Mouse Mover

Dhruv Jain

Presentation Objective

The objectives for the presentation are these:

1. Provide documentation of your accomplishments in E96
2. Provide experience in technical presentation preparation
3. Provide documentation that you may use in describing your work in interviews for internships or undergraduate research opportunities.

Product Development Mission

- The aim of this project was to develop a working motion pattern recognition system that could be used to control a virtual mouse pointer.

- The system recognizes six different motion patterns and executes six different actions: moving left, right, up, and down, as well as left and right clicking.

- This system can be used as an assistive technology to enable people to use a computer in ways that may be easier for them.

Design Overview: Technical Challenges

- The main challenge that I faced was the two-way communication required between the SensorTile and the computer.

- The system had to listen to the SensorTile outputs and virtually control the mouse pointer accordingly.

Technical Approach for Sensor Data Acquisition

- My system takes input from the accelerometer for the first state and the gyroscope for the second state.

- Personally, while training the system, I used the second state to return to the base position and cross the max angle threshold, although it can be used in other ways.

- The following is a snippet from a switch case within Train_Orientation:

```
case 0:

    sprintf(msg1, "\r\nTrain mouse left movement on LED On");
    CDC_Fill_Buffer((uint8_t *) msg1, strlen(msg1));

    Feature_Extraction_State_0(handle, &ttt_1, &ttt_2, &ttt_3,
            &ttt_mag_scale);

    Feature_Extraction_State_1(handle_g, &ttt_1, &ttt_2, &ttt_3,
            &ttt_mag_scale);

    break;
```

Technical Approach for Feature Extraction

- The first feature state uses data from the accelerometer.

- The second feature state uses data from the gyroscope. If the SensorTile has not been moved for 4 seconds or if it crosses an angular threshold of 30 degrees, it will move on with training the next motion pattern.

IoT System Implementation

- I wrote a Python script to read from the serial port that the SensorTile was writing to and trigger the different mouse actions.

- I also needed to write my own system for reading the serial port data since I could not use a program like PuTTY at the same time as a custom script that was accessing the COM port.

- I used pyautogui (Python module) to control the mouse that should (theoretically) be platform-independent, although I have not tested this on any platform except Windows.

IoT System Demonstration

- YouTube Link: https://youtu.be/OnOPmhkEuQk

Future IoT Missions

- This project can be taken a lot further, allowing for more than just 6 hard-coded actions.

- Having worked on similar projects before as a hobby, the use of machine learning was new to me, and certainly has a place in most developing technologies going forward.