

## ABSTRACT

Title of Thesis: BUILDING VIRTUAL FRIENDSHIPS  
THROUGH MIRRORED GESTURES

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During the COVID-19 pandemic isolation period, social gaming was an effective way for people to find connections and alleviate feelings of loneliness. However, the communication systems built within these games have limitations. In-game communication systems usually consist of emotes, predetermined avatar gestures, and simple chat features. Due to these limitations, critical social cues, such as nonverbal synchrony, are lost during these online interactions. This study evaluates the integration of nonverbal gesture synchrony in social games as a potential addition to existing communication systems to foster genuine social connections between players during online play. The game environment for this research study is an emote-based and a gesture-based version of the social game *KANDI.io*. When comparing the two versions in structured game sessions, this study found an enjoyment preference for the gesture-based experience. However, after further discussion, it was determined that there was no overall preference for this experience over the emote-based design. These results revealed that when

engaging with open-play games like the gesture-based system, some players felt vulnerable, experienced player distrust, and became more conscious of the interaction context.

BUILDING VIRTUAL FRIENDSHIPS THROUGH MIRRORED GESTURES

by

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## **Dedication**

*This is dedicated to every little girl who is taught to be small but dreams big.*

## **Acknowledgments**

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## Chapter 1: Introduction

Before the COVID-19 pandemic, rates of loneliness among populations in the United States, Europe, and China were high, causing what can be called a “behavioral epidemic” (Hwang, 2020). The emergency isolation period during the pandemic only increased feelings of loneliness. To help cope and appease these feelings, people used social gaming to connect with others at a distance. Games like Nintendo’s *Animal Crossing: New Horizons* became popular among new and old gamers (Tong, 2020). Players reported feeling connected to their loved ones through the game’s co-op features (Tong, 2021). However, when engaging with more intimate events within the game, players relied on external video and voice chats to connect with others more easily. Players found it difficult to trust unfamiliar players when using the built-in communication tools. The communication systems present within social games typically consists of simple text chats and avatar emotes activated through a button or menu selection. When using these systems, key components of socialization are missing. This study focuses on the nonverbal gesture synchrony component of social interaction.

Nonverbal gesture synchrony is how humans use imitation for successful socialization. The utilization of mirror neurons aids the process of contextualizing other people’s gesture choices and using them to influence our own. Relevant research studies found that when more gesture synchrony is present, people's feelings of likeability and trust increase (Iacobini, 2009). In social gaming, when text and voice chats are unavailable, an individual’s natural gesture expression becomes limited to the expressions available through the player’s avatar. Players use avatars as extensions of themselves and express personal choices and personality traits through

their avatars (Hart, 2017). New communication systems could expand player expression and facilitate more genuine socialization within games. The research study presented in this paper explores the use of gesture expression as a way to achieve this goal.

This research study looks at *Sky: Children of the Light* to understand how nonverbal gestures can be implemented successfully in a social game setting. The game's design separates interactions based on collaborative play, where players use each other as tools to complete tasks, versus social play, where players interact without a specific goal to accomplish. This separation allowed the developers to create a more complex social interaction system that helps players make genuine connections, helps foster relationship growth between players, and separates player relationships from the game's primary goal. This research study looks at the design of these social interactions and uses the foundational ideas from this game as a starting point for the project design. *Sky: Children of the Light* also serves as the main inspiration for the design and implementation of the game this study uses, *KANDI.io*.

*KANDI.io* is a mobile social game simulation developed to test the ideas presented within this study. PLUR (Peace, Love, Unity, and Respect) social rituals from the rave party subculture inspired the game's design. For one ritual, known as "Kandi Trading," rave goers complete a handshake and trade unique jewelry with each other as a way to foster community and social connections with each other. Using this social ritual's effective structure, the design evaluation of the *KANDI.io* system can focus on the nuances of player feelings. *KANDI.io* interprets this physical handshake into emote-based and gesture-based designs. The emote-based design represents standard communication systems within social games and translates the handshake

into a collection of emoji expressions the avatars perform. The gesture-based design takes this ritual and translates the structure into a series of collaborative gesture-based mini-games. I developed *KANDI.io* specifically for this study. I used the game engine GameMaker Studio 2.0 to implement the game. This study compares these two systems to evaluate the effectiveness of the gesture-based design against the traditional emote-based design.

This project recruited eight volunteers with gaming experience to participate in the experiment sessions. The experiment sessions included a questionnaire that captured personal perceptions of relationships built through social gaming. Participants also completed two game sessions, evaluation surveys, and an open-ended interview. The questionnaire revealed that 62.5% of participants believed online relationships built through social gaming are “real” relationships. The remaining 37.5% reported that they did not know if these relationships could be considered this way. Participants who had built relationships through social gaming reported that text and audio communication tools were crucial to developing these relationships. The game sessions had participants interact with both the emote-based and gesture-based designs of *KANDI.io*. The evaluation surveys for the designs asked participants about their general enjoyment. They also contained a Likert scale rating section to determine feelings around connection, interaction engagement, and comfortability with the interaction design when approaching other players.

The game session, evaluation survey, and interview results showed that the gesture-based design gave players more intense feelings of engagement and genuine connections with the other player than the emote-based design. However, players did not respond as strongly to the idea of

engaging more players with the same interaction. The interview data revealed that participants had concerns regarding the “risk” the gesture-based system presented. Participants expressed worries about how other players would judge their performance and the other player’s intentions. Participants also expressed general anxiety about the increased self-involvement within the interaction. These worries were not present during the participant’s experience with the emote-based system. The structure of the emote-based interaction provided equal emotional feedback for both players and gave players a sense of control, increasing player confidence. These key points were why players did not prefer the gesture-based design over the emote-based design in the context of meeting new players through a social game.

Despite these feelings, players also expressed satisfaction with the use of gestures as a way of playing games with another player and reported that the co-creation designs of the interactions in the gesture-based system were vital to them feeling like they were genuinely bonding with the other player. Another interesting finding was that players desired a sense of asymmetry and individuality in their interactions. Rather than performing tasks that require perfect gesture mimicry, participants want more freedom in their pathways and interaction choices to show their personality and learn more about the other player. Participants expressed that this would enhance their connection with the other player.

This study was not without its limitations. The KANDIO.io game is a social simulation where participants interact with a computer-generated user rather than another person. In a future version of the game, participants would play with another real user to experience more genuine interactions. The game also had a few technical difficulties that may have interfered with the

participants' immersion during the experience. Despite these limitations, the study presented interesting findings about player vulnerability and self-involvement with gesture-based interactions. Future research could explore the space between emote-based social interactions and more free-play-based interactions using gestures. Research could determine the point that players begin to feel this vulnerability when shifting into free-play interactions and determine what key elements need to be implemented alongside these interactions to foster player confidence and increase feelings of safety and personal agency in social gaming spaces.



## **Chapter 2: Related Work**

This section focuses on related research work on the psychological impacts of imitation in social interactions, relevant social gaming studies, and evaluations of the effects of synchronous distance affection devices and applications. It is a collection of journal articles, book chapters, and product studies.

### **2.1 Mechanisms of Imitation in Social Interaction**

To understand the importance of non-verbal gestural communication in online communication systems, the role of imitation in psychology must first be established. *Imitation, Empathy, and Mirror Neurons* is a research review by Marco Iacobini. This paper provides an in-depth look into key frameworks and research studies about the function of imitation in human psychology. These studies provide the necessary context around non-verbal synchrony and how it influences relationship-building between people, especially in dyadic settings. This section serves as a background and foundational review for the gestural behavioral studies presented in this paper.

#### **2.1.1 Mirror Neurons**

Mirror neurons are released when a person perceives another individual performing any action (di Pellegrino et al., 1992; Gallese et al., 1996, as cited in Iacoboni, 2009). A series of primate observation studies were conducted to understand the usage of these mirror neurons in imitation behavior. The studies found that about one-third of the mirror neurons would fire when

observing and mimicking other primates' actions. These mirror neurons interpret other primates' actions and then work with the remaining neurons fired to initiate unique actions related to accomplishing similar goals rather than engaging in an exact mirror of the other primate's behavior. Iacobini describes this process of interpretation as a "flexible coding of actions of self and others" rather than a direct mirroring of another's actions (Iacobini, 2009).

As stated by the author, "This flexibility is an important property for successful social interactions because even though imitation is a pervasive phenomenon in humans, people do not imitate each other all the time but rather often perform coordinated, cooperative, complementary actions." (Iacoboni, 2009). Mirror neurons are essential instruments of social interaction and collaboration. This framing is crucial as we look deeper into how nonverbal synchrony facilitates social interaction and how we understand the usage of these neurons to generate other social concepts, such as likeability and trust.

### **2.1.2 Psychological Frameworks and Social Motivations**

This study brings up two psychological frameworks that can serve as the foundation of imitation in cognition; the Ideomotor Framework and the Associative Learning Sequence Model. We will look at both to understand how the usage of mirror neurons can be better understood and analyzed for social interaction.

The Ideomotor Framework insinuates that a person's actions are not in response to their environment. Instead, they represent a goal the individual wishes to complete. This definition

encompasses imitation by describing mimicry as a tool for producing similar outcomes to those witnessed by the individual. This mental framework can be described as such, “According to this framework, when I see somebody else’s actions and their consequence, I activate the representations of my own actions that would produce those consequences” (Iacoboni, 2009). The second framework, the Associative Sequence Learning Model (ASL), is similar to the Ideomotor Framework. This model frames imitation as a series of learned associations between sensory and motor representations of actions rather than seeing imitative behavior as innate. This framework argues that all species use imitative behavior (Iacoboni, 2009). Further supporting the idea that imitation is learned behavior shaped by experience. This framing allows for more flexibility in how people use imitation in different contexts.

The main difference between the two models is how sensory and motor representations link together in our experiences. Both models support the idea of imitation and rely on the assumption that our perceptual and motor experience is imperative to our ability to imitate. They support the idea that imitation is essential for achieving goals and navigating the world. With the support of both these frameworks, we can expand our understanding of the motivations behind using mirrored behavior in social situations and how they affect relationship building between individuals.

### **2.1.3 Impacts on Social Interaction**

Using the previous definitions and frameworks, this study also reviews a series of experiments to support the central hypothesis “... that imitation facilitates social interactions,

increases connectedness, and liking, gets people closer to each other, and fosters mutual care... Thus, this account would predict a correlation between the tendency to imitate others and the ability to empathize with them.” The series of experiments reviewed provided results that supported the following ideas: (1) That imitation is automatic and pervasive, (2) That imitation is linked to perceived likability, (3) That there is a correlation between one’s ability to empathize and their imitative abilities (Iacoboni, 2009). Thus, supporting the idea that imitation could be a critical tool in building better social relationships. With the perception tools used by both parties in these dyadic social experiments, we can see how these concepts of imitation can serve as a psychological foundation for understanding the use of nonverbal synchrony in social interactions.

## **2.2 Behavioral Studies for Social Intimacy through Imitation**

Most social gesture studies focus on anecdotes or role-play situations to evaluate the effects of non-verbal synchrony. However, two studies utilized Motion Energy Analysis to capture nonverbal synchrony in real-time in more natural social interactions. The studies compared the data captured by this technology with self-reports of relationship and interaction satisfaction and quality to determine the role that gestures play in social interactions. In the first study, Ramseyer and Tschacher hypothesized that synchronous body movements are a manifestation of rapport and, ultimately, relationship quality (Ramseyer & Tschacher, 2011). The study also classifies nonverbal synchrony as a gestalt that humans can perceive on a flexible time basis (Ramseyer & Tschacher, 2011). This classification is in line with the flexible coding framework for mirror neurons introduced earlier. Humans naturally use imitation and mirroring

to learn how to accomplish goals better, supporting the idea of nonverbal synchrony being a gestalt.

In the first study, Ramseyer and Tschacher tested the concept in psychotherapy relationships and compared it against the quality of treatment. Then again, in 2014, Ramseyer gathered a team to test the same concept with non-psychotherapy dyadic interactions and analyzed the data through emotional perceptions of the interactions. For the first study, they found that rates of nonverbal synchrony correlated positively with patients' evaluations of the quality of the therapeutic relationship. For the second study, they found an even higher positive correlation in non-psychotherapeutic dyadic interactions. A final finding of the study recognizes, "One very important facet of social interaction is nonverbal behavior. Apart from the transcribable verbal content that is exchanged in a social interaction, numerous channels of information in other areas than speech are simultaneously active and exert a strong influence on the interaction." (Ramseyer, 2013).

These studies show non-verbal synchrony's essential role in socializing and relationship-building. However, it is challenging in long-distance relationships to utilize non-verbal synchrony as a bonding tool. The following section reviews studies that explore how technology can give separated individuals tools to express these critical gestural and evaluate the effects these technologies have on long-distance relationships.

## **2.3 Distance Affection Device Studies**

Distance affection devices are examples of nonverbal synchrony systems for building and fostering intimacy between individuals. The work that we will be looking into includes the LumiTouch and Kissenger systems built to facilitate the maintenance of intimate long-distance relationships. Previous studies conducted in 2004 tested prototypes of distance affection devices. These studies were reviewed but not included in this paper. These distance affection systems use synchronous signals or real-time haptic feedback as the main components of their design. Therefore the structure of these prototypes and the study findings are encompassed by the Lumitouch and Kissenger system studies. Therefore these two systems serve as an adequate foundation for the design of distance affection systems.

### **2.3.1 LumiTouch System**

The LumiTouch system uses light-infused interactive picture frames to communicate emotional content remotely. The study describes the system as such: "When one user touches the picture frame, the other picture frame- owned by a loved one - lights up" (Chang, 2001). LumiTouch was designed at a time when web-enabled devices were being introduced. However, this kind of emotional application has not been studied extensively. LumiTouch used a picture frame to easily incorporate the technology into a user's home while using light information to communicate the data information between the two picture frames. The system featured a unique emotional language that could be used to design and send specific messages to their partner in the system. This included a selection of colors and the ability to create patterns with them to

generate and pass messages to each other. One user observation showed that users created patterns with their partners to convey messages such as “Good Luck” or “I’m busy” (Chang, 2001). However, there were issues with the symmetry of the system. When engaging with the system, the active user is initially unsure of the other’s presence or situation. They may feel anxiety when waiting for a response. This is due to the imbalance caused by one user being active and one user passively receiving the data (Chang, 2001).

### **2.3.2 Kissenger**

Kissenger is a unique distance affection system that focuses on the intimate act of romantic kissing. The system utilizes two paired devices that use force receptors and other haptic information to simultaneously record and transmit kissing data (Saadatian, 2014). The study focused on heterosexual presenting user pairs during evaluation and attempted to simulate the experience of intimate kissing as much as possible. The synchronous data transfer was essential to the experience feeling “real.” The system was received well and had positive feedback from users. However, the unfamiliarity of it caused discomfort for some pairs. The study found that interactions with the system fell into two phases: familiarization and incorporation. The familiarization phase focused on configuration, cultural reactions, and aesthetics, while the incorporation phase focused on the usability and affectivity of Kissenger (Saadatian, 2014). Kissenger focused on building a technological system that could help supplement intimate interactions between long-distance romantic partners.

### **2.3.3 Implications**

These early looks at the impacts of simple gesture synchrony help provide a foundation that social relationships benefit from these kinds of distance affection interactions. This idea can inform and influence the development of online social interactions. Both situations have the same limitations of being unable to engage in synchronous physical interaction that comes with being close to each other. The rest of this section looks through various video game studies. These studies help give context around how players interact with each other currently, what successful dynamics and systems look like in these spaces, and how current events have altered the importance and use of online games culturally. These studies also look at areas in social gaming that can be enhanced to improve relationship-building through online games.

## **2.4 Social Game Studies**

### **2.4.1 Player-Avatar Perceptions and Relationships**

To understand the social dynamics of social gaming, an understanding of how players extend their identities into playable avatars must be established. While this topic is not a research focus, understanding how players perceive their digital representations will provide a psychological foundation for the way they perceive different communication systems, their social choices while using those systems, and the actions they receive and perceive from other players.



A study done by Care Hart explored the relationship between a player's sense of self and their avatar representation in the game *Skyrim*. The author uses a definition of "self" introduced in an earlier study by Baumeister in 1999. The definition reads as such, "...in this study the term ["self"] refers broadly to an internalized self-concept, or how a person perceives themselves in relation to others and their environment." (Baumeister, 1999, as cited by Hart, 2017). Through this definition, we are also introduced to multispatial self-projections. This allows the definition of "self" to encompass many types of self-projection expressed through avatar creation in gaming environments. The study focused on breaking down the idea of one's self-concept into two personas, the "actual self" and the "ideal self." This study analyzed these personas through five personality dimensions to evaluate a player's self-identification with their online gaming avatar.

The results found that there was only one consistent characteristic between players and their avatar personas: the proactive expression of openness to experience. These results suggest that participants used avatars to explore alternative versions of themselves or even complete opposites to their personalities. This brings multispatial self-projections to the forefront of players' relationships with their avatars. Players can explore different personas and personality traits with little emotional investment in the dedication to their sense of "self." Rather than expressing a direct representation of their person in their avatar, players explored new ideas and self-actualization exercises through their interactions with their avatar.

This study found that although players explore different possibilities, they still engage with avatars as an extension of themselves. As stated, "The gamer controls the avatar, reacts to

and with the avatar, and responds to changes in the avatar's conditions and environment. This creates what Lewis et al. (2008) refer to as character attachment" (Hart, 2017). The players also expressed the same level of openness to experience when exploring their character representation. While avatars tend not to be direct representations of the player, they are important tools of navigation and expression for players while engaging in online social gaming spaces.

#### **2.4.2 Social dynamics of online gaming**

*Ultima Online* was one of the first Massive Multiplayer Online Games (MMORPG) accessible to the general public. Most MMORPGs were text-based adventure games requiring advanced computing skills (Kolo & Baur, 2004). A remote ethnographic study of *Ultima Online* was conducted to observe player motivations and the effects of in-game socializing on the players' offline social life through an online questionnaire that garnered 104 answers. The study found that seeking communication and social relations was a significant factor in players' motivations to participate in the game. They found that players consistently played the game to keep in contact with fellow players they met during their time in the game. They even found a correlation between the number of sessions and the presence of interaction partners.

They also found that relationships made between players would regularly extend into the players' offline lives, and they would continue to communicate with each other using other communication channels like email. They found no evidence that online play negatively impacts offline social relations besides reports of some issues with the amount of time spent playing the

game. The player has expressed satisfaction in being a part of a growing society within the game's community. There was an emphasis on the fact that a sense of community and a well-designed social structure is imperative to a positive experience while playing MMORPGs. "Although this is not an entirely new fact, it is surprising that as far as MMORPGs go, many developers are still focusing on improving graphical realism, haptic interfaces or speech, and elements of artificial intelligence in games instead of adding new qualities in terms of social experience." (Kolo and Baur, 2004).

Even at the beginning of MMORPGs, we can see the importance of socializing regarding social games. While the ability to create a new appearance and engage in new choices within games, the need for genuine social connection was still necessary for enjoyment and investment. As the industry moved forward to more complex MMORPGs, the social systems were able to become more complex themselves. They sparked even more interesting questions about how individuals play these games map to psychological communication and identity-based mental frameworks.

### **2.4.3 Interaction forms and communicative actions in multiplayer games**

This paper shows how a communicative actions framework can categorize and analyze how interaction forms are used and perceived within social gaming spaces. The CAT framework was used as the basis for its analysis to help provide more insight into the effects and impacts of this communication action. The CAT framework consists of six social actions and is structurally similar to the Associative Sequence Learning Model and Ideomotor framework presented earlier.

This framework views player actions and communication through a goal-oriented collaborative framework (Manninen, 2003). The study analyzes the twelve interaction manifestations found in multiplayer online games (Manninen, 2003).

This study provides a detailed look into how to develop a method of mapping and analyzing social interactions in games to social communication frameworks within psychology. The focus of this study lies in the assumption that the foundation of player behavior is based on the player's in-game completion and competitive goals. This kind of game structure can also be described as collaborative play. However, the study reveals two significant limitations of socializing through online games:

(1) “The reduced set of intuitive non-verbal cues is one of the distinctive features that separates computer-mediated communication settings from face-to-face encounters.”

(Manninen, 2003)

(2) “The contextual and communicative support for interaction is essential in providing players with meaningful ways to express themselves and their actions.” (Manninen,

2003)

The study was structured based on the implied goals presented by the game. Consequently, communication systems were used for goals besides general socialization between players. When there is no in-game goal to achieve, like combat battles, how do player

motivations change, specifically when socializing with other players? We can explore this idea by using social games in more recent events, such as the COVID-19 isolation period.

## **2.5 Social Gaming and COVID-19**

### **2.5.1 Importance of Social Gaming during Isolation**

During COVID-19, social gaming was shown to help with feelings of loneliness and isolation during the quarantine period. A survey study was conducted to determine the impacts of social gaming during the COVID-19 pandemic. The study found a substantial increase in time spent on social gaming during the isolation period (Ballard & Spencer, 2022). A similar survey study recorded that participants increased their gaming habits because of an increased need for social contacts. (Cmentowski and Kruger, 2020). While the amount of social gaming decreased after the stay-at-home order was lifted, it was proven that it played an essential role in staying connected with friends and family. One game utilized frequently between experienced and new gamers was the Nintendo title *Animal Crossing: New Horizons*. In this section, we look at how this game's design and communication systems provided opportunities for people to interact with each other in meaningful ways at a distance for extended periods.

### **2.5.2 Animal Crossing: New Horizons Player Stories and Social Impacts**

Nintendo released *Animal Crossing: New Horizons (AC:NH)* in May 2020 during the COVID-19 isolation period. In its first month, the game sold five million digital copies and

became the best-selling game in the animal crossing series (Zhu, 2020). One of the main features of animal crossing is the Co-op play feature that allows players to visit each other's islands, complete daily tasks, and socialize in-game. This social interaction was one of the main highlights of the game's success as it helped players combat loneliness during the isolation period (Zhu, 2020).

In a survey study conducted by Xin Tong in 2021, it was found that one of the main themes of *AC:NH* was social dynamics. The game allowed players to meet in social groups in semi-private environments, and they were able to create self-generated activities that could mirror their real-world experiences and social needs (Tong, 2021). However, it was also found that the kind of social interactions that occurred and the needs around them changed based on the task being performed. When engaging in more complex and intimate events like birthday parties or other celebrations, individuals found that the visual representations and interactions available through their avatars were not enough to express their thoughts and feelings with each other. This caused video and audio chat to be imperative to these more intimate experiences. Players effectively organized their social activities through the game's features and external communication tools, including virtual concerts, tea parties, graduation celebrations, tours, and custom mini-games. One player stated while recounting their experience, "...My sister is still very far away, but if we talk and play together, I feel we are there together." (Tong, 2021).

### 2.5.3 Limitations and Implications

This study found that *AC:NH* facilitates positive behaviors with explicit and implicit rewards that reinforce social interactions and foster a friendly atmosphere in players' communities. Results found that *Animal Crossing: New Horizons* affected players' behaviors in 3 ways: (1) Players mirror their real-life behaviors in *AC:NH*, (2) Players recreate game objects or perform game behaviors in real life. (3) discovered that players provided help to support each other, for which their good deeds would be rewarded and reinforced, shifting players' motivation to socialize from extrinsic rewards to intrinsic satisfaction. Unlike the game studies previously presented, *AC:NH* had a more direct projection from the player's sense of self to the avatar. This has seemed to influence player choices and engagement, especially during social interactions. Players would use external communication tools to have more complex conversations but would use their avatar as their representation of self in the social space.

Although external communication channels were used during more intimate gaming experiences, when completing more collaborative tasks with other players, like "Stalk Trading" or "Cataloging," these communication tools were not used. As was stated in the study, "...there was "no need to talk, and we just followed the social norms to exchange or trade"" (Tong, 2021). During these interactions, the in-game communication system was mostly sufficient. However, some players found it difficult to trust each other. Instead of vetting a player through the communication system, they would severely limit the actions a visiting player can accomplish.

Trust and the genuine-ness of social interactions were questionable as one player reported being blocked off from a fellow player's island, leaving the interaction feeling unwelcome and judged.

These tools and social interactions were available to players, but there was still a layer of distrust when completing these tasks. There were limited opportunities for players to make new connections with each other and so rather than opening their worlds to new opportunities, they shut them off to protect their hard work and effectively themselves from players who would manipulate the system. This study explores the gaps in these experiences, including:

- (1) how to effectively build trust between players through initial meetings and short social interactions.
- (2) how to help players feel more comfortable interacting with each other.
- (3) How to encourage players to continue interacting with each other, especially with limited social communication systems in games.



### **Chapter 3: The Design of Sky: Children of Light’s Social Interaction System**

The mobile social game *Sky: Children of Light (S:COL)* has greatly influenced this study's game design and motivations. Here we define the difference between social play and collaborative play. The designers of *Sky: Children of Light* also provide a set of principles to follow for designing successful social games. We are also given examples of game features that use non-verbal social interactions successfully in online gaming. This game looks at successful online relationship building with a non-verbal communication and social interaction system design. With the foundation of this established game, we can expand on this idea of a non-verbal social communication system and explore areas of enhancement.

#### **3.1 Background**

*S:COL* is an online multiplayer mobile game created by Thatgamecompany, designed with human connection at the forefront of its design. In an interview with Apple, the creative director, Jenova Chen, stated, “ ‘At its core, *S:COL* is a game about compassion and generosity... It’s about connecting people and nudging them to do good for each other.” (Apple, 2020). Accessibility being one of the main goals of the game, the team behind the game’s design chose to use mobile devices as the main platform. In the game, players are introduced to a fantasy world with puzzles and complex stories to solve. While in the game environment, players can also interact with each other. The social interaction design is where the game becomes especially unique from other multiplayer online mobile games. The design team defines this difference through their perspective on social play and the design of their interaction mechanics.

### 3.2 Principles of Social Play

During a design talk at GDC, John Hughes - a developer who worked on the *S:COL* project - presented a design breakdown of the game's social interaction system. He revealed that while designing the game's social aspect, the team followed a collection of principles while designing their successful social play dynamic design. These principles include: goal-oriented play is the enemy of social play; players should be encouraged to form a connection and find empathy for other players, and expression is at the core of forming connections. The idea of social rituals was brought into the game to do this effectively. Hughes also references Joseph Campbell's theories about social rituals as an inspiration for the design of the social interaction system (GDC, 2020).

In the book *Myths to Live By*, Joseph Campbell explains how learned social rituals were a rite of passage in ancient societies and can be used to establish importance and intention when interacting with other members of society (Campbell, 2017). In the case of *S:COL*, they are a way to ground all social interactions in a foundation of compassion and consideration for others. However, for these social interactions to maintain their effect, they must happen organically. This means that even in situations of rejection. Rather than protecting their players from more negative moments of rejection by intervening, the designers let players handle these awkward situations on their own. Hughes defends this design choice by explaining, "Removing the stakes involved in investing in another player also removes the opportunity to be vulnerable" (GDC, 2020).

The team also worked to establish the difference between collaborative and social play. While developing *S:COL*, the team defined social play as “Any activity performed near other players, which encourages simulating the thoughts and feelings of others.” (GDC, 2020). Collaborative play is when players perform actions and activities together with the primary intention of completing a goal by using the assistance of another’s presence. As described by Hughes in relation to collaborative gaming, “In the case of a door requiring two people to open, the other person has the same function as a simple key.” (GDC, 2020). By separating these two frameworks of play, the team was able to explore interactions that followed a social gameplay loop which is defined by the following elements: (1) Players express themselves; (2) Players are rewarded for entertaining or helping each other; (3) Rewards allow players more options to express themselves.

### **3.3 Design of Social Dynamic Economy**

After establishing their principles of play, the team worked to design the main features of the social system that would foster these compassionate feelings between players. They settled on an interaction system that allows players to explore the game’s environments together and to show appreciation for each other through gifting. They found that the ability to explore the game’s environment together rather than progress through a story together helped to reframe how players viewed each other in a way that aligns with the principles of social play rather than collaborative play.

Despite the general effectiveness of this system, they found that only having these two elements created fleeting interactions with another player within the experience. When

interacting with players later, it was difficult to tell who was who and how close the relationship between the two players was. To ground these social play experiences into the greater scheme of the game, the designers implemented the “Heart Economy” and the personalization of avatar outfits. When a player receives gifts, they are then awarded hearts which could be used to unlock different outfit options for their avatar. Through this social economy, players can define what is meaningful to them rather than these moments being prescribed. So, a player’s actions can be expressed genuinely and perceived as genuine, thus fostering the trust built between two players.

**Figure 3.1**

*S:COL social gifting mechanic imagery*



In addition to this heart economy, the designers implemented a hand-holding game mechanic. The intention was to alter the system to help players foster intimacy, trust, and empathy with each other while completing these interactions together. This mechanic allows players to lead each other through exploration and even story-progression-related experiences. Here players can experience the game together while also having to consider each other's feelings and opportunities for engagement. Players can practice social empathy for each other to explore the game together.

**Figure 3.2**

*S:COL Hand-holding mechanic imagery*



### **3.4 Player Impacts and Implications**

Cooperative play encourages players to use each other as tools to bring themselves to the end of a goal rather than encouraging them to see each other as two individuals to build a relationship. The game separates cooperative play and social play spaces spatially in the game's

environment to signal to players the intention and foundation of the interaction. The space design encourages players to consider how they interact with each other. This encourages players to build new motivations for engaging other players in play. This also creates a new foundation of trust of intention between players because the game environment itself can give cues and understanding for other players' motivations and goals. This allows players to stay more open to new opportunities and find more confidence in boundary-based interactions like the rejection of introduction and exploration.

### **3.5 Influences on this study**

*KANDI.io*, the game this study uses as the main tool for evaluation, is largely influenced by the design of *S:COL*. The main elements that have been taken into account are the importance of rituals in social interaction, the difference between social play and collaborative “goal-oriented” play, the exchange of a unique memento to represent the shared experiences between players, and the accessibility of a mobile platform. Since *S:COL* is a social game with non-verbal gestures at the core of the mechanic system design, we can look to its success as an adequate foundation for the design of *KANDI.io*. This current study can explore new avenues to refine and enhance non-verbal social interactions in online gaming by adding a new element, non-verbal gesture synchrony, by the players. Rather than selecting actions for an avatar to complete to express actions and interactions with another player, players can express these thoughts and feelings directly to each other. Thus, bringing the experience closer to the player and bridging the separation between the avatar’s perceived experience and the player's experience and perception.

## Chapter 4: Designing KANDI.io Game

### 4.1 Introduction to KANDI.io

*KANDI.io* is a simulation prototype for a mobile social game that uses social mechanisms used in rave culture to promote pro-social interactions and relationship-building online. Players will interact with a computer user to complete a gesture-based mini-game representing a specific social interaction. *KANDI.io* is a pro-social, social-play mobile game simulation. The game uses the concepts of mirror neurons and non-verbal synchrony with the implementation of social rituals as the foundation of its design to explore the enhancement of social interactions online. This chapter takes a deep dive into the design and implementation of the *KANDI.io* system.

### 4.2 Themes in KANDI.io

In the review for *S:COL* we were introduced to social rituals to support players during their first meeting. *KANDI.io* also uses the same social ritual theme to teach social interaction that *Sky: Children of the Light* implemented in their socio-economic system. *KANDI.io* takes a slightly different approach to the implementation of social rituals. Rather than developing a new ritual, the game takes inspiration from successful socialization rituals in rave culture spaces. The secular nature of these social mechanics prevents the game simulation from generalizing any religious or ethnocultural social rituals while still allowing players to engage in established cultural and social rituals.

*KANDI.io* uses the Peace, Love, Unity, and Respect (PLUR) movement within rave culture as a foundation of its design. PLUR originated in New York’s electronic dance music scene to keep raves and underground parties peaceful. PLUR, previously known as PLUM (Peace, Love, Unity Movement), is known as the “raver manifesto.” DJ Frankie recounts that the movement began after a fight had broken out at a rave, now known as Storm Rave. “The PLUR thing came about five days after that, on the Fourth of July, 1990. We were gonna go paint the subway cars with the message, ‘Peace Love and Unity.’ That was the movement. We went and painted the subway car, and it was always about that PLUR speech that everybody knows today, which comes from that original concept. Everybody was welcome, and we were all in it together.” (Sterling, 2016). By incorporating these pro-social experiences, the game encourages players to enter the game space with the mindset of engaging in social play rather than defaulting to the mindset of collaborative play.

### **4.3 System Design and Implementation of *KANDI.io***

The *KANDI.io* system went through a couple of iterations for design, including an online server-client design to allow two people to play the game. However, due to the security limitations of the testing site, a connection could not be made between local devices. Therefore, a simulation-based experience was an appropriate solution. In the current *KANDI.io* system, players interact with computer users when engaging in social interactions in the game. The pathways and choices made by the computer users attempt to replicate the visual experience of interacting with another player by following more natural patterns of movement and interaction. These interactions include delayed taps, object-dragging patterns, and imperfect drawing animations.



I used the game engine GameMaker Studio 2.0 to implement *KANDI.io*. The game was developed using the gestures and haptic settings available for android phones within the engine. To simulate another player's behavior for the computer user, I utilized the sequence and animation features to develop unique movement pathways. I also used a Samsung Galaxy 5 for development and as the main testing device. To properly connect this device, I used Android Studio and Android File Transfer to help bridge my MacOS computer's connection to the mobile phone. Due to the game engine's limitations, certain haptic features were unavailable. To address this issue, I used timed visual cues to represent specific interactions, such as shaking the phone.

#### **4.4 Design of KANDI.io**

*KANDI.io* is a social game simulation inspired by the social rituals of PLUR culture. The simulation has players interact with a computer user to trade in-game collectibles known as “Kandi,” - artifacts inspired by the real-life jewelry accessories traded during rave events. The simulation explores two ways players can trade these collectible items within the game through an emote-based design and a gesture-based design of the system.

The gesture-based design has players complete a series of collaborative mini-games inspired by the PLUR handshake, using synchronous gesture mechanics. The second design includes a more common interaction of selecting an emote button and observing the avatar animations of the trade using emoji communication. This emote-based design represents current social interaction systems commonly used in social games.

This section looks at the design of the *KANDI.io* components. It looks at the design choices that show this application's potential as the primary evaluation tool for this project and the limitations that may affect the results of the experiment sessions.

#### **4.4.1 Gameplay Overview**

The game starts by having the player choose between two provided avatars that will represent them in the social space. They then can navigate their avatar through a simple social space with one computer-generated player present. Each avatar has a colored ring around the sprite that displays whether the player is open for engagement. When both of the player's social circle spaces are open for interaction and intersection, both players would be allowed to engage with another user in a handshake mini-game. When both players accept this invitation, the handshake mini-game begins.

The handshake takes the players through four mini-games that use synchronous gesture interactions as the main mechanic. The interactions represent interpretations of the PLUR handshake and include a celebration interaction at the end. After the last interaction, the players complete their "Kandi" jewelry trade. The players are then added to each other's trade list and can now track their relationship in the game.

#### **4.4.2 Game Mechanics of KANDI.io**

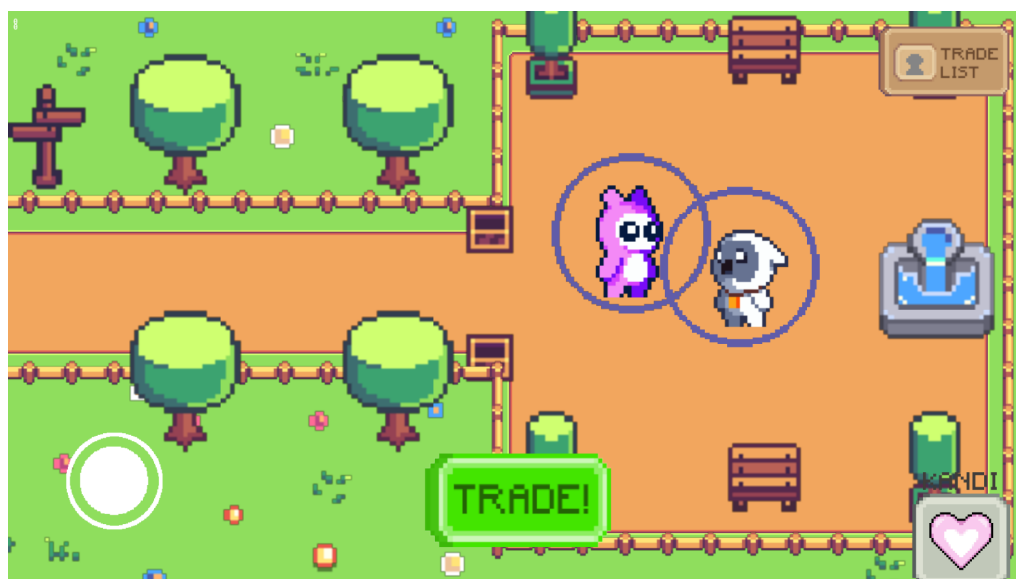
##### *Engagement Circle Mechanic*

This mechanic's design allows players to set up boundaries regarding their openness to engagement while playing the game. This design choice was related to the findings in the study

conducted by Cate Hart. Players typically project their openness to new experiences through avatars (Hart, 2017). *KANDI.io* represented this boundary through a color-coded social engagement circle that surrounds the character and represents the player's desire for engagement. Players can complete a trade together when they are open to social engagement. When a player is not open to social engagement, other players cannot initiate trades with them. This boundary allows players to maintain control of their experience while using the *KANDI.io* system. These circles also provide a visual cue for the spatial closeness needed to initiate a trade.

**Figure 4.1**

*KANDI.io - Intersected engagement circles*



### *Gesture Handshake Design*

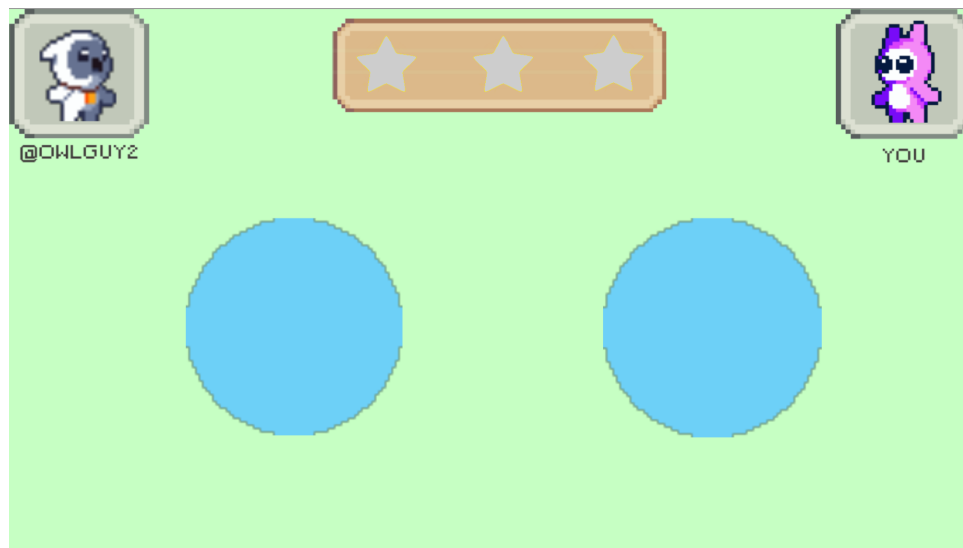
To minimize discomfort and learning curves while using the application, the main mechanics focused on standard touch gestures. The touch gesture reference guide, created by

Craig Villamor, was used to determine which gestures were appropriate in the *KANDI.io* system. The guide introduces various user actions to accomplish specific goals on a touchscreen device (Villamor, 2010). This game utilizes the “press” gesture for synchronous touch and the “press and drag” for the drawing and moving actions on the screen. The game also utilizes the mobile phone’s haptic system to implement the shaking motion for the final interaction. Below is an in-depth look at the four interactions in the mini-game:

- (1) *Peace*: The first interaction has the players use a long “press” gesture with two fingers on the screen at the same points to represent the joining of two peace hand gestures.

**Figure 4.2**

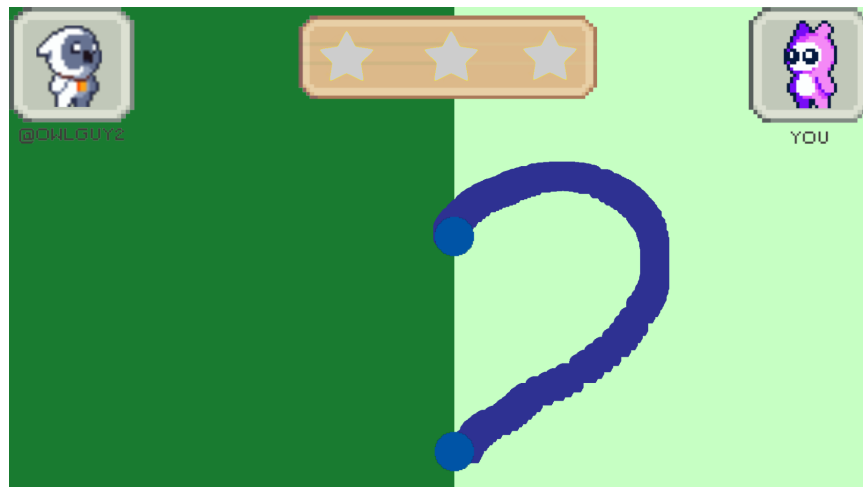
*KANDI.io Gesture Design - Peace Finger Press Interaction*



- (2) *Love*: The second interaction uses the “press and drag” interaction and has players draw one-half of a cartoon heart to represent the concept of Love in PLUR.

**Figure 4.3**

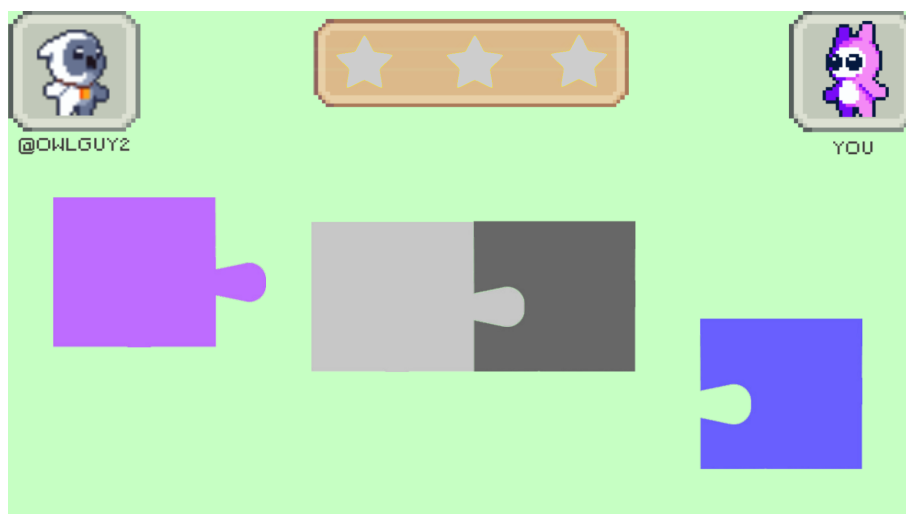
*KANDI.io Gesture Design - Love Draw Interaction*



(3) *Unity and Respect*: Players use the “press and drag” interaction to place two puzzle pieces together in the third interaction.

**Figure 4.4**

*KANDI.io Gesture Design - Unity and Respect Object Drag Interaction*



(4) *Celebration*: Players celebrate the beginning of their in-game relationship by physically shaking their phones together in celebration.

**Figure 4.5**

*KANDI.io Gesture Design - Celebration Shake Interaction*



### *Emoji Handshake Design*

The simulation's emoji design represents existing non-verbal communication systems available within the game. In this system, the player's navigation mechanics remains the same. When the trade is initiated, avatar animations play with emojis representing each element of the PLUR handshake: peace, love, unity, and respect. After the animations finish, the trade completes, and players exchange their unique Kandi.

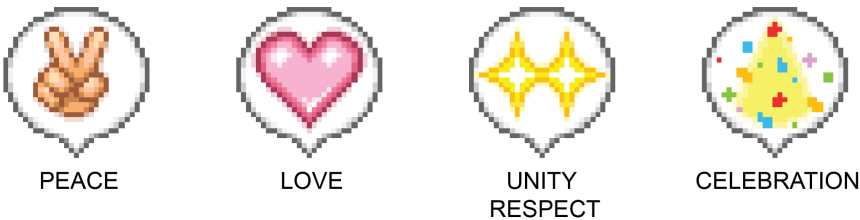
**Figure 4.6**

KANDI.io Emoji Handshake - Peace Emoji Animation



**Figure 4.7**

*KANDI.io - PLUR Handshake Emoji Representations*



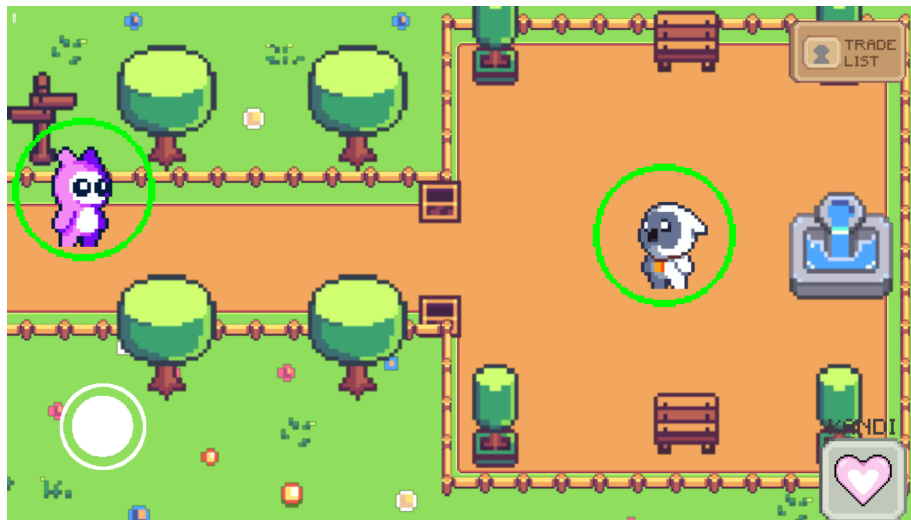
**4.4.3 Visual Design of KANDI.io**

*KANDI.io* is a social game simulation. Bright colors and pixel art elements are used as visual cues to help with player immersion during their interaction. The assets and sprites chosen promote positive feelings and openness to social experience. The game has two different environments. The first is the open social space environment where players can walk around and

interact with each other. The second is the handshake mini-game environment, where players use gestures to interact with each other.

**Figure 4.8**

*KANDI.io - Social Space Environment*

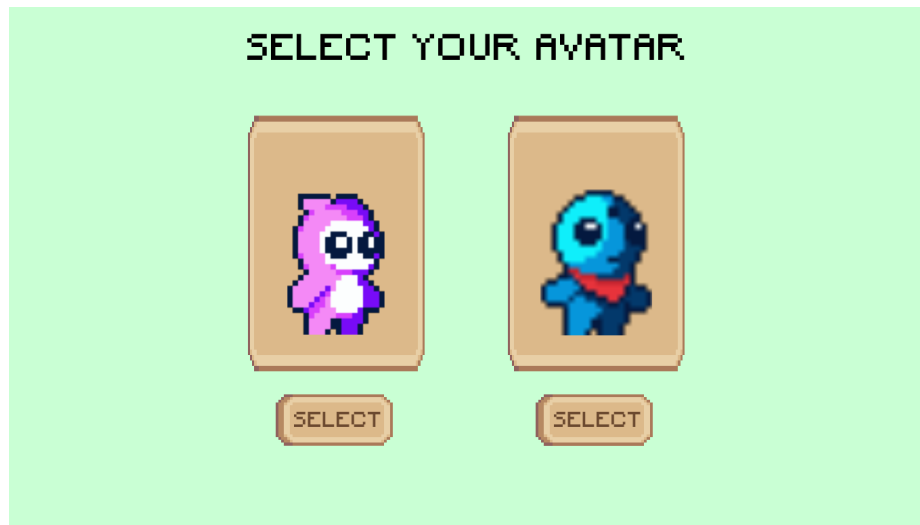


Non-human avatar designs were chosen in place of human-like avatars to help alleviate any perception issues that may come from a player not identifying with the human features of their avatar. As seen in the *AC:NH* player studies, when players are more connected to their avatar's actions and experiences, players tend to view their avatars more as extensions of themselves and their actions. Therefore, this game avoids this issue by giving two options of fantasy characters that do not contain human-like characteristics. This design choice was essential to supporting the players' comfort while engaging with the system.

**Figure 4.9**



*KANDI.io - Avatar Selection Screen*



## Chapter 5: Experiment Sessions

### 5.1 Motivation and Research Questions

#### 5.1.1 Overview and Motivation

This research study focuses on determining whether potential players would feel a genuine connection to another player in a social gaming environment using a mirrored gesture interaction communication system. Participants compared an emote-based design of a social game with a gesture-based design of the same game and chose which system they preferred. Likert reverse scaling was used in the evaluation surveys to capture emotional intensity and nuances regarding the specific areas of study. Interviews were conducted to provide context and reveal details regarding the results found from the surveys.

KANDI.io was designed and implemented as a social game simulation for this research study. Its unique gesture-based communication system aligns with the goals and needs of this research study. The prototype design of this game may affect results due to technical difficulties that may occur. However, a unique design was critical to the study. Using a unique system places participants at an equal experience level with the game. The game also includes an emoji-based system with the same structure, visuals, and goals as the gesture-based system. By alleviating the need for a platform switch, participants can focus on the details and nuances of the social interaction mechanics.

Participants with prior gaming experience were selected to account for any learning curves or obstacles that may arise due to unfamiliar gaming spaces. This expertise allowed for a

more in-depth evaluation and discussion when comparing the two systems. Participants completed a pre-questionnaire survey to determine their preconceived notions of online relationships and their personal experience with gaming to give any needed background information that may influence their results.

Data analysis included the consolidation and color-coded Likert reverse scaling data display. These methods revealed positivity trends and emotional intensity about the study's topics. Thematic analysis of the participant interviews was completed and used to identify recurring themes within the data. The themes were grouped and refined into key considerations regarding the players' mental frameworks, design recommendations, and highlights of the experience that can be applied to future work.

### **5.1.2 Research Questions**

Three main research questions drove this study:

1. How does a player's experience with existing social interaction systems in social games affect their perception of online relationship building?
2. Does integrating nonverbal gesture synchrony into online social interaction systems in social games help online players build stronger first impressions of each other, thus helping them build stronger online relationships?

3. How do the socio-emotional impacts of a nonverbal gesture synchrony system compare to a standard emote system commonly built into social games?

Question one explores current perceptions of online relationship building and will help bring context to the perspective participants will be coming from while interacting with the *KANDI.io* system. Question two focuses on how nonverbal synchrony interactions with other players may affect their perception of the strength of their online relationships. Question three explores how this non-verbal gesture social system compares to traditional systems regarding effectiveness and user feelings.

## **5.2 Methods**

### **5.2.1 Recruitment**

Participants were discovered via email advertisements approved by the IRB board. Advertisements were sent through UMD student email listservs. The advertisement asked for healthy adults (over the age of 18 years old) and English-proficient participants. Experience with gaming was preferred but optional. Participants were required to travel to the University of Maryland College Campus to participate in the study. Study sessions were scheduled based on convenience for the participant and the Principal Investigator.

**Table 5.1***Participant Demographics*

Overview		
<b>Age Range</b>	23 - 29	
<b>Gender Identity (Self-Identified)</b>	50% Male; 50% Female	
<b>Education Level</b>	Partial/Some College	25.0% (2)
	Obtained Bachelor's	37.5% (3)
	Pursuing Master's	37.5% (3)
<b>National Origin</b>	USA	50.0% (4)
	China	25.0% (2)
	India	12.5% (1)
	Philippines	12.5% (1)

Eight volunteers participated in this project. Participants were adults between the ages of 23 and 29 and were 50% self-identified male and 50% self-identified female. All participants had at least some college experience. The breakdown of nationalities was diverse, with 50% of the participants being native to the United States, 25% of participants being native to China, 12.5% of participants being native to India, and 12.5% of participants being native to the Philippines.

**5.2.2 Procedure Overview**

At the beginning of the study, participants were given a demographics survey (Appendix A) and a pre-study questionnaire (Appendix B) to help give context to the participants' experience with social games and perceptions of online friendships built through social gaming. Before starting their game sessions, participants were given a short tutorial on how to use the *KANDI.io* system for both the gesture and emoji versions. After engaging with each design, they

completed a post-game evaluation survey (Appendix C). After completing evaluations for both systems, the participant answers post-study interview questions (Appendix D) with the Principal Investigator.

### **5.2.3 Pregame Questionnaire**

The pre-game Questionnaire was administered to capture participants' general experience with gaming and their thoughts and perceptions of online friendships built within gaming spaces. This data is intended to help inform the observed behavior during the gaming sessions. It can provide a baseline to observe any potential changes participants may have had in their feelings about the topics being explored during the study. This questionnaire also helps to understand how current online social interaction systems have potentially impacted the social and cultural understanding of virtual friendships.

The questionnaire was constructed using multiple-choice and short-answer questions to evaluate player perceptions. Multiple-choice answers allow for comparison and consolidation during analysis, while the open-ended short-answer questions allow participants to express more personalized thoughts and feelings regarding the topics.

### **5.2.4 Game Sessions**

After completing the demographics survey and pre-study questionnaire, participants were introduced to the *KANDI.io* simulation application. They were provided with a short tutorial to help with any preventable issues during their interaction with the system. The participants then

engaged with both versions of the system, the gesture design, and the emoji design, on their own while being encouraged to share their thoughts and feelings as they used each system.

Electronic observation notes were recorded during the participant's engagement with the gesture and emoji design to capture real-time insights about participant choices, reactions, and verbal statements. An overhead mobile camera was set up above the participants to video capture their arms and hands interacting with the phone. The observation data collected serve as additional qualitative points that can be used to supplement the main results from the post-questionnaire survey.

### **5.2.5 Post-game Evaluation Survey**

The postgame Questionnaire was designed to evaluate the enjoyment and impact of an introductory social interaction based on non-verbal gesture synchrony with a new person. The evaluation survey includes a Likert reverse scale rating section that will compare user feelings about a standard emoji-based social interaction system and the gesture-based system. This format was chosen to reveal any emotional nuances when participants approach the statements from a negative and positive perspective. This data will inform how individuals emotionally respond to the design differences.

The post-game Evaluation survey starts with a short section about player enjoyment that includes a multiple-choice question and a short answer question about general game enjoyment. The second section includes Likert scale-rating questions to gather quantitative data that can be

used to understand player thoughts regarding the effectiveness of the gesture design system versus the emoji design system.

### **5.2.6 Participant Interviews**

Participant interviews were conducted to collect qualitative data to support the data gathered by the Post-game and Pre-game questionnaires and to reveal any remaining insights. The interview questions serve as conversation guides so that the interview would feel more like a discussion than a formal interview. These guiding questions were designed to delve deeper into the participants' thoughts and feelings while playing the two versions of *KANDI.io*. This interview will capture qualitative information about the user's thoughts and feelings about each system.

### **5.2.7 Hypothesis**

The following hypotheses were designed to explore how participants' experiences with online gaming affect their ability to build online social relationships. The hypotheses also investigate the effectiveness of the gesture design of the *KANDI.io* system against the emoji design system.

H1 Players with positive perceptions of online social relationships will report using external communication channels to build these relationships.

H2 Players will rate their social interaction with the computer user in gesture-based experience more positively than their interaction in the emoji system design in terms of creating genuine connections with the other player.



H3 Players will report a preference for the gesture design experience over the emoji system design.

### 5.3 Results and Discussion

After the completion of the experiment sessions, the surveys were consolidated and analyzed to compare user feelings and evaluate the effectiveness of the gesture-based social game system. The post-game interviews were used to evaluate the player's experience through qualitative data and to help support the quantitative results derived from the surveys.

#### 5.3.1 Player Perceptions of Online Relationships

**Table 5.2**

*Pre-Questionnaire Results*

Question	Answer	Percentage
Q7 Do you have any social relationships (friendships, acquaintances, etc.) that were built within an online gaming space?)	Yes	87.5% (7)
	No	12.5% (1)
Q8 If yes, Which elements of the online gaming space were crucial to building these social relationships? Please select all that apply	Text Chat	71.43% (5)
	Voice Chat	71.43% (5)
	Built-in emote system	57.14% (4)
Q9 Do you consider online friendships as "real" friendships?	Yes	62.5% (5)
	No	0% (0)
	I don't know	37.5% (3)

All participants had experience with playing social games, and most had experience with developing friendships through these games. 71.43% of participants relied on external tools such as text and voice chat. 57.14% of participants also used the built-in remote systems as a main tool for interaction.

Although 87.5% of participants reported that they developed friendships through games, only 62.5% of participants reported that they believed online relationships built online could be classified as “real” relationships. The remaining 37.5% of participants reported that they were unsure of how to classify these relationships. The participants who reported “Yes” to Q9 reported positive social relationships that seemed to be built through external communication tools. Participants reported that verbal personal conversations and in-person meet-ups were key to building these relationships. One Participant even stated, “There are people I communicate with every day, and I haven’t met them in person. Relationship strong enough enough to invite them to my own wedding.” The individuals who responded “I do not know” to Q9 also reported having social game relationships. However, they also noted that the relationships were not built because of the game but rather through personal conversations through external communication tools such as voice chat.

### 5.3.2 Emoji vs. Gesture Design: Evaluation Surveys

**Table 5.3**

*Evaluation Survey Results Part 1: Did you Enjoy The Experience?*

Answer	Emoji Design (%)	Gesture Design (%)
YES	87.5% (7)	87.5% (7)
NO	12.5% (1)	0% (0)

NEUTRAL	0% (0)	12.5% (1)
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At the end of each game session, participants filled out a survey about their enjoyment of each design, and asked for an explanation for their answer. Participants were then asked to rate statements on a Likert scale regarding their feelings about the social interactions present in the system. 87.5% of the participants expressed enjoyment of both game simulation designs. However, one participant expressed discontent with the emoji design and neutrality for the gesture design. This participant felt that neither interaction would help them build a meaningful relationship. During their post-evaluation interview, the participant expressed that the ability to verbally strategize, jeer at, and celebrate with fellow players was critical to their definition of meaningful online interaction.

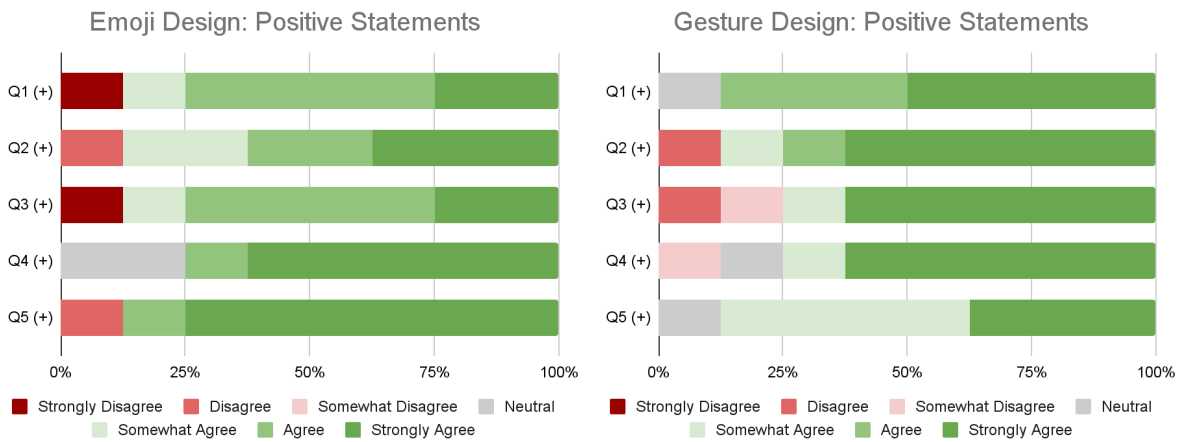
Participants who reported having enjoyed the emoji experience expressed that they shared and exchanged mutual emotions and gave similar feelings to the physical PLUR handshake ritual. Participants who reported having enjoyed the gesture-based experience reported feelings of genuine connection and intimacy. They also enjoyed the increased interactivity of the experience and felt that the interactions helped them to feel like they were “building a bond” with the other player. However, despite enjoying the experience, a participant stated, “It feels more engaging, but I don’t like how the other player can see errors in my execution of the emotes”.

### 5.3.3 Emoji vs. Gesture Design Likert Scale Comparison

The Likert reverse scale rating section of the evaluation survey was designed to capture emotional nuances that may appear when approaching the statements from both a positive and a negative perspective. The data from the Likert scale rating section for each design was consolidated and compared against each other to evaluate the percentage breakdown and the intensity of the emotions. For the positive perspective comparison, ratings of agreement were coded with green, and ratings of disagreement were coded with red. For the negative perspective comparison, these codes were switched to track the positive trends within the data.

**Figure 5.1**

*Scale Rating Results for Emoji and Gesture Design - Positive Perspective*



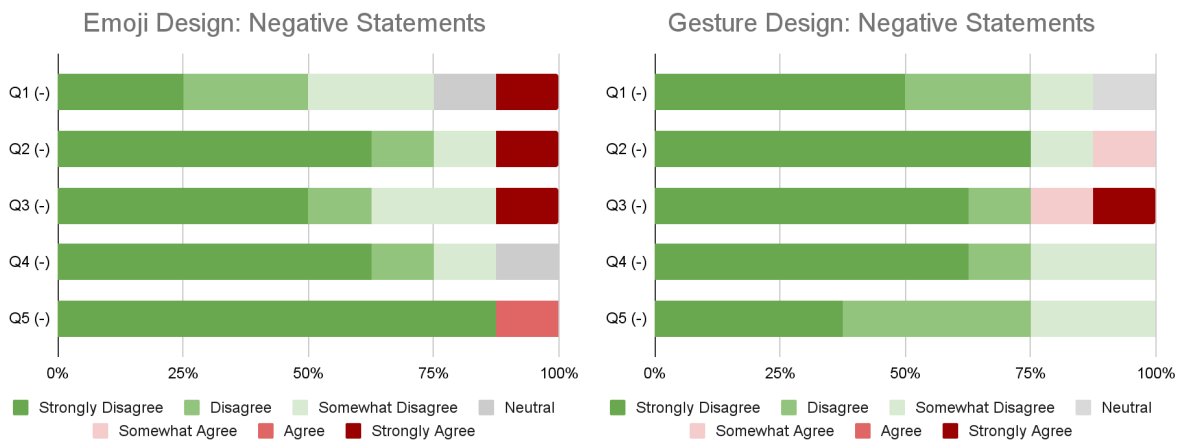
*Note.* Each statement from the scale portion of the questionnaire is represented by the numbered abbreviation and the perspective. E.g. The positive perspective of the question 1 is represented by “Q1 (+)” while the negative perspective is “Q1(-)”

When comparing the Likert scale data for both designs from the positive end of the spectrum, it can be seen that the gesture design results in trends more positively than the emoji design. For Q2, a question evaluating the meaningfulness of the interaction is not only on the

positive side but also shows a stronger positive intensity for the participants. We can also see through the positive trends and emotional intensity for Q1, Q2, and Q3 that participants felt they were building more genuine connections and enjoyment for the gesture experience versus the emoji experience. However, the intensity of the positive emotions is less strong than the emoji design for specific instances. For example, Q5 has a more positive breakdown for the gesture design than the emoji design. However, the intensity of those positive feelings is significantly weaker than the emoji design. This question evaluated the player's comfort with interacting with a different player using the same interaction. Participants felt more comfortable engaging new players with the emote-based design than with the gesture-based design. This insight seems to contradict the enjoyment rating of the gesture-based experience versus the enjoyment of the emoji-based experience. Based on these results, the gesture-based experience was seen as more meaningful and engaging than the emoji experience; however, participants seemed to feel wary about engaging with another player using this gesture system. The negative perspective of the Likert scale rating data helps to reveal nuances regarding these results.

## **Figure 5.2**

*Scale Rating Results for Emoji and Gesture Design - Negative Perspective*



*Note.* Each statement from the scale portion of the questionnaire is represented by the numbered abbreviation and the perspective. E.g. The positive perspective of the question 1 is represented by “Q1 (+)” while the negative perspective is “Q1(-)”

When approaching the statements from a negative perspective, the data for both designs shifts in both positive trends and intensity in emotions. The results remain similar in trends and support the original findings in the positive perspective but reveal emotional nuances for these trends through intensity. While participants positively rated the emoji experience with strong intensity for the positive perspective of Q1, we can see that when presented with the negative perspective of the statement, “This interaction felt boring,” the ratings seen in the positive perspective of this statement become less intense. This is also true for Q5 for the gesture experience. The negative perspective of this statement reads, “I would not feel comfortable greeting a different player with a similar interaction.” While participants initially rated the positive perspective of this experience with less intensity, the emotional response became stronger from this perspective. Based on the data presented, participants did not feel negative about the gesture experience in this regard. However, they seemed to be expressing caution regarding engaging with another player rather than rejecting the interaction.

#### **5.3.4 Emoji vs. Gesture Design Interview Analysis**

All Participants completed a post-evaluation interview and consented to an audio recording. Interviews were analyzed using a Thematic Analysis Procedure. All coded responses were grouped and then consolidated into central themes. Responses were also analyzed for supporting data for the survey results. Key themes were seen throughout the interviews and can serve as key reasonings and considerations for the Likert scale data results.

As previously seen in the Likert scale data results, while participants scored more positive leaning for the gesture design in terms of meaning and genuine connection, the interviews revealed no significant preference for this interaction. Participants reported feeling more involved in the gesture-based design but expressed worries and caution when discussing this kind of gesture in a real game setting. Many participants also expressed no preference between emote-based and gesture-based design experiences. When comparing the two experiences, a participant even stated they experienced similar feelings from both, and the difference between them was that one involved more risk than the other. Upon further inquiry, the “risk” was the uncertainty of the other player’s actions and intentions. This concern was commonly brought up among participants during the interview process. Participants also identified a difference in the level of investment and involvement of self for each interaction. For some participants, this was an essential factor in whether they felt comfortable interacting with someone unfamiliar.

Along with these results, other exciting themes were also brought up during the interviews that opened up discussions about player anxieties, expectations, and vulnerabilities

during interactions like the gesture-based handshake mini-game. Participants also provided design ideas and referenced existing game features that they felt were either similar or would enhance the experience of the game for both designs. The following section delves deeper into these key themes and explores the implications for game design.

## **5.4 Interview Analysis: Key Themes and Findings**

### **5.4.1 General Themes and Reactions**

Participants expressed that the game felt similar to other experiences that they have had with other social games and distance affection devices. When participants were asked about the gesture experience specifically, one participant said, “It reminded me of an old couple app that me and my wife used to use when we would be far away... We would send each other little kisses by just holding your thumb against the screen and it felt very intimate and it gave me the same sort of feeling.” A few participants also brought up the collaborative game, *It Takes Two*, and expressed similar feelings between the game and the gesture experience. Other collaboration-based social games compared to the experience include *Splatoon 3*, *Mario Party*, and *Don't Starve*. Participants also expressed enjoyment with the system design, expressing their preference and excitement for gesture-based mobile gaming experiences.

### **5.4.2 Key External Influences**

When discussing the experiences, two common themes arose around when and why participants would engage in the emoji and gesture design experiences. These two themes were



interaction context and perceived level of investment—the participant’s goal in the game and their relationship with the other player. When the relationship with the other player is weak, like a stranger or acquaintance, or the investment in bonding with them is low, the participants prefer the emoji version. When the relationship is stronger, like a friend, or the investment in bonding with the other player is higher, the gesture experience is preferred. One participant stated while discussing the context for the gesture experience, “If the goal of the game is to make friends and try to help people make friends online, I think the second one is that gesture one will be more interesting.”

### **5.4.3 Player Social Framework**

The Likert Scale data revealed that participants recognized that the gesture experience felt more meaningful but did not necessarily feel comfortable engaging with other players using this interaction. Due to this, some participants preferred both experiences for different contexts. The interview revealed that this is because participants had various concerns surrounding the implications of an interaction like the gesture experience. These concerns were grouped into two main parts of the player’s social framework when discussing their experience with the gesture-design and their prior experience with social gaming.

#### *Player Performance and Vulnerability*

Participants reported moments of anxiety while playing the gesture-based game that they did not experience during the emoji game due to more opportunities for free play during the experience. Some participants expressed being worried that the quality of their heart shape would be judged positively and that they were performing all of the tasks correctly.

It was reported that the gesture version felt more self-involved than the emote-based version. One participant stated, “The second one feels a little more like an extension of myself. Which is sort of like I'm extending my own hand, and I don't know what that other hand is going to do.”

#### *Player Caution and Distrust*

Some participants experienced anxiety regarding the other player's actions. Participants felt more involved in the gesture-based experience, generating more worries about equal player investment. A participant expressed, “I feel like that's like an aspect if you build into a game, especially if it's like a multiplayer game. People will take advantage of because not everyone intends on doing a cooperative task to succeed in the task.”

#### *Equal Player Feedback and Investment*

One fault of *KANDI.io* that presented concerns for participants was the lack of equal emotional feedback from the other player during the gesture experience. Participants reported anxiety due to the unknown reactions and thoughts of the other player. It increased feelings of vulnerability and made participants wary of engaging new players in an interaction like this. As expressed by a participant, “I think what the scary thing about the gestures [experience] actually is that the only feedback you have is the other person doing the task you've laid out.”

These considerations were unique to the gesture experience and were not an issue during the participants' experience with the emoji experience. This was due to the structured design of

the social interaction and the equality in experience. Both players give and receive the same involvement of self and emotional feedback, which participants felt made the interaction easier to use. Along with these concerns, participants also expressed the positive impacts of engaging in the collaborative mini-games present in the gesture experience.

#### **5.4.4 Co-Creation and Collaboration**

Participants identified the Heart Interaction, where each player completes a drawing of half of a heart, and the shake interaction, where players both shake their phone in celebration of the handshake completion, as the two interactions that stood out to them the most. The heart interaction gave participants a sense of co-creation, enhancing their bonding with the other player. One participant also highlighted the Puzzle interaction, where players would drag and drop two puzzle pieces together, as an interaction that also provided a feeling of co-creation. These feelings of creating something together made players engaged and invested in the gesture experience.

Participants would also reference games that invoke this feeling of co-creation during discussion. One participant brought up a drawing mini-game in *It Takes Two* and suggested a similar design to help enhance the feeling during the interactions. Some participants brought up how being able to complete non-symmetrical pictures with another person would help to enhance the feeling of working together. This came up after some participants realized they could draw something unique on the screen rather than just the predetermined heart symbol. One participant stated regarding creating something unique using the drawing feature, “Well, they can determine

a drawing, so it is a time that you can decide to collaborate. You can also create something weird and just mess things up.”

## Chapter 6: Design Recommendations

### 6.1 Key Elements of Semi-Structured Social Interaction

This research study revealed elements necessary for players engaging in semi-structured, containing both free play and structured play, social interactions online. Concerns such as player vulnerability, player distrust, and feedback equality are critical to creating a healthy social environment in which players feel comfortable. This section goes through essential components that should be considered when designing semi-structured social interactions.

#### *Asymmetry and Individuality*

While players enjoyed both the gesture and the emoji experience, one element that came up during the interviews was a desire for freedom to express individuality and to interact with other players asymmetrically. Rather than conducting perfect mimicry with their interactions, players wanted to complement the other player's gestures and experience the other player's unique interactions.

#### *Vulnerability in Free-Play*

Free-play interactions, such as drawing or developing unique pathways, allows for the Asymmetry and Individuality expressed previously. However, the vulnerability that comes with this element also needs to be considered. Developing ways to give players control of their experience is imperative to improving player confidence and comfortability in online social spaces.

### *Equal Feedback*

When creating social interactions in an online gaming space, players need to give and receive the same amount of emotional feedback to feel comfortable with each other. Whether the feedback is expressed through avatar emotes or other indicators of emotional state, these signals need to be communicated between players to build a sense of trust and equality.

## **6.2 Design Suggestions for KANDI.io**

During the interviews, participants expressed their frustrations, ideas, and concerns about the *KANDI.io* system. These issues may have affected their experience when using the system and should be addressed for future game versions.

Participants found the first interaction for representing peace, the finger tap interaction, unclear. They were unsure how to complete the task successfully and did not feel they could see the other player's gestures well in the interaction. In a future version of *KANDI.io*, this design would be refined to better cultivate the feeling of co-creation and collaboration through mixing colors and will have clear signals of player interaction and feedback. Some participants also found the puzzle interaction to be fast. Although some players enjoyed the interaction, some felt it was insignificant because it did not give them that feeling of bonding and collaboration with the other player. This interaction would also be refined to help cultivate the feeling of co-creation. Some participants also expressed that haptic and audio feedback was expected but not

received during the interactions. They felt a physical or audio signal of successful task completion would help them feel more confident during the interactions.

## **Chapter 7: Conclusion**

### **7.1 Limitations and Future Research**

#### **7.1.1 Limitations**

The main limitations of this study lie in the inability to have two participants play together in the simulation *KANDI.io*. Due to networking issues with the testing site, developing this server system was not feasible for the timeframe of this study. The study can tell us how players might feel about the potential of a system based on non-verbal gestural synchrony. However, in future studies, a final server-based version of *KANDI.io* would allow two real-world players to interact to explore how individuals would naturally interact in this space. The study only asked for an hour of the participants' time and only covered the initial meeting between two players. In a future version of this study, it would be ideal to have a long-term study where participants' relationship growth over time could be captured and analyzed. It would also be ideal if a larger pool of participants would allow for a better understanding of how different backgrounds impact a user's experience when using a social play system like *KANDI.io*.

#### **7.1.2 Future Research**

This study determined how players feel about a nonverbal gesture communication system within gaming compared to a traditional nonverbal emote-based communication system. This study identified that gesture-based systems feel more meaningful to social game players.



However, a collection of concerns must be addressed for players to feel safe enough to engage with new players online.

However, new questions arose in topics related to the emotional evaluation of these systems. Future research could explore the comfortability shift that occurs in the space between emote-based systems and free-play-inspired interactions like a gesture-based system. Below are examples of questions that could be explored:

1. When do players begin to feel more vulnerable when introducing gesture-based communication systems?
2. What kind of gestures generate the most feelings of anxiety and vulnerability?
3. What boundaries can be placed around these gestures to help players feel safe and in control?

These questions are suggestive and do not encompass the entire field of study around these issues, but they serve as a starting point. With these questions, future research could delve deeper into how to create more meaningful social interactions while protecting players, giving them confidence, and fostering a sense of agency in online gaming spaces.

## **7.2 Concluding Comments**

In this research study, the implementation of nonverbal synchrony was introduced as a social communication system within social games and compared against traditional emote-based communication systems. Evaluation designs considered the nuances within player feelings

through Likert reverse scale data collection and analysis. The quantitative results were supplemented and analyzed at a deeper level with in-depth interviews held with participants. Design recommendations for semi-structured social interactions within games were given based on the study's results. As the next steps, *KANDI.io* will be refined based on player feedback and design recommendations. Future research on this topic will be focused on understanding and mapping the space between comfortability and vulnerability online when integrating gesture-based communication systems into social interactions in online gaming.

**APPENDIX A: Demographics Survey**

**Participant Demographics Survey**

**Participant ID Assigned:** \_\_\_\_\_

**Age:** \_\_\_\_\_

**Gender Identity:** \_\_\_\_\_

**Education Level:** \_\_\_\_\_

**National Origin:** \_\_\_\_\_

## APPENDIX B: Social Games Survey

1. How often do you play video games?
  - a. Rarely
  - b. Occassionally
  - c. Frequently
  - d. Every Day
  
2. What platforms do you typically use for gaming?
  - a. Mobile (iOS, Android, Tablet/iPad)
  - b. Console (Playstation, Nintendo, Xbox)
  - c. PC (Windows, MacOS)
  - d. VR/AR Gaming (Oculus, Hololens, Meta Quest)
  - e. Other
  
1. Do you have experience with online gaming/online social gaming spaces (Second Life, Roblox, Fortnite, Valorant, etc.)?
  - a. Yes
  - b. No
  - c. I don't know
  
2. What online/social games have you played that you enjoyed? Please select all that apply and add any titles that aren't listed. (select all that apply)
  - a. Second Life
  - b. Roblox

- c. Fortnite
- d. Valorant
- e. Animal Crossing: New Horizons
- f. VR Chat
- g. Sky: Children of the Light

Other:

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3. How frequently do/did you play these games?

- a. Rarely
- b. Occassionally
- c. Frequently
- d. Every Day

4. What did you enjoy the most about playing these kinds of games?

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5. Do you have any social relationships (friendships, acquaintances, etc.) that were built within an online gaming space?

- a. Yes
- b. No

6. If yes, Which elements of the online gaming space were crucial to building these social relationships? Please select all that apply

- a. Text chat (either through the game or through an app)
- b. Voice chat (either through the game or through an app)
- c. Built in emote system (emojis, reactions, avatar animations)
- d. Other: \_\_\_\_\_

7. Do you consider online friendships as “real” friendships?

*Quotations have been used around words that are subjective in nature. Please answer this question based on your personal interpretation of this phrase.*

- a. Yes
- b. No
- c. I don't know

8. In a few sentences, please explain your answer to the question above:

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## APPENDIX C: Post-study Survey

### Post-Test Evaluation Survey: Design #1

#### Page 1: Opening Survey Questions

1. Did you enjoy this interaction?
  - a. Yes
  - b. No
  - c. Neutral

Based on your answer above, What did you enjoy or not enjoy about this experience?

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**Page 2:**

Please mark how you feel about each of the following statements from **Strongly Disagree** to **Strongly Agree**.

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
This interaction was fun.							
My interactions with the other player felt meaningful.							
I feel like I made a genuine connection with the other player.							
I would feel comfortable greeting the other player again.							
I would feel comfortable greeting a different player with a similar interaction.							
This interaction was boring.							
This interaction felt insignificant.							
I do not feel like I made a connection with the other player.							
I would not feel comfortable greeting the other player again.							
I would not feel comfortable greeting a different player with a similar interaction.							

## Post-Test Evaluation Survey: Design #2

### Page 1: Opening Survey Questions

2. Did you enjoy this interaction?

- a. Yes
- b. No
- c. Neutral

3. Based on your answer above, What did you enjoy or not enjoy about this experience?

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**Page 2: Likert Survey Questions:**

Please mark how you feel about each of the following statements from **Strongly Disagree** to **Strongly Agree**.

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
This interaction was fun.							
My interactions with the other player felt meaningful.							
I feel like I made a genuine connection with the other player.							
I would feel comfortable greeting the other player again.							
I would feel comfortable greeting a different player with a similar interaction.							
This interaction was boring.							
This interaction felt insignificant.							
I do not feel like I made a connection with the other player.							
I would not feel comfortable greeting the other player again.							
I would not feel comfortable greeting a different player with a similar interaction.							

## **APPENDIX D: Post Interview Guiding Questions**

1. What did you think of the handshake game?
2. Did the experiences feel different from each other? If so, in what way?
3. Did you prefer one experience over the other?
  - a. If yes, which one did you enjoy most and why?
  - b. If not, why?
4. Was there a specific part of the gesture-based experience that stood out to you?
5. Was there anything about the gesture-based experience that you would want to change?

Do you have any additional thoughts or critiques about this experience?

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