"Squash Yourself"
Project Proposal

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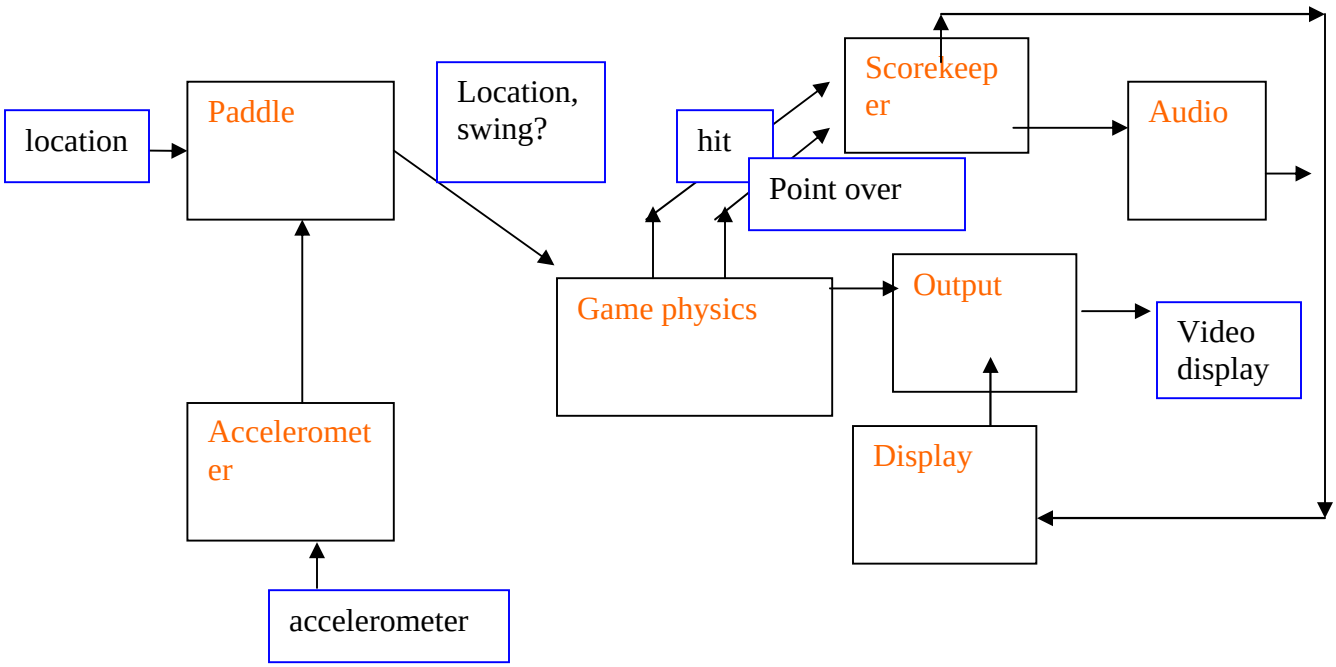
Introduction:

The goal of our final project is to implement a squash game. The player will have a paddle whose position will be determined by an infrared LED and will be recognized by an infrared sensor. The screen will display the squash court and the ball as it would appear to the player. The ball will increase in size as it approaches the player, and decrease in size as it moves back towards the virtual walls. A hit will be registered by a swing of the player's paddle if the ball is a certain size (is in within the specified hitting range). If the player misses the swing, they lose the point and the game resets. If the player hits the ball, it bounces back towards the virtual walls and after hitting the wall, approaches the player again at a different angle. The game ends after the player has accumulated ten losses.

Block diagram:



Module breakdown:

Paddle:

Paddle module will take as input the location of the paddle in space. The location of the paddle is determined by the infrared LED on the top of the paddle. This way, the paddle can be detected regardless of which way it is facing.

Accelerometer:

The accelerometer will be on the paddle and will determine the physical characteristics of each swing. The accelerometer will send the angle and velocity of the swing to the paddle module. These will later be used to determine the change in the ball's speed and the angle at which the ball travels, which will be determine by the game physics module.

Game physics:

Game physics takes the location of the paddle and swing information from the paddle module. The physics module creates the ball and manages it's location and movement. It determines whether or not a hit occurred (based on an intersection of the paddle and ball location, as well as the occurrence of a swing). If a hit occurred, the ball changes direction. The game physics module also checks to see if the ball passed the player without a swing occurring, which would result in the loss of a point. This module outputs the ball location to the output module. It also sends information to the scorekeeper as to whether a hit occurred or if the point was lost.

Scorekeeper:

Scorekeeper takes the output of the game physics module. It has two counters to keep track of losses and points. It sends these outputs to the display (which keeps track of the scoreboard). Once ten losses have been accumulated, the game is over.

Output:

Output module takes input from the game physics module and the display module. The display module will tell the output module what the ball will look like and the game physics module will tell the output module where the ball is placed on the screen. The output module sends the images from the display module to the screen.

Display:

The display module is where all of the sprites will be drawn. The ball, court, scoreboard (changing based on the input scores from scorekeeper), end point screen, and end game screen would all be stored in the display module. The display will choose which images to send to the output based on the scorekeeper. It will adjust the

scoreboard based on the point score of the game. It will also choose the end point screen at the end of a point and choose the game over screen at the end of a game.

Audio:

The audio module will receive the state of the game from the scorekeeper module. It will also have a button to push in order to record sound via the microphone and it will record into one of four slots, based on switches 0 and 1. The four sound clips are for the end of a point, the end of a game, a hit, and taunt. The audio will have one input button devoted to the taunt, so if a player hits the taunt button, they will hear the stored sound clip. The other three sound clips will be played based on the state sent from the scorekeeper. These audio signals will then be sent to the headphones.

Implementation plan:

The tasks will be divided among Will, Azadeh, and Sumit. Sumit will be in charge of the inputs and interfacing, especially the paddle inputs. Azadeh will be in charge of the game logic and scorekeeping. Will will handle the outputs and images that will be displayed to the screen.

The first task will be to just get a functioning game. The goal is to be able to register a hit, synchronize the timing with the ball on screen and have the ball bounce back and forth against the back of the wall.

Next, the location of the paddle will be determined by the camera. The game should be able to tell where the ball is on the screen. The ball will be able to move around the screen and bounce off the side walls in a predetermined way. This way hits will be registered only when the paddle location overlaps with the location of the ball on the screen.

After that, the goal will be to add the accelerometer functionality. This will affect the game physics module. The ball's movement will be based off of the hit angle and velocity of the swing as opposed to just bouncing as if off a flat surface.

If all of those functionalities are implemented properly, the next goal will be to make it a two player game. This will require a second accelerometer. The second player will double the inputs and adjust the scoreboard accordingly.

Afterwards, the audio will be handled, so that the game will include programmed sound bytes. This will improve the playability aspect of the game as users will be able to physically swing as well as experience the visual and audio realities of a squash match.