

ECE180DA : Lab 4 Report

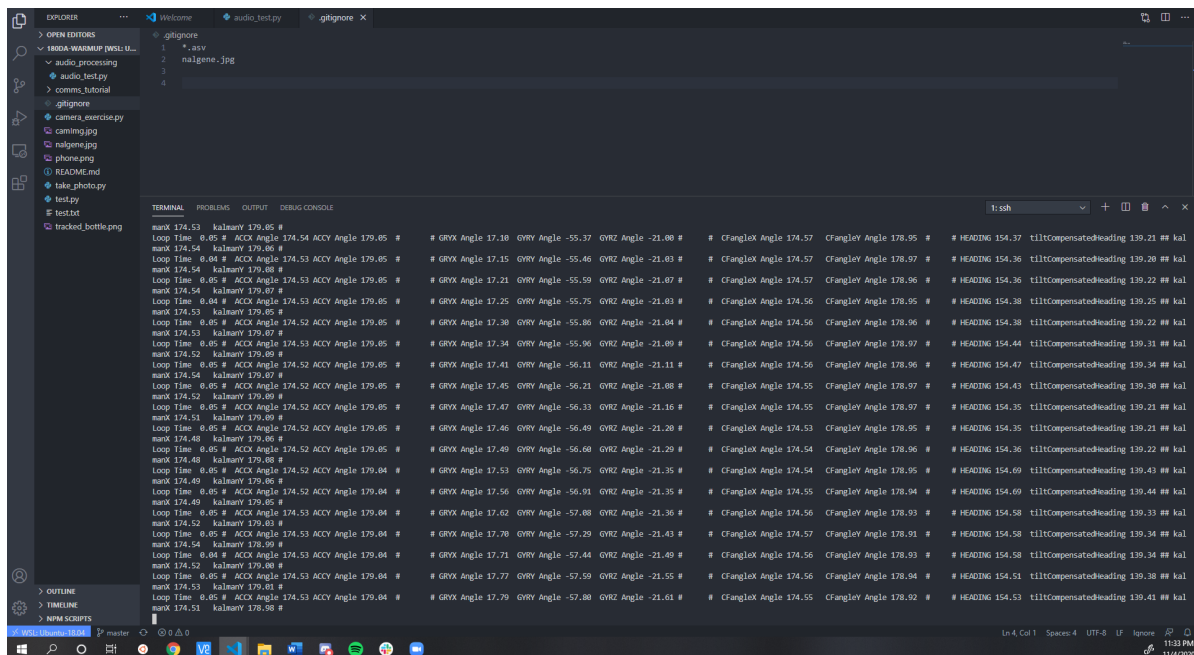
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Tasks Planned

- Complete IMU Tutorial
- Complete Midterm presentation and final project proposal
- Some reorganization of the github
- Hand tracker object

Tasks Completed

- IMU Tutorial completed
 - Ordered female to female cables for the IMU
 - Soldered header pins onto IMU (careful to not damage any of the traces nearby the pins)
 - Setup BerryIMU on the raspberry pi with all dependencies
 - Recorded data with the IMU following steps dictated, evidence below



The screenshot shows a terminal window on a Raspberry Pi with the following output:

```
mark 174.53 kalmanv 179.05 #
Loop Time 0.05 # ACX Angle 174.54 ACY Angle 179.05 # GRX Angle 17.30 GRY Angle -55.37 GYZ Angle -21.00 # CFangleX Angle 174.57 CFangleY Angle 178.95 # HEADING 154.37 tiltCompensatedHeading 139.21 ## kal
mark 174.54 kalmanv 179.06 #
Loop Time 0.04 # ACX Angle 174.53 ACY Angle 179.05 # GRX Angle 17.15 GRY Angle -55.46 GYZ Angle -21.03 # CFangleX Angle 174.57 CFangleY Angle 178.97 # HEADING 154.36 tiltCompensatedHeading 139.20 ## kal
mark 174.54 kalmanv 179.08 #
Loop Time 0.05 # ACX Angle 174.53 ACY Angle 179.05 # GRX Angle 17.21 GRY Angle -55.59 GYZ Angle -21.07 # CFangleX Angle 174.57 CFangleY Angle 178.96 # HEADING 154.36 tiltCompensatedHeading 139.22 ## kal
mark 174.54 kalmanv 179.07 #
Loop Time 0.04 # ACX Angle 174.53 ACY Angle 179.05 # GRX Angle 17.25 GRY Angle -55.75 GYZ Angle -21.03 # CFangleX Angle 174.56 CFangleY Angle 178.95 # HEADING 154.38 tiltCompensatedHeading 139.25 ## kal
mark 174.53 kalmanv 179.05 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.05 # GRX Angle 17.30 GRY Angle -55.86 GYZ Angle -21.04 # CFangleX Angle 174.56 CFangleY Angle 178.96 # HEADING 154.38 tiltCompensatedHeading 139.22 ## kal
mark 174.53 kalmanv 179.07 #
Loop Time 0.05 # ACX Angle 174.53 ACY Angle 179.05 # GRX Angle 17.34 GRY Angle -55.96 GYZ Angle -21.09 # CFangleX Angle 174.56 CFangleY Angle 178.97 # HEADING 154.44 tiltCompensatedHeading 139.31 ## kal
mark 174.52 kalmanv 179.09 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.05 # GRX Angle 17.41 GRY Angle -56.11 GYZ Angle -21.11 # CFangleX Angle 174.56 CFangleY Angle 178.96 # HEADING 154.47 tiltCompensatedHeading 139.34 ## kal
mark 174.54 kalmanv 179.07 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.05 # GRX Angle 17.45 GRY Angle -56.21 GYZ Angle -21.08 # CFangleX Angle 174.55 CFangleY Angle 178.97 # HEADING 154.43 tiltCompensatedHeading 139.30 ## kal
mark 174.52 kalmanv 179.09 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.05 # GRX Angle 17.47 GRY Angle -56.33 GYZ Angle -21.16 # CFangleX Angle 174.55 CFangleY Angle 178.97 # HEADING 154.35 tiltCompensatedHeading 139.21 ## kal
mark 174.51 kalmanv 179.09 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.05 # GRX Angle 17.46 GRY Angle -56.49 GYZ Angle -21.20 # CFangleX Angle 174.53 CFangleY Angle 178.95 # HEADING 154.35 tiltCompensatedHeading 139.21 ## kal
mark 174.48 kalmanv 179.06 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.05 # GRX Angle 17.49 GRY Angle -56.60 GYZ Angle -21.29 # CFangleX Angle 174.54 CFangleY Angle 178.96 # HEADING 154.36 tiltCompensatedHeading 139.22 ## kal
mark 174.48 kalmanv 179.08 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.04 # GRX Angle 17.53 GRY Angle -56.75 GYZ Angle -21.35 # CFangleX Angle 174.54 CFangleY Angle 178.95 # HEADING 154.69 tiltCompensatedHeading 139.43 ## kal
mark 174.49 kalmanv 179.06 #
Loop Time 0.05 # ACX Angle 174.52 ACY Angle 179.04 # GRX Angle 17.56 GRY Angle -56.91 GYZ Angle -21.35 # CFangleX Angle 174.55 CFangleY Angle 178.94 # HEADING 154.69 tiltCompensatedHeading 139.44 ## kal
mark 174.49 kalmanv 179.05 #
Loop Time 0.05 # ACX Angle 174.53 ACY Angle 179.04 # GRX Angle 17.62 GRY Angle -57.88 GYZ Angle -21.36 # CFangleX Angle 174.56 CFangleY Angle 178.93 # HEADING 154.58 tiltCompensatedHeading 139.33 ## kal
mark 174.52 kalmanv 179.03 #
Loop Time 0.05 # ACX Angle 174.53 ACY Angle 179.04 # GRX Angle 17.70 GRY Angle -57.29 GYZ Angle -21.43 # CFangleX Angle 174.57 CFangleY Angle 178.91 # HEADING 154.58 tiltCompensatedHeading 139.34 ## kal
mark 174.54 kalmanv 178.99 #
Loop Time 0.04 # ACX Angle 174.53 ACY Angle 179.04 # GRX Angle 17.71 GRY Angle -57.44 GYZ Angle -21.49 # CFangleX Angle 174.56 CFangleY Angle 178.93 # HEADING 154.58 tiltCompensatedHeading 139.34 ## kal
mark 174.52 kalmanv 179.00 #
Loop Time 0.05 # ACX Angle 174.53 ACY Angle 179.04 # GRX Angle 17.77 GRY Angle -57.59 GYZ Angle -21.55 # CFangleX Angle 174.56 CFangleY Angle 178.94 # HEADING 154.51 tiltCompensatedHeading 139.30 ## kal
mark 174.53 kalmanv 179.01 #
Loop Time 0.05 # ACX Angle 174.53 ACY Angle 179.04 # GRX Angle 17.79 GRY Angle -57.80 GYZ Angle -21.61 # CFangleX Angle 174.55 CFangleY Angle 178.92 # HEADING 154.53 tiltCompensatedHeading 139.41 ## kal
mark 174.51 kalmanv 178.98 #
```

Figure 1: IMU Data Recording

- Played around with thresholding values to determine between two classes of movements
- Planned out design for a more robust classifier
 - * Record data on a sliding window (seems like 20 samples is reasonable given a 1 second window)
 - * create labeled training set of various gestures (and garbage movements as well)

- * use cvxpy and soft SVM to create decision boundaries for multiclass classification (either one v one or one v all)
 - * can train on randomly error prone data aswell to increase robustness
 - * actual interproduct should execute quite quickly
- Completed midterm presentation with team, discusses moving more in the direction of creating a virtual desktop (upon which the apps can be run on and act more as stretch goals)
 - As midterm presentation helps to refine final project presentation these have been complementary tasks (the above task)
 - created rough API for hand tracker (ensuring can interface well with Nico's image processing functions)

Future Direction

- complete implementation of hand tracker
- write general script for training classifiers for our gesture recognition (and I suppose whatever else we would be inclined to classify)
 - go ML!
- make a do.sh script to handle linting with set of paramaters (not necessary rn just nice)
- start some preliminary integration depending on progress of others