

Smart Phone Sensing: Report - 1

Bhavya Jain (4745507), Konrad Kleeberger(4748476)

February 26, 2018

Group - CCS; Phone - OnePlus 5; Android Version - 8.0.0; API - 26

1 Abstract

This is intermediate report for localization application to be developed for the course IN4254. This work uses the concept of Received Signal Strength to determine the location of the user. Further, Accelerometer is used to determine whether user is walking or not. For each process, multiple samples of data were collected and data was trained based on these.

2 Method

The data was saved and read using the output and input streams. The data was saved in "csv" format and was transferred to our systems. It was then processed using MS Excel and transformed into required format and added to application files on the phone.

For Location Detection the Wireless-Sensor had been used, it is accessible via the Wifi-Manager within Android. For the assignment we filtered the obtained Signals based on the SSID for 'eduroam' as this network is stable within the observed environment and will not change significantly. The method used for localization was a Range with minimum and maximum Strength of a cell. This was decided after studying sample data and it was observed that for each cell, signal strength variation was always in a certain range and different than the signal strength observed in other cell. To agree on a range we took multiple samples of each cell and processed it manually on the computer with Excel to identify the actual range.

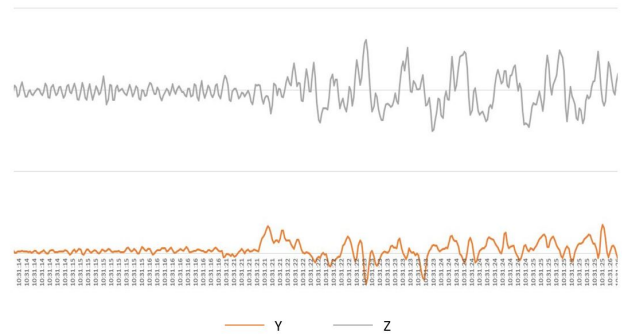
During the process for detecting the current cell on the mobile phone, the current values of the Wifi-Signals are compared with the ranges of the wifi access points and counted. The cell with the highest occurrence of wifi access points win and will be elected as location.

The Accelerometer was used for the Activity Detection. Only the Y-Axes and Z-Axes have been considered to determine the user activity, in this case, walking or standing. Data was recorded using the application and charts were plotted in MS Excel to observe patterns and determine suitable window.

¹<https://github.com/SmartPhoneSensingDelft>

3 Evaluation Setup

Figure 1: Part of Sample Data - Standing then Walking



The data for the Location Detection was recorded on the ground floor of the library. The size of the cells was around 3 by 3 meters. The range table of the signal strength is based on 5 samples by each cell. Verification of the result was done by going to each cell and pressing the localization button on the phone.

Multiple different data samples has been used for the Activity Detection in multiple and single sessions were used to determine suitable window. Sample size ranged from 5 seconds of activity to over three minutes in a single session by 2 participants. Based on these, the window size was determined to be 650ms. Mean of Y and Z axis values was calculated for each window. For detection of activity, application records user activity for 4 seconds and then the mean of Y and Z axis values is compared with the training data mean values to determine if user is walking.

4 Analysis of Results

For location detection, 15 tests were carried out, 5 for each of 3 cells. Correct cell was located in 12 cases or with 80% success. For activity detection, 10 tests were carried out to determine if the user is walking. Application was able to successfully determine user activity in 8 cases.

5 Helpful Links

Our app is based on the provided examples for the class. Especially Example 2 and 4. ¹

