

ECE/CS 498 Programming Assignment 2: Computing Moving Direction using Sensing on Smartphones Due 3rd April 2019 (11:59pm)

1 Objective

Computing the walking trajectory of a user using smartphone sensors (e.g., accelerometer, compass, gyroscope, barometer, etc.), and using this trajectory to collect location-based ambiance information.

1.1 Stage 1: Computing walking trajectory

From your first assignment, you already have an application that counts steps. Now, as a first step, translate the step count into physical displacement by multiplying step-count with the length of each step (you can manually measure the step-length). Then, extend the application to also continuously detect the users direction of walking (use gyroscope if necessary). Combining displacement and direction gives you the trajectory of the user.

For evaluation, you would need demo your application to the TAs. You are allowed to hold the phone in any way that best suits your application. During walking, your application needs to display the following values continuously.

- The total distance traveled from the starting point. For example, for the trajectory shown in Figure 1, the correct answer is 100 units at the final position and 70 units at point P1.
- The total rotation in degrees from the starting point. For example, for the trajectory shown in Figure 1, the correct answer is 630 degrees at the final position and 360 degrees at point P1 (before turning at P1).

Your submission will be evaluated based on the accuracy of the above two values.

1.2 Stage 2: Collecting location based ambiance data

In the second stage of the assignment, collect the following sensor readings from your smartphone by walking along the corridors of the first floor in CSL: magnetometer, light, sound, WiFi, compass, gyroscope, accelerometer. Your walking pattern in CSL should be as shown in Figure 2 you should enter through the main entrance, go forward, take a right turn into the south wing corridors, walk the rectangle and go into the north wing, walk the north wing corridors, and then come back to where you started. Once you have this data, your goal is to visualize how the compass of the phone was affected by the environment. For this, plot the measured compass reading along the corridors, as well as the direction, for different times during the walk (i.e., the X axis of this graph should be time and the Y axis should vary from 0 to 360). You can ask the TA for the true compass direction of the corridors, if needed.

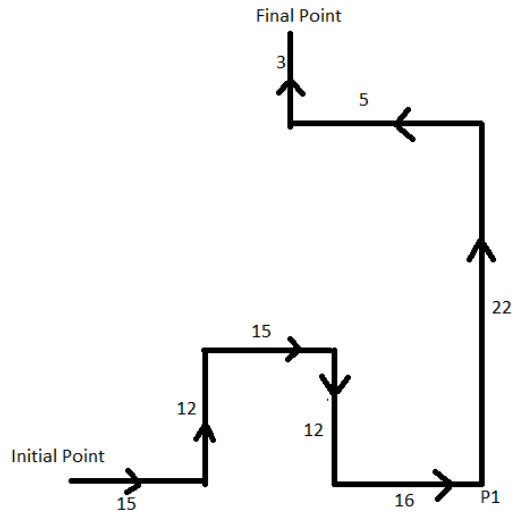


Figure 1: Walking Example

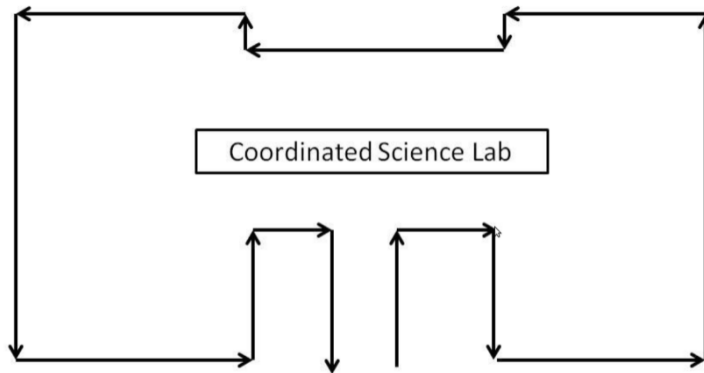


Figure 2: Walking pattern in CSL

2 Submission Guideline

Each group will submit one set of the following documents:

- The trajectory application.
- A graph whose X axis contains timestamp and Y axis will represent the compass reading. There will be 2 curves on this graph: one showing the true compass reading and another the measured compass reading.
- One CSV file with all the sensor readings collected for stage 2 of the assignment. The file name should be in the following format: `< username1 username2 > < date > < time > PA2.csv`
- A text file which will contain the name of the group member who walked for the second experiment, his/her step size (approx.) and his/her walking speed during the walk (how many steps taken in 10 seconds).
- All submissions should be made on compass.