Overview

Introduction

Indoor Localization is a technique which allows us to predict the location of mobile devices in indoor environments. This technique has become very popular in recent years and has been widely used in indoor rescue, indoor route navigation, and many other aspects. There are many methods to perform indoor localization. Scene analysis is the most popular method among all methods. In order to successfully perform scene analysis method, researchers need to implement both offline stage and online stage in the environment where indoor localization is performed. In offline stage, researchers use mobile devices to collect fingerprint (usually tuples of signal strength) while in online stage researchers can predict the location of mobile device by comparing the fingerprint with the collected fingerprint. Only if mobile device used in offline stage and online stage is the same kind, the accuracy of location prediction is guaranteed. The conclusion of this project has the potential for practical application in improving the accuracy of prediction when different kinds of mobile devices are used in offline stage and online stage.

Objective

The objective of this project is to find the difference between different smartphone sensors. To be more specific, the difference between smartphone sensors of Xiaomi Mi 3W, Motorola XT1052 and Samsung Galaxy Nexus. By doing this, researchers will be able to predict one of the three phone's offline fingerprint to the other phone's online fingerprint. Thus, the accuracy of location prediction for these three kind of phones will be improved. With further experiment, researchers may be able to apply this conclusion into more smartphones to further improve the localization method.

Methodology

We chose Xiaomi Mi 3W, Motorola XT1052 and Samsung Galaxy Nexus to perform data collection. And we chose 4 locations in academic building to collect data of signal strength. These four locations is indicated in the figure below.

For each of the three phones, we collect 100 samples of data at each location. Every sample consists all WIFI access points collected and the signal strength of them.

We process these data in Matlab and found the following: there are 139 access points in total, the maximum value of signal strength is -28 dBm and the minimum value is -94 dBm.

We count the distribution of signal strength for every combination of phone, location and access point. Then we fit a Weibull curve to every distribution we got. We analysis these Weibull curve and try to acquire the difference between different smartphone sensors. Main method we used here is plotting figure and visually comparing them.

Result and Conclusion

We plot the comparison figure and do the analysis for all three phones. Here we display the result of it between Xiaomi Mi 3W and Motorola XT1052. The first plot is the signal strength's mean (with absolute value) of Xiaomi (y-axis) versus it of Motorola (x-axis). The second plot is the standard derivation. We conclude that the first plot can be approximate to a straight line. While the second plot indicates most of the distributions have similar standard derivation. So the relationship between Xiaomi and Motorola is a linear relationship and we can predict one phone from the other.