Virtual Reality Ping Pong

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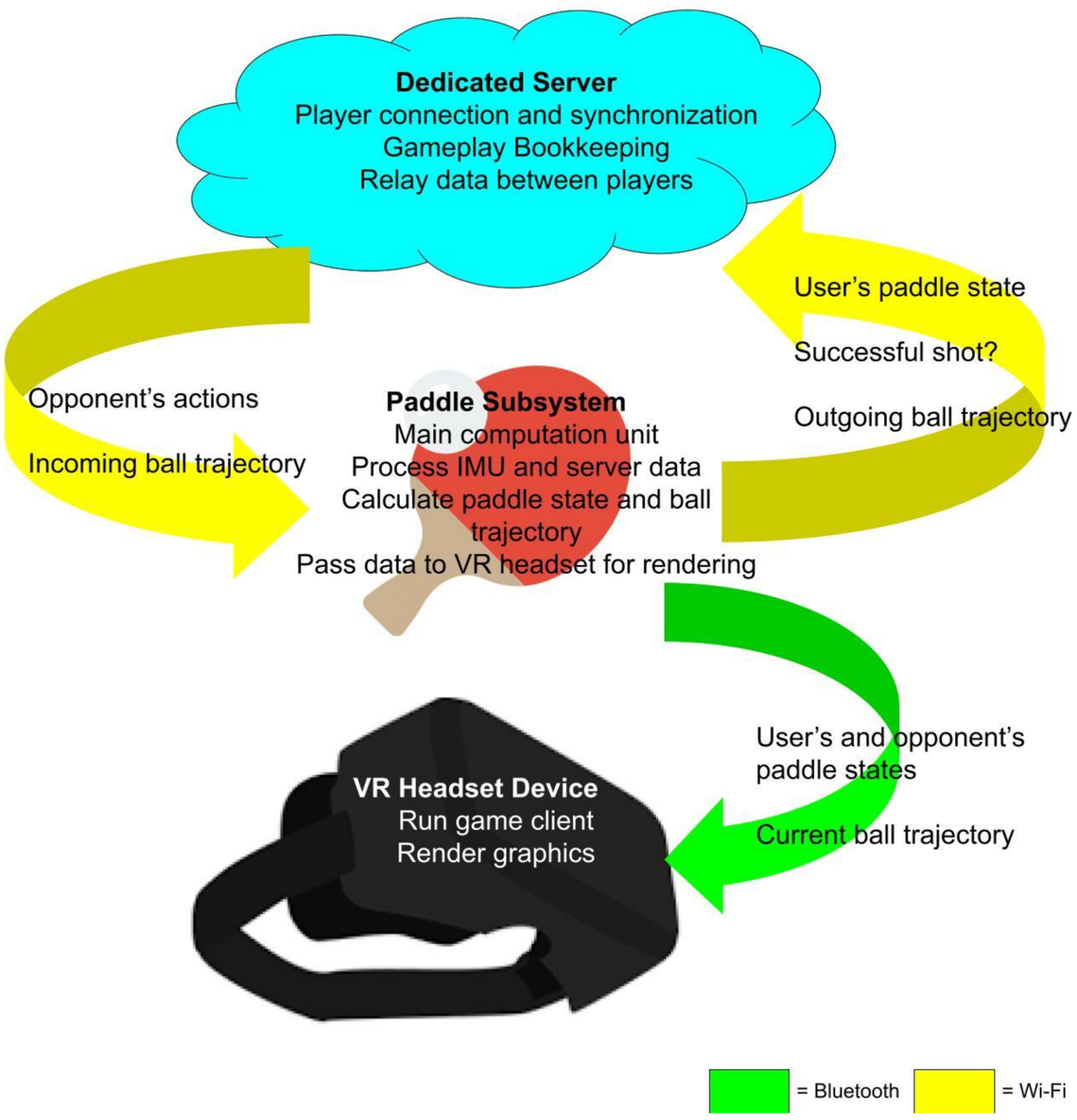
Product Pitch

Our product is a virtual reality table tennis game. It is targeted to boost engagement for those whose connections have been diminished by traditional virtual interaction during social distancing as a result of the pandemic.

Our product's primary feature is the realistic gameplay, which is achieved through low latency (0.4s within each player's setup, 0.1s between players) and high paddle state accuracy (70% for shot type, 85% for swing direction).

System Architecture

A central server acts as a connection as well as an arbiter. The server exchanges data (regarding both players' actions) with each paddle, which feeds data for the headset to render.



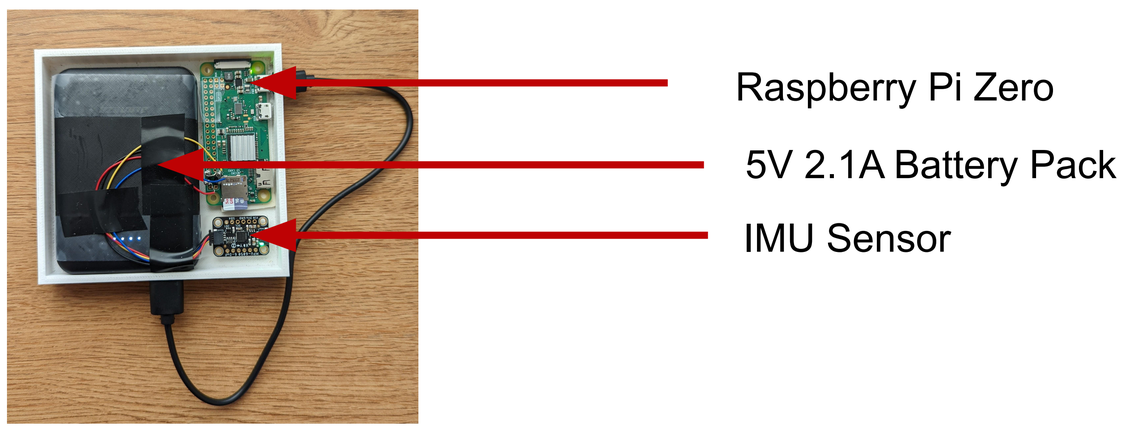
Conclusions & Additional Information

http://course.ece.cmu.edu/~ece500/projects/s22-teama4/

Ideas for future development include adding computer vision to track the position of the paddle, incorporating more paddle motions and ball interactions, and working on the game environment (audio, setting, etc.)

System Description

Our project uses an IMU sensor to get the orientation and linear acceleration of the paddle. We process the IMU data using the Madgwich and Butterworth filter. The IMU is connected to a Raspberry Pi Zero which reads data from the IMU for a determined sample period and uses the orientation and acceleration to classify the power, direction, and motion of the player's swing. The paddle then sends these classifications to the game where it triggers specific animations and paddle-ball interactions. The game is programmed using Unity and includes scripts that set up bluetooth connections and defines player movements as well as what to do when the ball collides with the paddle, table, or ground. To implement multiplayer, we used Mirror networking. The Raspberry Pi is really sending data to a player's Android/iOS phone where the game is built and running. We are using a Google Cardboard as a tool for viewing the game in virtual reality.



Paddle Hardware

System Evaluation

To test the swing type/direction accuracy, we performed a sample of different swings, and tallied how many of them behaved in our game as expected. To test latency, we marked the absolute time of when the data was sent from the paddle and when the data was received by our VR device, and averaged out the latencies.

Testing Metrics

Testing Metric:	Tested Values:	Passing Test Value:
Latency (paddle-to-headset)	0.4 seconds	0.3 seconds
Latency (opponent-to-player)	0.1 seconds (simulated)	0.3 seconds
Accuracy of Swing Type	70%	90%
Accuracy of Swing Direction	85%	95%

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