

PROGRAMMING ASSIGNMENT 2 - SOLUTIONS

1. source code for counting steps in walk-shoe.csv.

Ans: submitted in a different file. (p1.py)

2. compiling and running instructions for P1

Ans: Submitted in a different file. (Readme-p1)

3. source code for counting steps in walk-pocket.csv.

Ans: submitted in a different file. (p2.py)

4. compiling and running instructions for P2

Ans: Submitted in a different file. (Readme-p2)

5. Describe in detail what approach/algorithm have you implemented for step counting. Refer to P1 and P2 source codes and explain how your code implements your algorithm. For example, if you are using peak detection algorithm, point to segments of codes in P1 and P2 showing its implementation.

Explain what changes (if any) you had to make in your algorithm/implementation for counting steps in “walk-shoe.csv” and “walk-pocket.csv”

Ans: I have used “Peak Detection” algorithm for counting steps in my source code.

-Initial steps in the source code are the preprocessing steps. For preprocessing I have considered going with moving average with a window size of 0.3s. The code calculates window size by finding the index at which list reaches 300ms or any number near it by looking at the data given. Then the window size is used to calculate moving average on entire data to create a smoother data without noise.

-The second part of the code is about applying step counting algorithm. I have considered using “Peak Detection” algorithm for counting steps. According to the preprocessed data, A window size is selected, and non-overlapping windows are used to check for a peak value which is greater than the threshold. If such a value exists in the window, then it is considered as one step. In this way the entire data is analyzed, and steps are calculated.

-In p1, the method “preprocess” is the one doing all preprocessing steps and the method “stepCount” is the method doing all the peak detection. Line 26 determines the window size for implementing moving average using a window of 0.3s. Lines 28,29 and 30 calculate the average of the entire data. Lines 31 to 33 calculate average of first window and lines 34 to 37 calculate the moving average for the entire data. Line 38 calls the method for counting steps. Lines 16 and 17 are used to find the max value in the window and lines 18 and 19 check if the value is greater than the threshold value and increment the number of steps.

-p2 is similar to p1 except for the window calculation the nearest time to 0.3s is different based on the readings and the graph plot.

6. Gyroscope Readings

- a. How many turns does the user take during the walk? How do you determine if there is a turn using the trace?

Ans: The user takes 2 turns during the walk. A turn can be determined by looking at the trace of all the axes of the gyroscope and finding a spike in positive or negative direction. We see that there are 2 instances in the data where there is a sudden spike in the gyroscope readings on Y-Axis and Z-Axis. One of them is in negative direction and other is in positive direction. This means that there are 2 turns taken in the trace.

- b. List the exact times when the turn event happen.

Ans: The first turn starts happening at: **21,078ms**

The second turn starts happening at: **38,817ms**

7. Interference

- a. Are there any instances of magnetic interference in the trace?

Ans: Yes, there are instances of magnetic interference in the trace.

- b. If so, how many?

Ans: There are **2** clearly visible instances in the trace where magnetic interference happens.

- c. How do you figure out that there is magnetic interference using the trace?

Ans: If we look at the trace there are instances where heading direction values change suddenly for a short amount of time, but these are not reflected in the Gyroscope readings. This means that there has been interference in the sensor.

- d. List the exact times when the magnetic interference events happen.

Ans: The first interference starts happening at : **13,279ms** since there is significant difference in the heading direction readings.

The second interference starts happening at : **30,157ms** since there is significant difference in the heading direction readings.