

Assignment #1 (CS 407)

This assignment should be done in groups --- the same group as your class project. So each group should submit one printed answer sheet.

For this assignment you are given two data sets. Both datasets contain gyroscope and accelerometer data. There will be columns in the datasets which you will not use. The datasets were collected by placing a phone face up on a cart. The cart was then pushed along a path. This path involved only straight line movement, stopping, and sharp turns (turns were not curved, this means the cart had to come completely to rest before the turn was executed). As the data is real-world data, it is a good idea to divide the data into chunks. For example you may want to look at the gyroscope data to tell you when the cart was turning, when it was being pushed, and when it is stopped (none of these things happen simultaneously).

Part 1: Right Turn Data

The path taken by the cart in this dataset is as follows:

1. Cart starts from rest
2. Cart is pushed a distance **X** and brought to rest
3. Cart is turned 90 degrees to the right (from the perspective of the person pushing the cart) and then brought to rest
4. Cart is again pushed a distance **X** again and brought to rest

Your goal is to determine the value of **X** (total distance traversed by the cart is **2*X**). You will essentially need to double integrate the acceleration data. I recommend computing the change in velocity between each pair of acceleration points, using this data to compute the average velocity over this range (remember cart starts from rest), and then integrating the velocity data to determine position moved. You will have two parts of this data set to compute **X**, so you should be able to double check yourself (don't worry if the numbers don't match exactly, this is real-world data).

Report the value of **X** in meters

Hint: **X** is somewhere between 0 and 10 meters.

Part 2: Multiple Turn Dataset

For this part it is you will determine the path taken by the data set. You can assume the cart is pushed the same distance **Y** between turns (the distance actually varies in the data). What you should list for this part is the path taken by the cart. The only ways the cart can move are:

1. Push cart distance **Y**
2. Turn 45 degrees right/left (from perspective of person pushing cart)
3. Turn 90 degrees right/left (from perspective of person pushing cart)

Here is an example of how you should report your path:

1. Cart pushed distance **Y**
2. Cart turned 90 degrees left
3. Cart pushed distance **Y**
4. Cart turned 45 degrees right
5. Cart pushed distance **Y**

Hint: There are 4 turns in this path

What to submit:

You should submit as a printed report the following: What is the likely paths taken that lead to the two traces described above and a detailed explanation as to how you arrived at your answer, including copy of code/scripts that you wrote to arrive at them.