Assignment Report

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Development environment

IDE: Android Studio Electric Eel // 2022.1.1

Language: JAVA

JDK: Android Studio default JDK (JetBrain Runtime version 11.0.15)

Gradle: 7.5

Device: LG Q8

Android Version: 8.0.0(Android Oreo)

Implementation Details

1. Upload image

   Using image view, the app shows the image from the gallery of device.

2. Wardriving mode

   When you are in the wardriving mode with tapping the button, there will be a blue marker at the position where you tapped on the image view. After deciding the position to scan by moving the marker, you can scan the AP (Access point) signals at the current position. If you scan, the app shows the result of scanning and asks whether save the result or not. To save the result, you can tap "yes" button, then the app will save the available AP's BSSID and each signal level. Saved positions are marked as red markers. It saves the results with a hash map, which takes the positions as its keys, and the hash map with BSSID as key and signal level as value as its value. After saving more than or equal to 10 positions and its AP scan result, the app can enter the localization mode.

   Figure 1 Saved scan result structure in wardriving mode.

3. Localization

   In localizing, it scans AP signals at current position, and computes and shows the current position with a green marker constantly.

   - Localization Process.

     Using the scan result at the current position, for each value of the hash map the which is the result of wardriving mode, it searches whether there exists the available AP at the current position in the value. If exists, it adds a value of the level difference from that AP between current scan result and data in hash map to a distance vector. By computing minimum value of (Norm of the distance vector) / (Dimension of the distance vector), it finds the position of which value is the most similar with current AP scan result. With this position, using handler, it shows the current position on the screen.
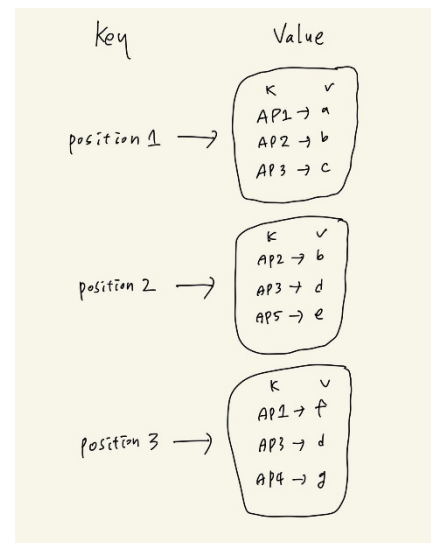
Experiment Result

As videos show, it works quite well. It means that my application finds my current location well. Although I cannot find the way to represent the accuracy numerically, I can compare the accuracy of the experiment result conducted in 1st floor and 2nd floor. The accuracy of the 2nd floor was higher than 1st floor. I will explain why in below as mentioning the limitations of this work.

My application has some limitations.

1. Period of AP scanning

   The period of AP scanning in Android wifimanager is about 5seconds. I try to reduce, but I couldn't. Because of this, after moving my location, I should wait some seconds to see the changed position through the screen of my device.

2. Similar AP patterns

   Of course, it is not good at distinguishing the points which have similar AP scan result. The two points nothing in between, will have similar result, because there is no obstacle to attenuating the AP signals. I think this is the reason that the accuracy of the 2nd floor was higher than 1st floor. Compare to 2nd floor, there was less sections which are divided by the building structure like the wall.