Gesture Based UI Development Project

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1 Introduction

The project specification required the developer to design and build an application with a natural user interface. There were many varieties of technologies made available but the one piece of hardware that caught my attention was the Myo Armband. "Using proprietary EMG sensors, the Myo armband measures electrical activity from your muscles to detect five gestures made by your hands. Using a 9-axis IMU, it also senses the motion, orientation and rotation of your forearm. The Myo armband transmits this information over a Bluetooth Smart connection to communicate with compatible devices." [2] After choosing this device I eventually came to the decision to incorporate the Myo's gestures to control the classical game "Snake" [3] due to it's popularity and its limited control inputs which would suit the limited amount of gestures recognized by the Myo as seen in Figure 1.

Figure 1: Myo Armband Gestures

2 Installation Guide

Requirements:

- Unity 2019.4.11f1.
- Myo Armband can also use keyboard.

Running the application:

- Clone the Github Repository
- Open Unity Hub
- Select add 2D project.
- Navigate to the /GestureBasedUIProject/Snake directory on your local machine.
- This will open the application on Unity.

3 Purpose of the application

The purpose of the application is to allow the user to experience a completely new method of control using the Myo Armband. Incorporating all five gestures available the application gives the user a more in-depth feel for

the game. The application can be used with keyboard and mouse or solely using the Myo Armband. Setup the Myo and Unity by following this guide [1].

3.1 Layout

This section will describe the rationale behind in game screens.

While running the application the user is brought to a home screen with the option to play the game. The home screen consists of: The Title, Play button, Record score and the current score. See Figure 2 for more detail.

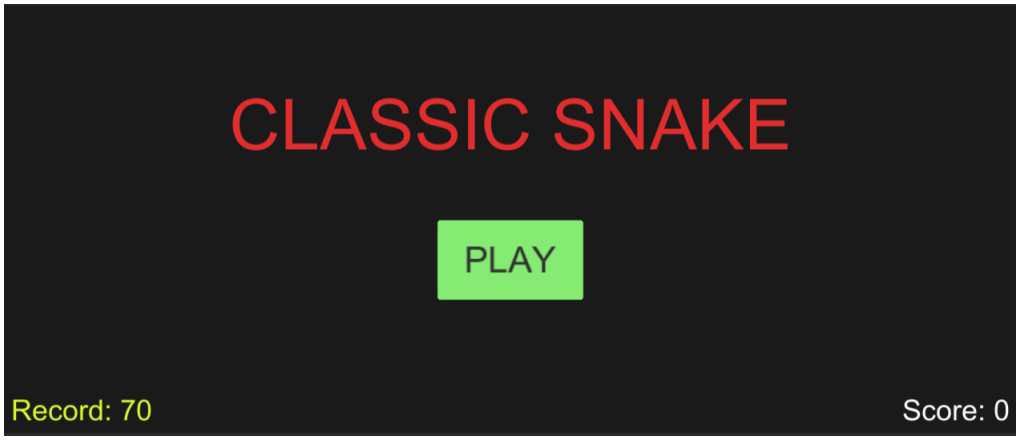

Figure 2: Home Screen

While in the game the user can use the Myo Armband that is connect via Bluetooth or the arrow keys to control the character. The objective of the game is to eat as mane purple squares without colliding with the walls or the character. The game becomes increasingly difficult when character eats more purple squares due to it growing for every square eaten. As seen in Figure 3, the character has increased in size from the beginning when it is only one square in size.

Figure 3: Gameplay Screen

4 Appropriate Gestures Identified

The Myo Armband had a lot of gestures that could be incorporated into this application but after testing I decided to only include four out seven available due to increased unreliability with certain gestures which I will discuss below.

The seven gestures that are made available with the Myo can be seen in Figure 4:

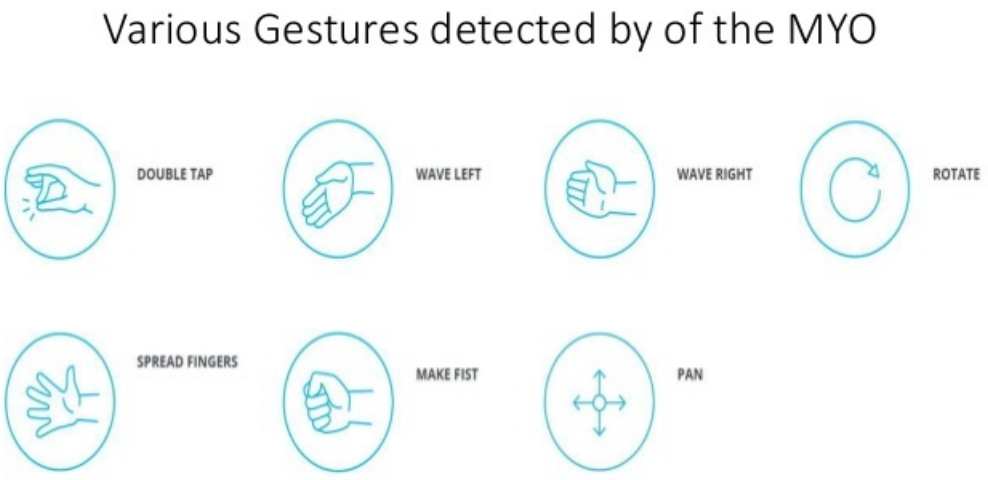

Figure 4: Gestures for the Myo Armband

Gestures Chosen and there functions:

Wave Right was picked due to the game having an option to control moving in the right direction, it was the most logical option. The user uses this gesture to turn the character in the right direction.

Wave Left was picked due to the game having an option to control moving in the left direction, it was the most logical option as well. The user uses this gesture to turn the character in the left direction.

The Fist gesture was given the objective to control the character in the down direction. The user uses this gesture to move the player in the downwards direction.

The Fingers Spread gesture was made to control the up movement of the character. The user uses this gesture to move the character in the upwards direction.

The Finger Tap gesture was not incorporated into the application due to it being very difficult and slow to register. After testing multiple times I had to rule it out because it would be difficult for the user to get the gesture to work all while playing a fast paced game.

The Rotate or Pan were not incorporated into the application because I did not see where these two gestures would work in this type of application.

Keyboard controls:

- Up Arrow - Moves the player up.

- Down Arrow - Moves the player down.
- Left Arrow - Moves the player to the left.
- Right Arrow - Moves the Player to the right.

5 Hardware used in creating the application

5.1 Myo Armband

The hardware I used in creating this application is the Myo Armband to maintain control of the application.

Figure 5: Myo Armband

6 Architecture

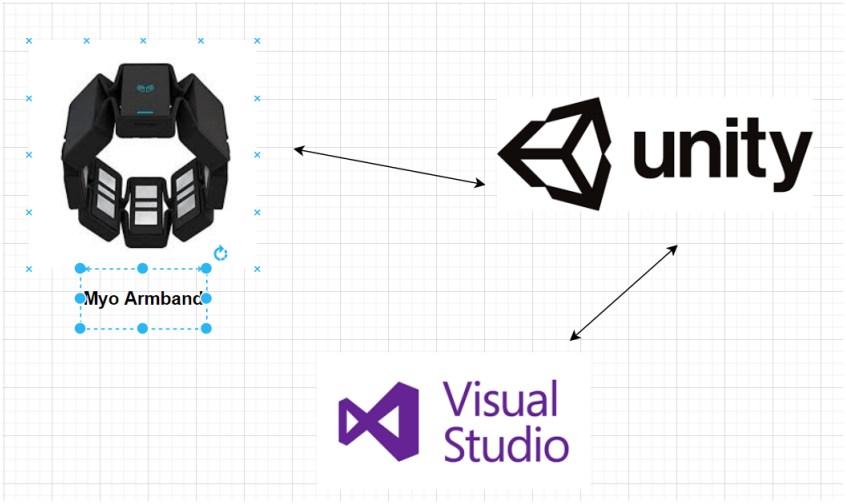

Figure 6: Architecture of application

Libraries Used:

- Myo Windows SDK

7 Conclusions Recommendation

Overall I am very happy with how the application turned out, I feel the lack of documentation for the Myo Armband due to it being discontinued made it more difficult to connect with different software. I have learned so much from completing this project such as having to connect a piece of hardware I had never used before to an application that I designed was very interesting.

References

[1] PAUL BERNHARDT. "Setting up the Myo Package in Unity". In: (). URL: https://developerblog.myo.com/setting-myo-package-unity/.

[2] NearLab. "Equipment". In: (). URL: https://nearlab.polimi.it/medical/equipment/.

[3] Wiki. "Snake". In: (). URL: https://en.wikipedia.org/wiki/Snake_(video_game_genre).