IN4254 Assignment 1

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Introduction

This assignment is to design an android application which can recognize locations of the user in Figure 1 with the implementation of Bayes filters. The android application is implemented on **HUAWEI ANE-AL00 (Android 8.0.0, API 26)**. Hang Ji develops the offline evaluation with Python on the computer side. Zhao Yin develops the online evaluation with Java on the smart phone side.
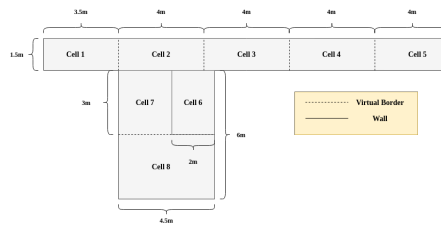

Figure 1: The layout of cells to be detected

Data Collection

The data is collected at a sampling rate of **5 times per minute**. The sampling time per cell is **5 minutes**. The samples are gathered handling the phone **in different directions**. The number of APs is **12**. We collect the data for training and testing **three times a day**. The layout is shown in Figure 1.

Data Processing

The APs which belong to temporal access points such as mobile phones are removed. In this project, the RSS values are not filtered. The reason is that the access points have a high density and the RSS values are collected at different time periods in a day with quadrant sampling method.

Sample Radio Maps

The pmf distributions of RSS for Cell 7 and Cell 8 are similar. The reason is that there is no actual border between Cell 7 and Cell 8. The pmf distributions of RSS for Cell 8 and Cell 5 are different. The reason is that there is an actual border between Cell 8 and Cell 5 and the distance between the two cells is relatively large.
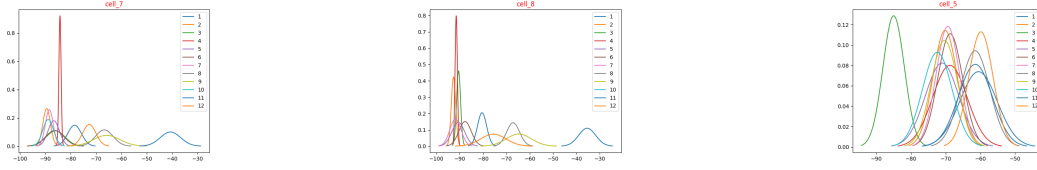
(a) pmf of RSS for cell 7   (b) pmf of RSS for cell 8   (c) pmf of RSS for cell 5

Figure 2: similar and different pmf of RSS

Evaluation

The serial approach for iterative Bayes process is adopted in this project. **Five numbers of tries** are used for update the final localization result. The confusion matrices of offline evaluation and online evaluation are shown in Figure 3. The online evaluation evaluates the accuracy of **10 attempts per cell**. The UI is shown in Figure 4. The detected cell turns green while others turn white.
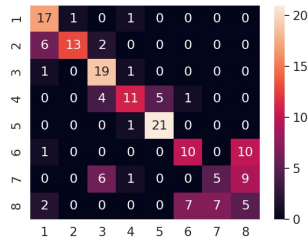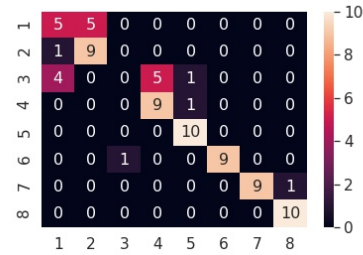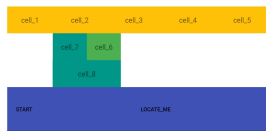

(a) offline evaluation   (b) online evaluation

Figure 3: confusion matrices for evaluation

(a) ui before localization   (b) ui after localization

Figure 4: UI

Discussion

The novelty of this assignment is that it applies Gaussian models for RSS values per APs instead of radio maps. It efficiently reduces the usage of memory. The difficulty of this assignment is that cells with virtual borders are difficult to distinguish during localization.