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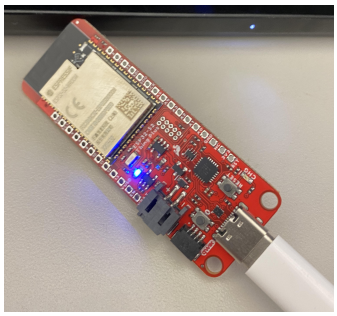
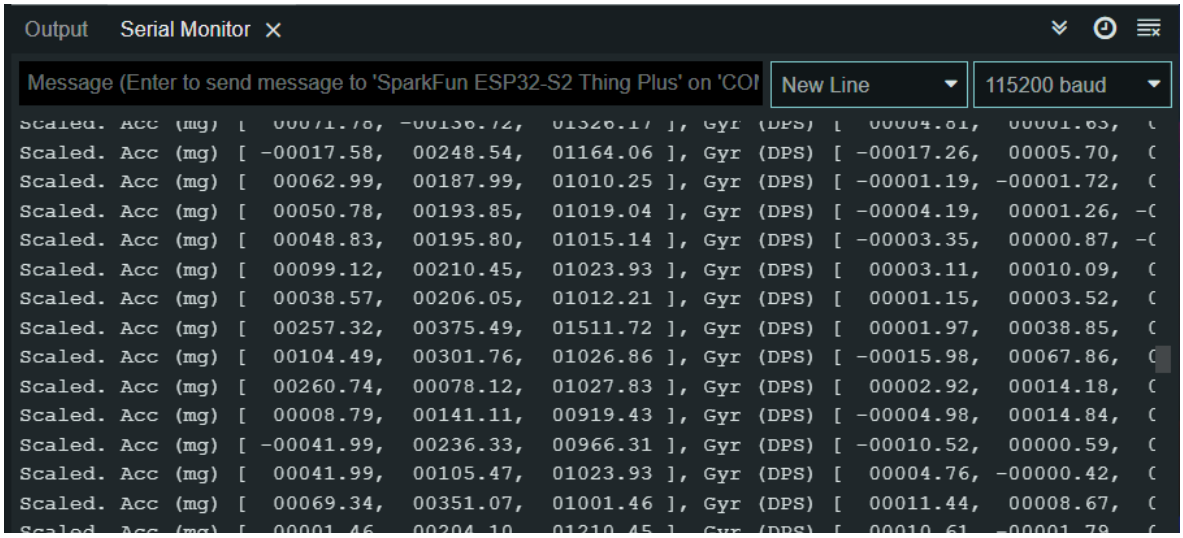
ECE 180D Lab 4 Writeup

Task 1:

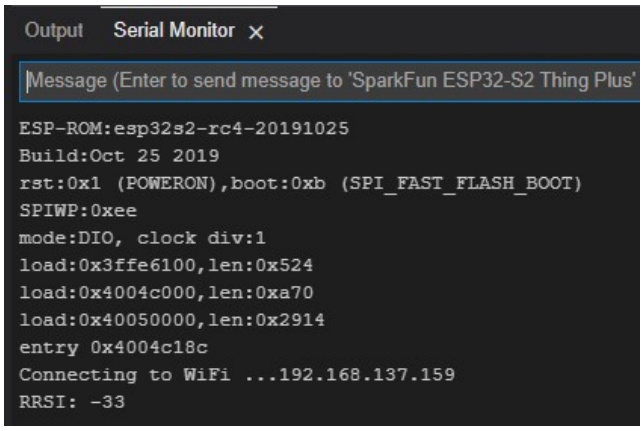
a.



b.



Task 2:



Task 3:

```
Received message: "b'386.71875'" on topic "ece180d/test" with QoS 0
Received message: "b'-65.91796'" on topic "ece180d/test" with QoS 0
Received message: "b'556.64062'" on topic "ece180d/test" with QoS 0
Received message: "b'227.53906'" on topic "ece180d/test" with QoS 0
Received message: "b'-445.8007'" on topic "ece180d/test" with QoS 0
Received message: "b'325.19531'" on topic "ece180d/test" with QoS 0
Received message: "b'-1041.992'" on topic "ece180d/test" with QoS 0
Received message: "b'445.80078'" on topic "ece180d/test" with QoS 0
Received message: "b'227.53906'" on topic "ece180d/test" with QoS 0
Received message: "b'445.80078'" on topic "ece180d/test" with QoS 0
Received message: "b'728.51562'" on topic "ece180d/test" with QoS 0
Received message: "b'1999.9389'" on topic "ece180d/test" with QoS 0
Received message: "b'1620.1171'" on topic "ece180d/test" with QoS 0
Received message: "b'451.66015'" on topic "ece180d/test" with QoS 0
Received message: "b'306.64062'" on topic "ece180d/test" with QoS 0
Received message: "b'-528.8085'" on topic "ece180d/test" with QoS 0
Received message: "b'693.84765'" on topic "ece180d/test" with QoS 0
Received message: "b'-290.0390'" on topic "ece180d/test" with QoS 0
Received message: "b'52.734375'" on topic "ece180d/test" with QoS 0
Received message: "b'72.265625'" on topic "ece180d/test" with QoS 0
Received message: "b'1487.7929'" on topic "ece180d/test" with QoS 0
Received message: "b'1009.2773'" on topic "ece180d/test" with QoS 0
Received message: "b'159.66796'" on topic "ece180d/test" with QoS 0
Received message: "b'1.464844'" on topic "ece180d/test" with QoS 0
```

Task 4:

1. From the data that is being constantly fed to the serial monitor from the IMU, we are able to see that the orientation matches the silkscreen on the IMU. Additionally, we can identify the axis facing down due to the acceleration from gravity. This is helpful for our project but can create problems down the line when we need to use acceleration to find velocity.
2. In addition to finding the acceleration of the IMU using gravity, we can also use the gyroscope to see the rate of rotation as well. One feature we could use would be classifying an idle state; this could be done by categorizing the gyroscope outputs to be close to 0 and having an unchanging acceleration value such that the derivative in each direction is approximately 0.
3. Here, I created a classifier for a Jab (moving forward on the X-axis) and a Pull Back (moving backward on the X-axis) motion. Here is a picture of the classifier output:

```
15:28:56.417 -> IDLE
15:28:56.459 -> IDLE
15:28:56.548 -> IDLE
15:28:56.596 -> IDLE
15:28:56.637 -> PUSH FORWARD DETECTED
15:28:56.681 -> PUSH FORWARD DETECTED
15:28:56.728 -> IDLE
15:28:56.776 -> IDLE
15:28:56.637 -> PULL BACK DETECTED
15:28:56.681 -> PULL BACK DETECTED
```

4. Unfortunately, I did not have time to finish this part of this lab, as it was time-consuming to define these motions and it was challenging to define a circular motion within the classifier. Going into our project, where we would inevitably have to define motions like these, I think I would need to define more helper classifiers for simpler motions, like up or down and left or right, to then define the circular motion classifier.