CSE 489/589 Mobile Systems and Applications

Spring 2022

Lab 3 (100 pts)

Due on midnight of Thursday, Apr. 14, 2022

Wi-Fi Localization

The goal of this lab is to implement a localization algorithm based on Wi-Fi RSSI measurements.

The experiment was conducted in a room with 3 Wi-Fi access points (their locations are known) as shown in Fig. 1. The RSSI measurements from all 3 access points (APs) at a number of unique locations in the room were taken in the offline phase for fingerprinting, as well as the phone's orientation when the measurement was taken. The collected data is stored in the file "offline.csv". The file has five columns (x, y, alpha, SSID, RSSI), where alpha is provided in degrees, RSSI is provided in decibels, and SSID is the unique identifier of an access point.

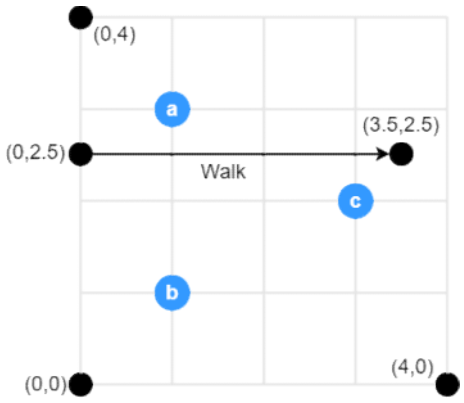

Fig. 1 Experiment Setting

In the online phase, a user in the room walks along a straight line (e.g the walk shown in Fig, 1). Given the RSSI measurements collected by this user's smartphone and the Wi-Fi fingerprints collected during the off-line phase, the task of lab is to find the beginning and end locations of the user's walk.

A python skeleton code (lab3.py) is provided to you which you should implement your Wi-Fi localization algorithm in the "wifi_localization()" function. Clustering algorithms such as KNN can be used here (read reference paper [1]). The coordinates of each AP are provided in the file "ap_locations.csv" which are also shown in Fig. 1. You can use the location information of APs to improve the localization performance.

To help you test your algorithm, data collected from a sample walk in the online phase is provided in the file "walk.csv", which has three columns (SSID, Time, RSSI). The ground truth of the walk is shown in Fig. 1.

In the skeleton code, a function "evaluate()" is provided to calculate the direction deviation and location deviation from the ground truth. Your grade of this lab is based on the errors (see the evaluate() function). Since your algorithm will be tested with another walk, you should not over-fit your algorithm to the provided walk data.

In addition to the python code, you need to write a report to document your localization algorithm, explain the rationale behind your algorithm, and the evaluation of your algorithm. Please use IEEE format to write your report.

Submission:

A Zip file including 1) python source code lab3_lastname.py (with appropriate comments), and 2) your report. Name the zipped file with your last name (lab3_lastname.zip, **replace lastname with your last name**) and upload it through Canvas.

Reference:

[1] RADAR: an in-building RF-based user location and tracking system, IEEE INFOCOM 2000.