Indoor Tracker

CSE465 Mobile Computing (Fall 2019)

Code submission deadline: 2019-11-22 23:59

Demo day: 2019-11-26 (in class)

Introduction

Indoor localization refers to tracking objects in an indoor environment. As the Global Positioning System (GPS) is not suitable for high-accuracy indoor localization, indoor localization has been an active research area for many years. Many localization techniques have been proposed including range-based algorithms, range-free algorithms and fingerprinting.

Figure 1: Indoor tracker apps.

In this project, you will build an Android application for indoor tracker in E106 2nd floor by using various technologies and sensors such as accelerometer, gyroscope, compass, AP information of Wi-Fi and so on. There are requirements should be followed. Your application will be evaluated on demo day at E106 2nd floor holding device in your hands by yourself.

Background

- **Fingerprinting**: Fingerprinting is to compare the present signal strength received from multiple Wi-Fi access points (AP) with the Wi-Fi signal strength vectors recorded in candidate positions. As in figure 2, you can collect the AP signal strengths and compare these strength values to your current signal strength to estimate your position.

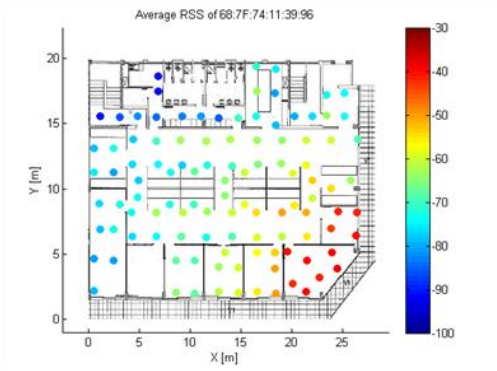

Figure 2: Coverage of a WLAN AP with the locations where the signal is strong (red), moderate (green) or weak (blue).

- ***Moving distance estimation***: To draw your path on the map, you should estimate the distance of how much you move and convert the distance to pixel values for matching the real estimated distance and distance of the map. For estimating the moving distance, you can consider counting the number of steps and estimate step length from sensor data as in figure 3.

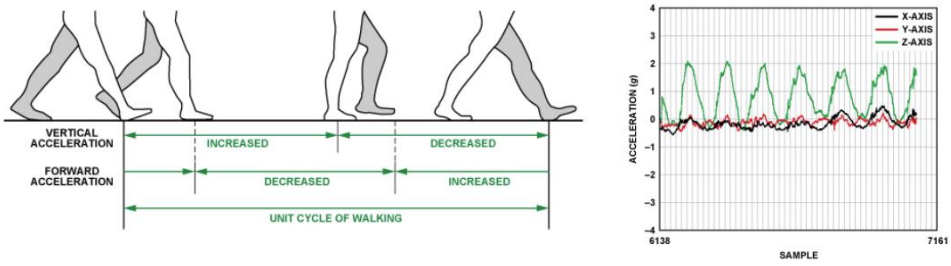

Figure 3: Walking stages and acceleration pattern.

- ***Wall blocking & Map-matching***: Another thing you should consider for indoor trackers is that *'going through wall'* situations. To compensate those unrealistic events, you can process the floor map to narrow down the walkable area from the entire floor map, stopping at the wall or bend the motion to be inside the walls.

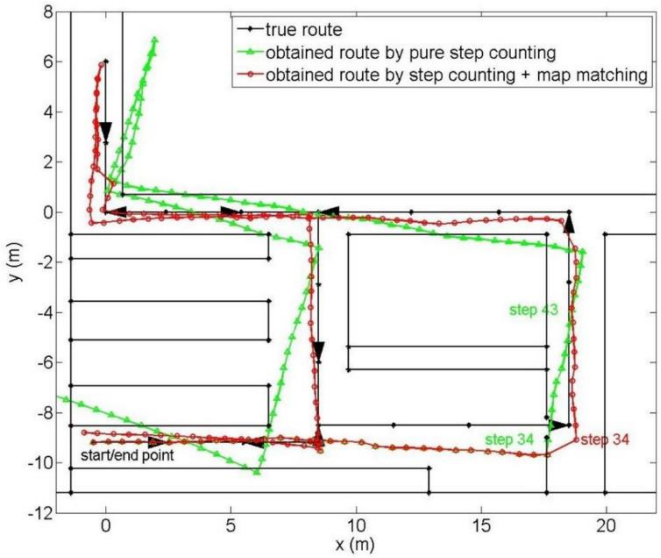

Figure 4: An example of wall consideration.

Goal

The goal of this project is building an Android application for indoor tracker in E106 2nd floor. Your application should identify start position with localization techniques (e.g., fingerprinting). Then, as in figure 1, your application should show your current position marker on the map and draw your moving path by connecting position markers with considering the background. Note that your moving path draw on your map should avoid *'going through wall'* situations.

In summary, your application should follow the below requirements.

- Draw indoor map image on your application.
- Identify your start position with localization techniques. (e.g., fingerprinting)
- Draw moving path on the map.

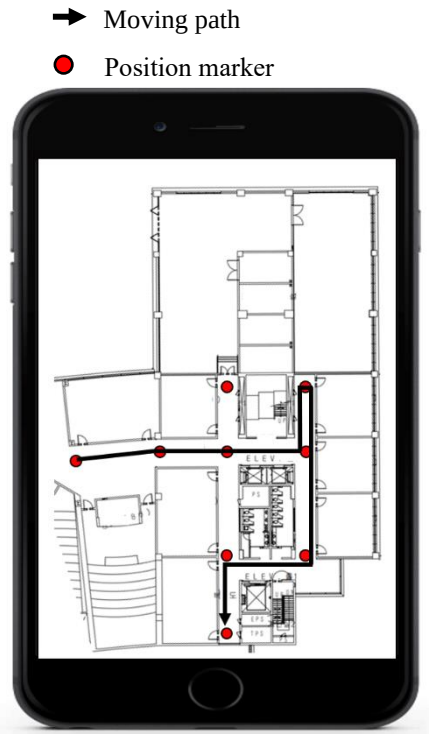

Figure 5: Sample screenshot.

Compensation Algorithm (*Extra Points*)

There may exist various compensation algorithms for achieving better accuracy. Suppose that L_t is an estimated position of a user at time step t. After x time steps from time step t, you can obtain $x+1$ sequential estimated positions $L_t, L_{t+1}, \cdots L_{t+x}$. Then, you can utilize these sequential estimated positions for compensating the estimated position L_t at time step x.

In this project, if you build an algorithm for compensation of your estimated moving path, you will get extra points. To get extra points, as you can see in figure 5, you should build a button for compensation. When you push this button after moving, your algorithm will compensate your estimated moving path more correctly as in figure 5.

In evaluation, if you implement compensation algorithm and it corrects your estimated moving path more correctly, you will get extra points in this project.

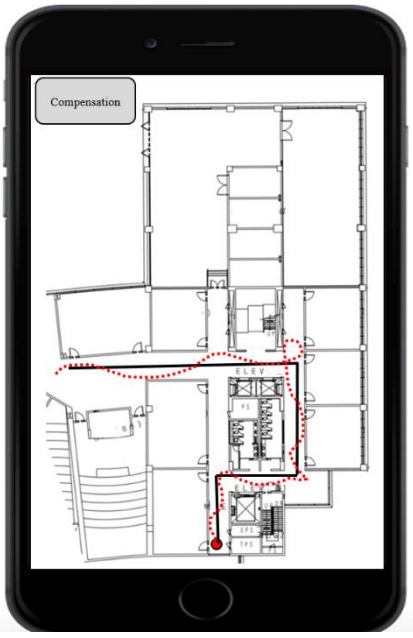

Figure 6: Example of compensation.

Evaluation

Your application will be evaluated on demo day at E106 2nd floor by yourself. Your start position will be ***randomly chosen*** by TA. In evaluation, you will walk around 2nd floor of E106 holding your device in your hand. TA will evaluate the below criteria. On demo day, you will come to classroom at E106 (specific classroom number will be announced later) not our classroom.

- Whether your application identifies start position correctly or not.
- Whether your application draws your moving path correctly or not.

Grading Policy

- Identification of start position: 30 %
- Drawing moving path correctly: 70 %
- Implementing compensation algorithm: 20% (extra points)

Submission

- Compress your Android project directory which includes source code to *.zip* file.
- Send email to kmbin@unist.ac.kr.
- Please name your *.zip* file below format (20xxxxxx is your student id).
- **[CSE465 20xxxxxx_project2].zip**