safe in a lock box to be retrieved as needed for the remainder of my analysis.

Analysis Design

The analysis was mostly qualitative, and consisted of watching and rewatching the gameplay footage from the study to glean what understanding I could of how players were interacting. I took notes while watching to keep track of my observations and any interesting quotes that happened to be said during any given gameplay session. I also marked the scores in the end, as they provide a more quantitative outlook on the sessions.

3.2 Development

The development-centric methods utilized are all intricately planned. Assets had to be designed from the outset of the project to be provide the necessary pieces that the game later needed to be constructed and coded optimally.

3.2.1 Asset Design and Allocation

Each asset design tool was chosen for a reason, and aided development in its own uniquely significant way. The most major software tools will be discussed in this subsection, ordered by significance to the project.

Spriting in the GNU Image Manipulation Program

The creation of sprites was absolutely essential to the visual nature of the video game medium. Emotion Commotion is no exception to this fundamental trope of video game design. This meant that all character designs had to be created somehow to allow for players to receive the visual feedback needed for proper enjoyment of Emotion Commotion.

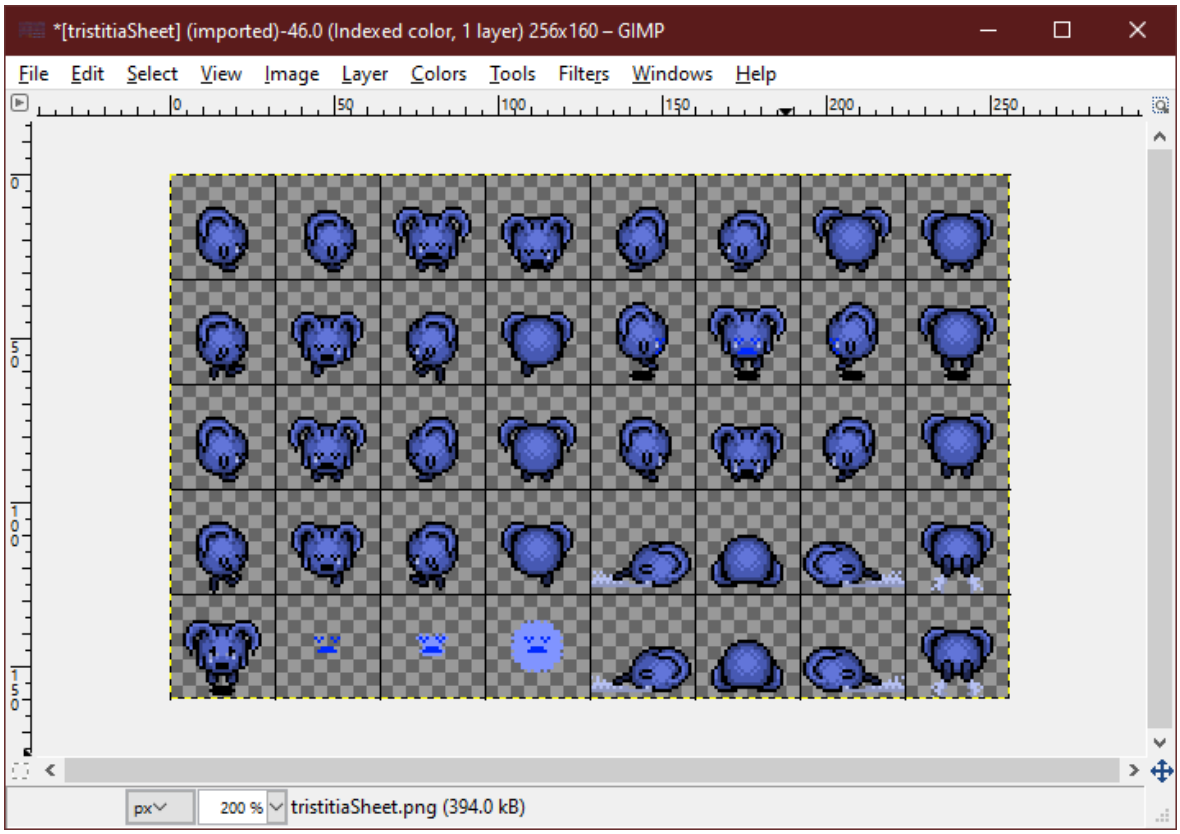

Figure 3.1: An example of a spritesheet from Emotion Commotion as opened in GIMP. This is Tristitia's spritesheet, and the fullest spritesheet in the game.

To meet this visual need for sprites, I made use of the GNU Image Manipulation Program, or GIMP [1]. GIMP offers a relatively basic suite of image editing tools,

similarly to other image manipulation software, though it offers its tools at no cost. The specific tools utilized within GIMP in the creation and design of the sprite assets used in Emotion Commotion were the "Indexed" image mode, found in GIMP's default roster of tools, as well as the even more basic abilities needed in spritework, such as those needed to draw elements a single pixel at a time (the "Pencil Tool"), the various selection tools needed for manipulating large portions of sprites, and more.

The sprites themselves were created to the 16 color index standard found in many games throughout the industry. Some games that use this standard use it with the treatment of the alpha color as the 16th color in the color index array. As a result, each sprite used in Emotion Commotion only uses a maximum of 15 unique colors. This is held in all cases of individual sprites. Without the ability to use GIMP's "Indexed" image mode, this process would have been far more difficult, and far less certain. The majority of the sprites were also created in another sprite standard, which is the 32 pixel by 32 pixel sprite, something that GIMP also made simpler to achieve.

After sprites were created, the images were collected into spritesheets, also made using GIMP. These spritesheets were made of grids, typically divided into 32 by 32 pixel squares where the individual sprites were placed. These spritesheets were the final images input into Unity to create all of the animations used in the game.

Creating Sound Effects in Audacity

The creation of sound effects was also important, as, in all forms of animation, sound is vital. Emotion Commotion needed a wide array of sounds to be completed, and the array created was rather conservative for a video game. That said, each character in the game had several sound effects created, as well as several sound effects for the various non-player characters and the breakable objects.

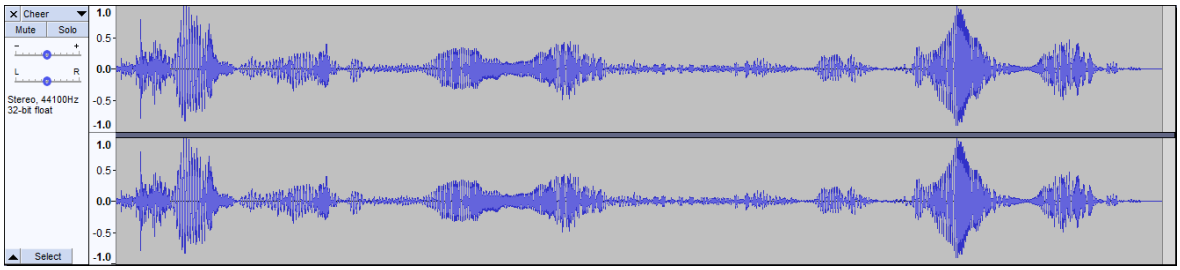

Figure 3.2: An example of a waveform for a sound effect from Emotion Commotion as opened in Audacity. This is Dilectio's cheer sound effect, though it is, sadly, unheard in the final build utilized in this project.

Audacity was the tool of choice for the creation of sound effects [2]. It is a rather basic audio editing tool, but it gets the job of recording and editing sound done while remaining free to use. That said, some of its more specific tools were also utilized. The primary tools used were Audacity's "Noise Reduction" tool, "Change Pitch" tool, and "Vocoder" tool, as well as, too a far lesser extent, many other minor tools within the program.

The sound effects were all created by myself, making what I can only imagine were some rather strange noises into my microphone while recording using Audacity.

I then took the audio recorded and used the "Noise Reduction" tool to remove the background noise to the best of my ability, before pitch shifting the audio up by 10% for male characters, and 20% for female characters. After these steps, I made use of the "Vocoder" tool within Audacity to distort the audio with the default 10 band setup Audacity offers. All of these were done to make the audio sound less like a college student in a small room, and more like a small emotion-creature. These sound effects created in Audacity were then input into Unity as is for use in the game.

Miscellaneous Assets Allocated

Other assets were needed, beyond those made in GIMP and Audacity. Such assets were allocated by other means. The main asset that had to be allocated is the background music, which was created by Mike Eltman [10], and was used with his express permission. The song plays during the gameplay showcased in the demo. Another asset allocated was the sound that plays when you collect a gemote, which is from the Legend of Zelda: Majora's Mask, and is Tatl the fairy's position shifting sound [6].

3.2.2 Game Construction

Once assets were assembled and ready to go, implementing them into the actual game was of high import. Please note that I differentiate between the coding and the construction of the game in Unity2D, though they do go hand-in-hand. Each environment brings its own challenges, and each is very different as a process.

Unity2D

Unity2D was the platform of choice for the development of Emotion Commotion [4]. As the game is itself 2D, there was no need to develop the game in anything other than the 2D-centric environment of Unity2D. As an industry standard, Unity provides all of the essential tools I could need for the construction of a game such as Emotion Commotion.

The game construction began with the creation of the main scene that would be needed for the game, the field of play. Once that was added, the next step was to add a character to begin the development of the characters who would need to interact with the rest of the elements in the game. Construction in Unity began with Risio's "GameObject," as he is one of the most basic characters in the game. Risio's attack projectile also needed to be constructed for the sake of creating the baseline attack projectile for all other player characters in the game. Once these prefabs were assembled, the baselines they formed were able to be used to generate the rest of the 4 characters and player attacks found in the final build of the game as developed for this project.

After the construction of the initial character prefabs, I added the destructibles to the scene so that the player character could actually start interacting with the game world. This also meant creating the collectibles and score UI. Once this was done, all 224 crates and 24 statues were then manually placed on the map.

Destructible creation and placement were then followed by the creation of an initial Nullus enemy, shortly followed by the creation of another Nullus enemy, each designed

to patrol in a separate dimension (the first left and right, and the second moving up and down). After this, all 30 of the Nullos were individually placed in their initial positions.

The final steps for the construction of the game were creating the other playable characters to join Risio in the game, and adding a final score screen. Neither of these processes were particularly complex, aside from swapping the animation frames on each of the other characters from Risio's to their own.

Code

As mentioned above, I distinguish the coding of scripts for the sake of Emotion Commotion separately from the construction of the assets in Unity, itself. The C# coding for the project is obviously inherently linked to Unity, though it was a far more abstract, less UI-intensive part in the development of the game.

The first script that needed to be developed in C# was the basis of all movement scripts for all characters. This script was developed in tandem with Risio's "GameObject," and was followed by the script for the projectile that Risio would fire as an attack, which, in-turn, was the basis of all other projectile scripts.

```
40      if (Input.GetKey(KeyCode.LeftArrow) && (!isMoving || isMovedLeft)) // Move left
41        {
42          isMovedLeft = true;
43          isMovedRight = false;
44          isMovedForward = false;
45          isMovedBackward = false;
46
47          isFacingLeft = true;
48          isFacingRight = false;
49          isFacingForward = false;
50          isFacingBackward = false;
51
52          isMoving = true;
53
54          AnimatingMove(isMovedLeft, isMovedRight, isMovedForward, isMovedBackward);
55        } else if (Input.GetKey(KeyCode.RightArrow) && (!isMoving || isMovedRight)) // Move right
56          {
57            isMovedRight = true;
```

Figure 3.3: A very early excerpt of the script for moving player characters that had been developed for Emotion Commotion.

The next script that was developed was that of the crates in-game. This script was a basic bit of code for destructibles that, quite honestly, was little more than saying, "If a projectile touches you, break, scatter gemotes, and stop existing." This was easily generalized into the script for the statues, which were rather similar, only varying in a couple nuanced ways, such as number of gemotes spawned. This resulted in the need to develop the scoring script, and the gemote acquisition script, which counted points based upon which gemote was touched, displaying the score value at the top of the screen, and deleted touched gemotes, respectively.

The next duo of scripts was the scripts for the Nullos. One script covered the movement of the left and right moving Nullos, and one script covered the movement of

the up and down moving Nullos. The only major difference between these scripts and those of the destructibles was that these scripts needed to also move the NPC's back and forth.

```
74    void OnTriggerEnter2D (Collider2D other){
75      if (alive) {
76        if (other.tag == "Risio Projectile" || other.tag == "Furia Projectile" || other.tag == "Tristitia Projectile" || other.tag == "Dormio
77          alive = false;
78        } else if (other.tag == "Patrol 1") {
79          runningBackward = false;
80          runningForward = true;
81        } else if (other.tag == "Patrol 2"){
82          runningForward = false;
83          runningBackward = true;
84        }
85      }
86    }
```

Figure 3.4: An excerpt of the finalized script for the non-player characters that move from top to bottom in Emotion Commotion.

These scripts were then followed by the other character-specific scripts that were needed to make each character feel unique. This meant modifying Risio's scripts to slow the other characters down a little, add a slide to Tristitia, extend the range of Furia's projectile (by increasing its speed), and to reduce the number of gemotes lost when Dormio gets hit.

Chapter 4

Experimental Results

The results of this project's study were rather interesting, as they weren't entirely what I would have expected. After the thorough analysis of the footage I was able to compile my results here. The data is all laid out in Evaluation section found below.

4.1 Experimental Design

As was discussed at the end of the previous chapter, the experiment was designed where the participants were placed into 3 random groups of 3 people. Each of these groups was given a different description of the way they were expected to play the game Super Mario 3D World [12]. The cooperative group was told to aim for the highest overall score, the competitive group was told to aim for the highest individual score, and the control was asked to simply complete the level they were asked to play through.

These sessions were recorded using OBS Studio [5] to allow for the analysis of them at a later time. The footage was stored to a USB flash drive that was always held in a safe environment, namely Professor Jumadinova's office or my personal lock box.

This footage was analyzed through repeated viewings of the footage, as I took as detailed of notes as I could to understand what was occurring in the videos. Those notes stand as the basis for the analysis found in the Evaluation section.

4.2 Evaluation

There is much to note on the footage of each session, as well as what the post-gameplay surveys indicated. Overall, I looked to see how players were interacting based upon their groupings. As a result, I heavily looked for more competitive and more cooperative interactions in all groupings in an effort to gauge whether or not the presentation of the game had an influence the behaviors of the players.

The details of my evaluation are split up some as there is both quantitative and qualitative data to assess, though there is a significant focus on the qualitative data, as this study is first and foremost observational. The quantitative data primarily serves to leverage the qualitative observations.

4.2.1 Super Mario 3D World Study

The study done as part of this project was not on the game Emotion Commotion, itself, as was discussed previously in this thesis. Super Mario 3D World [12] became the game of choice for the study as a result, so all data found here pertains to that game.

Each subsubsection below holds and evaluation of some of the data of from this study, starting with the quantitative data, and ending with a series of comparisons between the groupings. The first two of which are between the experimental groupings and the control, and the third is a head-to-head of the two experimental groupings.

Some overall things to note before diving into these comparisons, however, are some aspects that are shared across all groupings. In all groupings, most players were new to Super Mario 3D World, and needed to take some time to learn the controls. Most of the players also expressed that they'd enjoyed their time playing the game, though none said that it hadn't been enjoyable at all. One participant even went as far as to say, "It [the gameplay session] brought back childhood memories of playing video games with my brothers." As a result of the commonality of these statements, I'll be leaving mention of them out of the rest of the discussion to come, as it would become rather repetitive, otherwise.

Quantitative Data Comparisons

The data from the following graphs will be used as a part of the comparisons in the coming subsubsections. While much of the analysis below will be qualitative, these scores are all relevant to the discussion to be had about the results of this study.

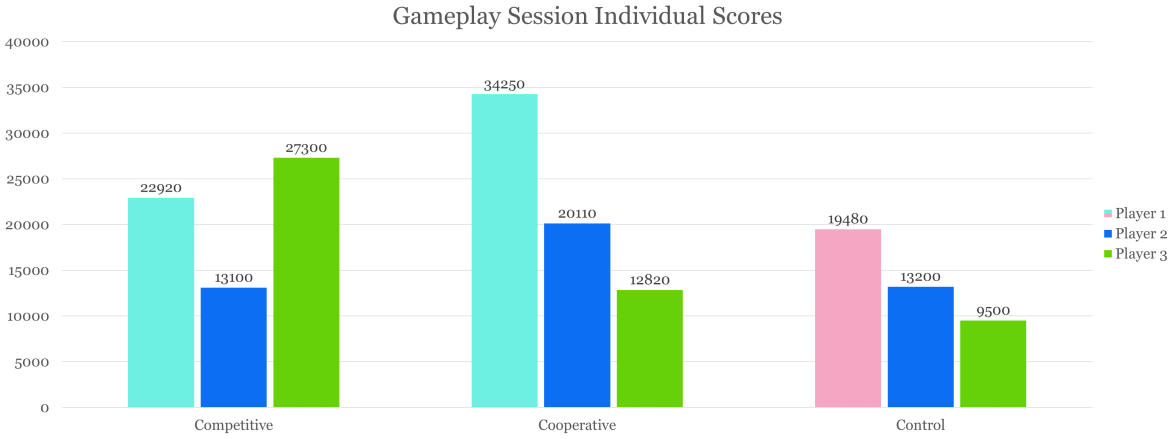

Figure 4.1: This graph is of the individual scores earned by all players. The bar colors represent the character played, with light blue representing Rosalina, blue representing Toad, green representing Luigi, and pink representing Peach.

In Figure 4.1, you will notice that the highest individual score was in the cooperative group. That said, both of the other scores in the cooperative group were lower than their counterparts' in the competitive group. Also of note is that the lowest scores are found in the control group, where the least direction was given, and the objective was simply to "complete the level," not build a high score. This may be a fault of my

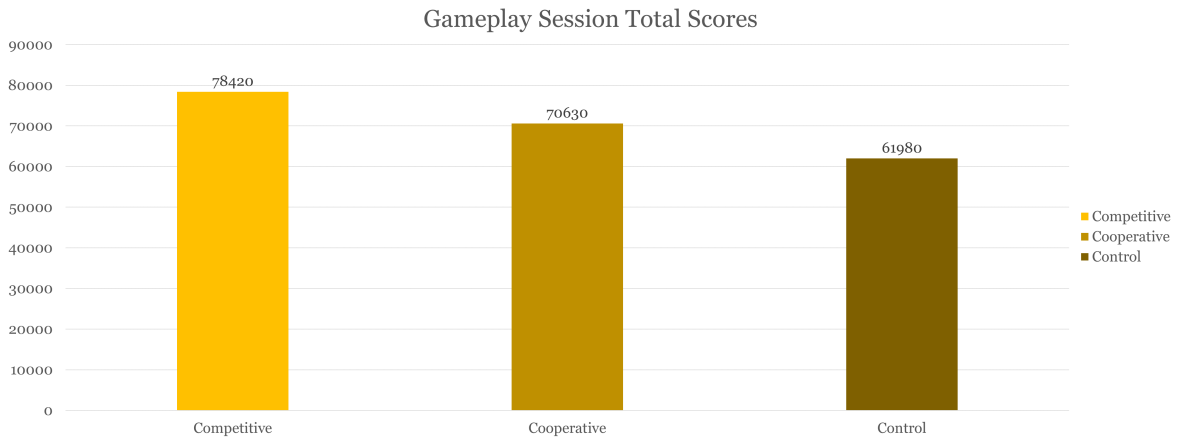

Figure 4.2: This graph is of the total scores earned by each of the groups. The bar colors represent the score totals, with the brightest being the highest, and the dimmest being the lowest.

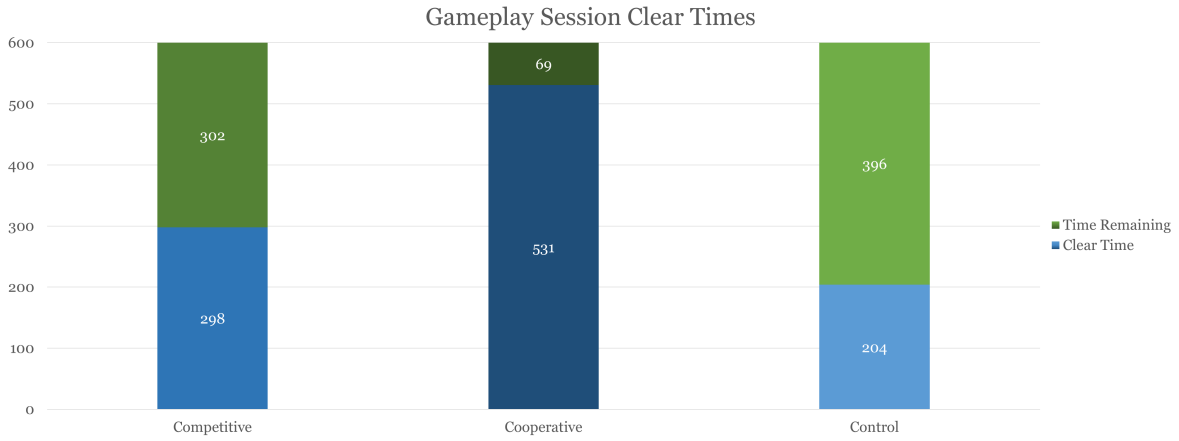

Figure 4.3: This graph is of the time units it took each group to finish the level. The bar colors represent the times, with the brightest being the fastest, and the dimmest being the slowest.

instructions, as the other groups clearly did focus far more on how they scored in the study. I'd built this version of the study off of the planned one for Emotion Commotion, and had forgotten that there are more ways to play Super Mario 3D World than there are to play Emotion Commotion.

In Figure 4.2, you will notice that, despite the highest individual score's place being with the cooperative group, that the competitive group still had a higher score. While the control has placed far more evenly with the others than the individual scores would have led one to believe. These are all tied to the time scores, which you will find below. Also of note, and something that you can't see in the graph here, is that the competitive group actually holds the high score for this stage in its entirety. They played on my personal save file, and still achieved the highest score with their own, far more limited, experience with the game.

As you can see from Figure 4.3, the control had the fastest time by 94 units. This

is where much of their score came from, allowing them to come far closer to the other groupings' total scores.

Competitive vs. Control

There are a lot of interesting observational comparisons to be made between the competitive and the control groups. One might think that the competitive grouping would have been the least cooperative, but there was a surprising degree of positive interaction from players in the group. This is opposed to the generally loose and casual conversation held by members of the control group. The only times when there was much discussion of what to do in the control group was when they worked together to acquire a Green Star from the level, which is quoted below.

Figure 4.4: This screenshot of gameplay is from the control grouping. You can see how Peach was moving pretty fast, from this shot. Luigi (in the bubble) is floating here because he'd been too far behind Peach, causing him to be pulled forward.

P3: Get the star.

P2 acquires the star.

P3: Did you get it?

P2: Yeah.

That said, the conversation held by the control grouping was rather amicable much of the time. Most of the conversation was less about strategy or plans, but instead discussion of the graphics, the enemy designs, and the like. That said, all of the control group's players said that there wasn't much communication in some way, shape, or form. The most direct statement of this lack of communication was when one of the

players said, "The little communication was mostly exclamations about various features in the game; there wasn't much coordination except on basic controls and goals," in the survey given post-gameplay.

Cooperative vs. Control

Figure 4.5: This screenshot of gameplay is from the cooperative grouping. It's from around the moment of the conversation below, while Toad was waiting for the other two players to finish exploring the last bit of the level.

The cooperative group was quite different from the control, in a number of ways. The most apparent way was the sheer degree of gameplay strategy communication that the cooperative grouping showcased. As discussed in the previous subsubsection, the control group was rather limited in its cooperative communication. That said, the cooperative group's discussion seems to have limited their speed rather heavily. Before moving on, there would be a short, but still time-consuming conversation of whether or not it was best to move on yet. The following conversation is one such discussion from the cooperative group, held immediately before completing the level:

P2: Ready?

P1: For what? Ready for what?

P2: To finish the level.

P1: Oh!

P3: Yeah.

P1: Yeah, okay.

The control group, however was extremely speedy, mostly due to one player. One of the participants from the control grouping stated that, "Peach was moving too fast for the rest of us to figure out the controls," and again that, "Peach was moving too fast." In watching the gameplay, it is true that the Peach player, Player 1 of the control group, was moving rather quickly, with no goal but to complete the level. This resulted in a significant difference in the clear times between the cooperative and the control groupings, with a total difference of 327 units of in-game time. This also came at a loss to the control's ability to take part in as much exploration as the other groupings.

Competitive vs. Cooperative

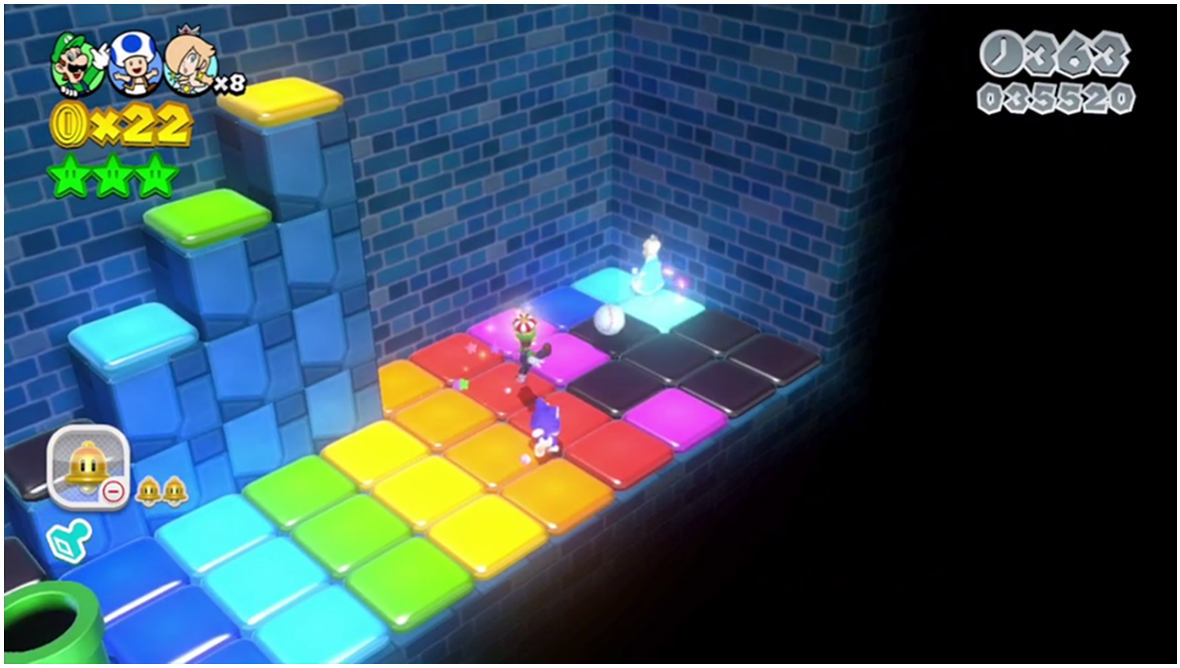

Figure 4.6: This screenshot of gameplay is from the competitive grouping. You can see here that Luigi is kicking the ball at Rosalina. At this time, the player was saying, "Get 'em!".

In looking at the differences between the competitive and the cooperative groupings, many subtler differences begin to show in how each group played. While both groups had moments of cooperation, the competitive group had a lot of clear moments when, despite helping each other verbally, players were playing more selfishly. At one point, Player 1 from the competitive group found 3 of the Super Bell power-ups that provide the cat suit, and collected them all for themself, rather than sharing them with the other two players in their group. There was also no coordination of back-up power-ups, something that was present in the cooperative team, which even went as far as to have one person collect a power-up so that the other could spawn it in for themself. Player 3 from the competitive group also stated that they'd been "pushing the level forward" in an effort to "get first dibs on the loot."

The pushiness of the competitive group's Player 3 may also have been partially to blame for the less explorative nature of the competitive group compared to the coop-

erative group. That said, it is also likely to be part of the reason that the competitive group was able to complete the level 233 time units faster than the cooperative group, which, in the end, is why they managed to attain a higher total score than them, despite their lack of as thorough of level combing.

That said, both groups were cooperative at times. While the cooperative group would often ask before moving on (such as its Player 2's, "Do we want to go on, or do we want to explore?"), the competitive group was still described by one member as "pretty cooperative" saying that they were all "quick to tell each other what we had figured out."

One behavior that was unique to the competitive group occurred upon the discovery of kickable baseballs in the level. The competitive group's Player 3 kicked one of the balls into Player 1 while saying, "Get 'em!" This behavior was entirely absent from the other groups, and is completely different from the types of interactions seen in the cooperative group, where almost every interaction had the group's shared interests at heart.

As was noted in the quantitative analysis of this study, the highest score ever achieved on this level in Super Mario 3D World, at least on my save file, was held by the competitive grouping. That said, with how high the total scores of each player in the cooperative grouping were, I have no doubt that, had they moved only slightly faster, the cooperative grouping would have held this title with great ease.

4.3 Threats to Validity

There were threats to the validity of this study, and they weren't minor ones, at that. There were a number of limitations on the study, all of which kept a firm stranglehold on the validity of it all. There were also questions that it couldn't answer.

4.3.1 Limitations

The limitations that this study was most affected by were primarily that of time and participants. The plan for this study was initially to have groups of four players, however, due to a lack of participants requesting to join the study over the week that I was looking for them, I had to reduce the group sizes by one person each. This lack of participants limited the scale of the experiment, leaving it more difficult to find true trends in how players communicated and played Super Mario 3D World.

There was also a plan for a second part to the study that would have followed the Spring 2020 semester's Spring Break, but, due to the coronavirus outbreak forcing the college to work online, rather than in person, the second part had to be entirely cancelled. This second part of the study would have acquired participants for a study on Emotion Commotion, which, at the time of the first study, was not ready for a full-scale playtest.

As a result, there were no means of studying the gameplay of Emotion Commotion at all. This was limiting to the ability to directly discuss how the game itself influenced players.

4.3.2 Unanswered Questions

This study has some questions that I'd have preferred it to have answered, but it was unable to provide clear and concise answers on them, for any of a variety of reasons.

One clearly unanswered question is whether or not differences in level design can lead to stronger effects on how players go through the game. This would have been explored in the second study focused upon Emotion Commotion, which would have featured three builds, one for each grouping, where there were differences in the ways in which statues would be placed. The purposes of these statues would have been to prime players to be more ready to attack non-player characters in the cooperative grouping, and to prime players to be more ready to attack player characters in the competitive grouping.

Another unanswered question is if my presentation of Super Mario 3D World to the control group is why that group's Player 1 sped so hastily through the level. If I had had more participants, and had been able to run two control groups, it would be clearer, if both groups were faster at completing the level, that my presentation was to blame for Player 1's haste, and not simply the fact that they were a generally more hasty player.

Chapter 5

Discussion and Future Work

Much has been discussed over the course of this thesis, and it is time that it come to a close. In this final chapter, I will provide one last summary of what the study has shown, as well as a look to the future of both Emotion Commotion and the field of collocated video game research.

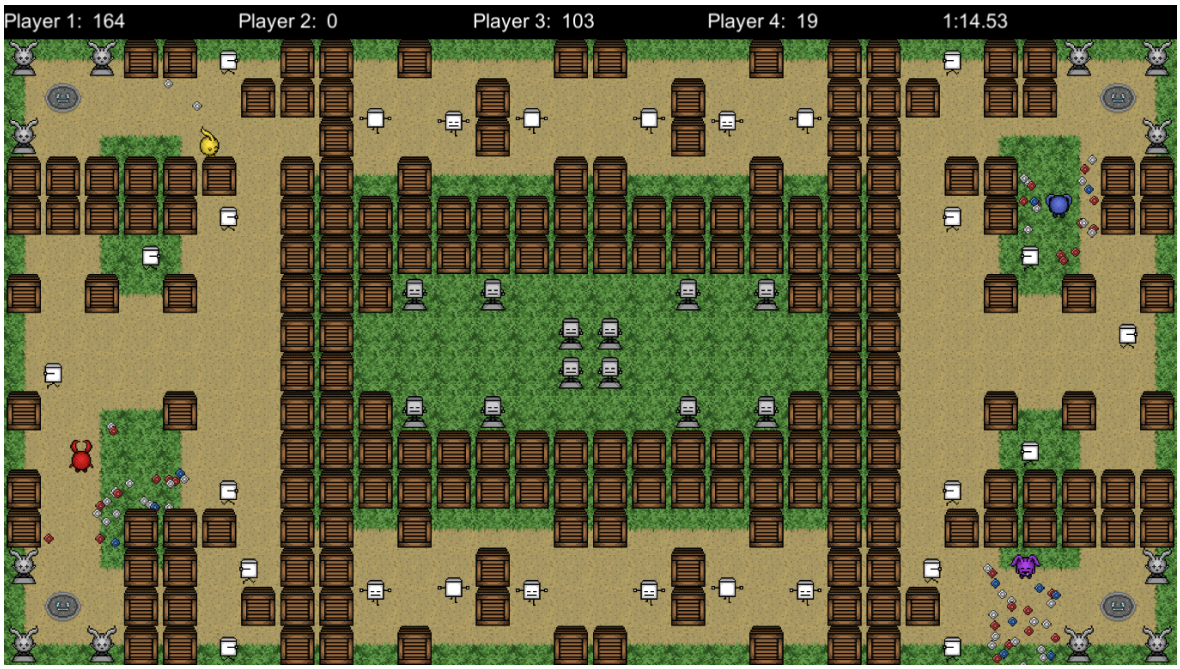

Figure 5.1: This is a screenshot from the final build of Emotion Commotion, as built for this project. You will notice some differences between this and the mock-up map shown back in the first chapter.

5.1 Summary of Results

While the previous chapter's analysis covered a lot of the results of the study, I would like to take some time to answer some of the questions I'd posed in the second chapter of this thesis, before I summarize the main results of my study.

5.1.1 Answered Questions

Do players use more harsh language in competitive environments?

In the study, there was only one grouping in which I could hear any swearing in the footage captured from their gameplay session. This was the control group, though, not one of the experimental groups. That said, none of these were the results of frustrations, as the swearing in Breuer, Scharkow, and Quandt's paper seemed to have been [7]. Two of the instances were driven by surprise, the first being an instance in which the control grouping's Player 2 said, "Oh fuck!" as they'd very nearly been hit by a Galoomba, just jumping in time to avoid the hit and land on its head. The second was from their Player 3, who said, "Oh shit, I'm a cat," upon receiving a Cat Suit. The only other instance was from Player 3, amusedly saying, "Look at Luigi with his little ass up," to the fact that Cat Luigi's tail was raised as he walked on all fours. None of these seemed to be aggressive in the moments, and none of them were in a particularly competitive environment. As such, I think it isn't safe to say that players are any more likely to use harsh language in a competitive environment, at least when playing Super Mario 3D World [12] while being filmed.

Do players still play aggressively against each other when guided to play together?

The players in the cooperative grouping were all very kind and helpful when interacting with each other, with no instances of aggression of any sort directed at any of the other players. Even when presented with mechanics that could be used to disrupt another player, they didn't even consider using them as such in any way that they showed or verbalized. The kickable baseballs were kicked around, but never at each other, and never with intent to hit anyone of the group. The mechanic wherein players can lift each other up and throw each other was also never used maliciously, granted that was noticed by the group towards the end of their gameplay. As such, I think that it is safe to say, at least based upon the testing I was capable of, that players won't necessarily play aggressively against each other when guided to play together.

Are players more aggressive or prone to frustration towards NPC's than other players?

In all groupings, players did strive to defeat the NPC's in the level, but they were never frustrated by the NPC's in any degree that influenced their behaviors towards them. None of the enemy characters in the game led to any potentially negative outward emotions other than, at most, shock or surprise, such as with the introduction of enemies such as Mini Goombas and Spiny Skipsqueaks, which are both more difficult to deal with than their normal variants. As a result, I can't say that players were particularly more aggressive towards the NPC's than the other players.

Are competitive players ever cooperative?

The competitive grouping from my study was rather cooperative at times, despite the fact that they sometimes had strategies, as mentioned in the previous chapter, that

deliberately hoarded points for themselves. That said, they would occasionally work together to explore tall walls that the camera wouldn't go higher on without multiple of the players nearby, collect the green star in the room with the light-up tiles, and just generally learn mechanics. These moments of cooperation show that, even when directed to play against one another, people may still play cooperatively.

Are cooperative players ever collaborative?

While I'd initially have expected that the cooperative grouping would occasionally work against each other, even in jest, there were no moments of this. I'd even go as far as to say that, during their gameplay session, they functioned as if they'd been directed to play collaboratively, at least by the definition that was discussed in Stenros, Paavilainen and Mäyrä [16].

5.1.2 Results

Overall, I think that the research done as a part of the Emotion Commotion project has led to some interesting findings. First, suggesting cooperative gameplay can lead to very strong communication between players and strong drives for exploration, while suggesting competitive play can lead to strong communication, but also drives to hide motives, hoard points where possible, and otherwise work to benefit oneself. These results point to a need for games with specific types of local multiplayer experiences in mind to present themselves in ways that make clear enough the intention of play, as, if a game is too loose with its presentation, it may lead to unintended styles of play. That said, if developers would like to leave a game's multiplayer experience more open, this is also an option, as it can allow for more personal experiences, where one collection of friends might play more competitively, and another more cooperatively.

5.2 Future Work

There are two areas of future work that this project has influenced. The first is the future of Emotion Commotion itself, the direction of which has been nudged in a more defined direction due in no small part to the participants in the study, and their responses to features shown in Super Mario 3D World. The second is the future of the research in the field of collocated multiplayer experiences.

5.2.1 How the Study Informs Emotion Commotion

I found three main areas in which the study featuring Super Mario 3D World has aimed the future direction of Emotion Commotion. These areas are explorative gameplay, engaging mechanics, and puzzles. All of which are discussed at length below.

Explorative Gameplay

Super Mario 3D World's level design allows for a lot of engaging ways for players to explore the mini worlds that they're placed within. I noticed just how much players

enjoyed being able to explore the levels, and how disappointed players who couldn't explore the levels as much as they'd have liked seemed to feel in their responses.

While the version of Emotion Commotion built for this project is very static, with little to no world to explore, my vision for the future of this game includes more intricately designed levels that allow for more exploration. The gameplay would also shift into something more goal oriented to allow for the levels to be more than sandboxes with time limits like the current build's level is. It is my hope that these directional shifts will allow for a more interesting exploratory experience.

Engaging Use of Mechanics

The exploration discussed in the previous subsubsection was strengthened with the use of engaging mechanics that encouraged exploration, such as the ability to climb walls as cats, and the ability to float as Peach. I noticed that these mechanics, especially the wall climbing, were enjoyable for many of the players in my study.

The fact that each character in Emotion Commotion has unique abilities could allow for some way to make use of such engaging mechanic use in exploration. I could add other abilities to each character that would work to make them feel even more unique, and allow them to interact with the level designs in ways that they currently cannot. One idea I have is for Dormio to be able to sleep on branches or poles, acting as a part of the level that other players could use to swing across gaps to get to small areas with extra gemotes. Other options could include switch gates that can either be used by Tristitia on her own, thanks to her sliding mechanic, or groups of players, where one can open the gate to allow another to enter and find some gemotes. The possibilities are numerous, as there are many other ways to represent each of the concepts embodied by the characters within Emotion Commotion.

Puzzles

One of the other features of Super Mario 3D World that I noticed players seemed to enjoy was the light-up tile puzzle in the level I had them play. All groups played this puzzle, and all groups were noticeably quick to start working to complete it.

As such, puzzles are something I'd like to look into adding to Emotion Commotion at some point in the future level designs. While I don't intend for these puzzles to get to be much of a focus, like puzzles are in Legend of Zelda games, I'd at least like to have some small puzzle, potentially even hidden, that provides some reward. One thing I'd initially considered while developing Emotion Commotion was, if I had enough time, a few Easter egg characters that could be unlocked with cheat codes. I think that these characters could instead be rewards for the completion of puzzles, along with a healthy pile of gemotes.

5.2.2 Future Research

This project's reach isn't limited to the development of the game, however, and I would be remiss to leave out a discussion of the future research that this could lead to. I think that, as this study was very limited by the size of the overall pool of participants

gathered, more research needs to be done to answer the unanswered questions from this project, as well as to better confirm the findings listed in this and the previous chapters. That's one of the greatest limits of undergraduate research, sadly. That said, more research could also be done using the initially planned versions of Emotion Commotion as tools to better control and present the game as necessary to lead to even clearer research.

5.3 Conclusion

Overall, this project has come very far since its conception, and much work has been done, both in terms of research and in terms of development. The game has gone from a single yellow ball who could walk around an empty field to an actual multiplayer experience. The study has changed wildly due to several factors, from time, to number of participants, to COVID-19.

Despite all of the setbacks, I was still able to come to the conclusions I've discussed throughout the last two chapters. While I'm certain that further research would help to make my findings more significant, I still think that it is safe to say that players communicate in relatively amicable ways rather often with games like Super Mario 3D World, where they can play against each other, but don't particularly need to.

Bibliography

[1] GNU Image Manipulation Program 2.8.22. Published as open source software, 2017. Retrieved from https://www.gimp.org/.

[2] Audacity 2.3.3. Published as open source software, 2019. Audacity® software is copyright © 1999-2019 Audacity Team. Web site: https://audacityteam.org/. It is free software distributed under the terms of the GNU General Public License. The name Audacity® is a registered trademark of Dominic Mazzoni.

[3] Random UX 2.1.9. Published as a smartphone application, 2019.

[4] Unity 2019.2. Published as an integrated development environment, 2019. Retrieved from https://unity.com/.

[5] Open Broadcaster Software 24.0.3. Published as open source software, 2020. Retrieved from https://obsproject.com/.

[6] Aonuma, E., and Koizumi, Y. The Legend of Zelda: Majora's Mask. Published as a video game for the Nintendo 64, 2000.

[7] Breuer, J., Scharkow, M., and Quandt, T. Sore losers? A reexamination of the frustration–aggression hypothesis for colocated video game play. *Psychology of Popular Media Culture 4*, 2 (2015), 126.

[8] Chapanis, A. Interactive human communication. *Scientific American 232*, 3 (1975), 36–46.

[9] Cheung, V., Chang, Y.-L. B., and Scott, S. D. Communication channels and awareness cues in collocated collaborative time-critical gaming. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work* (2012), ACM, pp. 569–578.

[10] Eltman, M. The Mission Ahead, the Mission Above, 2020.

[11] Gartenberg, C. The future of gaming is lonely (and online only), 2016. Retrieved from https://www.theverge.com/2015/6/25/8844073/goodbye-local-multiplayer-we-will-miss-you-and-the-goldeneye-days-of-yore.

[12] Hayashida, K., and Motokura, K. Super Mario 3D World. Published as a video game for the Nintendo Wii U, 2013.

[13] Mandryk, R. L., and Inkpen, K. M. Supporting free play in ubiquitous computer games. In *Workshop on designing ubiquitous computing games, UbiComp* (2001), Citeseer, pp. 1–6.

[14] Noz, F., and An, J. Cat cat revolution: an interspecies gaming experience. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (2011), ACM, pp. 2661–2664.

[15] Ricketson, D. 2018.

[16] Stenros, J., Paavilainen, J., and Mäyrä, F. The many faces of sociability and social play in games. In *Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era* (2009), ACM, pp. 82–89.

[17] Tassi, P. Are we all just giving up on split-screen video games forever?, 2016. Retrieved from https://www.forbes.com/sites/insertcoin/2016/06/06/are-we-all-just-giving-up-on-split-screen-video-games-forever/.

[18] Tse, E., Greenberg, S., Shen, C., and Forlines, C. Multimodal multiplayer tabletop gaming. *Computers in Entertainment (CIE) 5*, 2 (2007), 12.

[19] Williams, R. B., and Clippinger, C. A. Aggression, competition and computer games: computer and human opponents. *Computers in human behavior 18*, 5 (2002), 495–506.