Figure 1: Image of the game 'In the Same Boat'. Player making a 'joy' facial expression with her partner to successfully complete a jump over a whirlpool obstacle.

'In the Same Boat', A Game of Mirroring Emotions for Enhancing Social Play

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ABSTRACT

Social closeness is important for an individual's health and well-being, and this is especially difficult to maintain over a distance. Games can help with this, to connect and strengthen relationships or create new ones by enabling shared playful experiences. The demo proposed is a game we designed called 'In the Same Boat', a two-player game intended to foster social closeness between players over a distance. We leverage the synchronization of both players' physiological data (heart rate, breathing, facial expressions) mapped to an input scheme to control the movement of a canoe down a river.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; *Collaborative and social computing*; • **Applied computing** → **Computer games**.

Figure 2: Two players syncing a 'disgusted' facial expression to duck under a log obstacle. Emojis at the bottom of each player's screen denotes their facial expression (right emoji) and their partner's (left emoji).

KEYWORDS

Emotion; Body games; physiological data; social games.

INTRODUCTION AND BACKGROUND

People who care about each other, work together, or know one another don't always live in the same geographical location. As social closeness—i.e., feeling connected to others—is vital for our well-being [6], building and evaluating tools that help connect people over a distance has been a priority for designers and researchers in human-computer interaction (HCI). Games and playful activities have been long used to support *co-located* social interactions: pick-up sports leagues or board game nights can help us satisfy our need to feel related to others and create shared experiences that draw us together. With recent technological advances, these shared game experiences can now connect people over a distance as well. Gamers spend an average of 6 hours/week playing with others online and 5 hours/week playing with others in person [1]. More than half of frequent gamers report that games help them connect with their friends and family [1], whereas game researchers have deconstructed online social games to identify their value for relationship formation and maintenance [2, 7].

Most prior work in the area of gaming for closeness—especially games that use embodied or physiological input—primarily place an emphasis on the co-located game experience. For example, Isbister's interdependent wearables [4] and Zanouei et. al's emotional game experience are for co-located players [8]. However, there have also been games designed to support interaction over a distance—e.g., Mueller's framework for exertion interactions over a distance [5] described games such as table tennis for three, jogging over a distance, and sports over a distance. Our work expands on this reported prior work by combining collaboration mechanics, embodied interaction (through physiology), mirroring, and networked play.

Our goal is to design a game that will support people with existing relationships to maintain intimacy, trust, fondness, and affection over a distance through networked play. With this inspiration in mind, we created an embodied physiological mirroring game, 'In the Same Boat', was designed to foster social closeness. The novelty of this game lies in the need for players to synchronize their physiological data–using heart rate, respiratory (or breathing) rate, and facial expressions—as a core mechanic that enables networked gameplay.
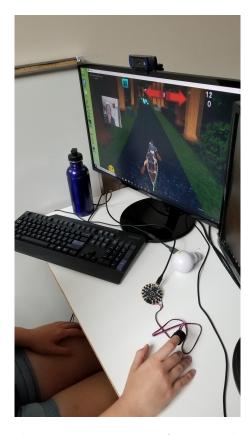
Figure 3: Game setup: Webcam, circuit playground attached to finger, and game on screen.

'IN THE SAME BOAT' GAMEPLAY

In the design, we leverage players' emotions and physiology as an alternative controller. The game is a two-player infinite runner played over a network, in which players use their physiological input to control a canoe riding down a river, while dodging obstacles along the way (see Figure 2). The two players must sync their facial expressions to dodge obstacles that occur in the middle lane of the river, and they must sync their heart rate (or breathing rate in an alternate version) to stay in the middle of the river. If they fail to synchronize in time, the canoe will move to either the left or right portion of the river, which has more obstacles and therefore increases the game difficulty. The left and right red arrows in the upper right portion of the screen indicate in which direction the canoe is moving depending on the heart rates of the players. Figure 2 depicts screenshots of both players syncing a 'disgusted' facial expression to duck under a fallen log, and Figure 1 depicts one player making a 'joy' facial expression to jump over a whirlpool. Players must decide which actions to take to keep their heartrates in sync. For example, to spike their heart rate, a player may get up and do a couple jumping jacks, or to calm down, they may take a few deep breaths. For controller mappings, the front player (in the canoe) controls the right side of the boat and the back player controls the left. If the front player paddles faster (i.e., heart rate increases), the boat begins to turn left. The same mechanic is true with the player in the back. If either player's heart rate decreases significantly, both players need to quickly sync their heart rates back up to one another in order to move back to the middle path.

Our first two game design requirements were *emotion mirroring* through *embodied physiological interaction*. To operationalize these in the game, we wanted to force players to synchronize their biometrics, due to prior work that suggests coordinated action leads to a heightened sense of social closeness between participants [3]. The next requirement was to maximize the *cooperation* and *interdependence* mechanics of the game, as these mechanics have been shown to build trust [2]. We thought about real-life activities in which two people heavily rely on each other and decided on canoeing. We wanted to build off this idea in the game and give people the chance to cooperate by syncing into a 'physiological cadence' with each other. When canoeing with multiple people, they must synchronize their stroke rate in order to keep their speed constant and stay traveling in a forward direction down the river. The interdependence of making the players directly responsible for their "side" of the canoe is intended to facilitate a greater sense of cooperation, concentration, and engagement amongst players. We opted to work within the infinite runner genre to emphasize the impact that emotional syncing has on the gameplay—failing to sync your expression with the other person in time will quickly cause you to lose the game and restart. This puts primary focus onto the interdependence of the gameplay, as the players rely heavily on each other to progress in the game.

The current game setup includes two seated players each with a webcam, the game on the screen, and the Circuit Playground attached to a finger sensor (see Figure 3). The game was built using

the Unity 3D game engine. We used the Affdex Facial Recognition software by Affectiva to capture each player's facial expressions through the webcam, and the Affdex SDK package for Unity. For the hardware, we used the built-in microphone on the Adafruit Circuit Playground and attached a heart rate sensor to the board.

CONCLUSION AND FUTURE WORK

In conclusion, we created an embodied mirroring game—In the Same Boat—to explore social closeness between players over a distance. The game leverages players' physiological data (both direct and indirect) as input to the game and focuses on the synchrony of physiological input as the mechanic that realized cooperation and interdependence in the game. It was designed to promote an intimate interaction, by focusing on embodied interaction using physiological input, mirroring emotions through syncing, and networked play. To the best of our knowledge, this game is the first to leverage physiological syncing over a distance and has the potential to help geographically-distributed friends, family, and partners to feel closer through playful interaction. Displaying this as a demo at CHI gives the community a chance to try out these mechanics for themselves and will be a fun way to get to know and interact with strangers in a large group environment.

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