Automatic System Upgrade for Indoor Localization Applications

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Overview

Indoor positioning systems were first introduced in the early 1990s. The purpose of these systems is to locate or track objects in indoor areas where the Global Positioning System cannot normally operate due to the signal coverage of satellites. The difference between indoor positioning systems and the Global Positioning System is that the former provides positioning service in outdoor area by using radio waves, magnetic fields or sensor information, while the latter provides positioning services in indoor areas by using satellites to transmit positioning information.

The Android application built by last year’s project group can locate the user and display the user’s location on a smartphone screen. There is a database which stores the Wi-Fi signal data that the application can access without internet access. However, the drawback of this approach is that the Android application and Wi-Fi signal data are difficult to manage. It is because the Wi-Fi signal data will be changed if the system has some changes on Wi-Fi network structure. The database file has to be kept up to date. Therefore, the database file always need to be updated. Although there is an update version of database, the users have to download the database file themselves manually and put it in specific location. The application does not have the function of informing users to update their database file. It is not a good practice that the application expects the users to do some operations by themselves before use the application until it is user friendly enough. In our project, we build a server which can update Android devices’ database files automatically. No longer need to update the users to download and locate the database file by themselves. It’s much convenient than the previous approach.

Besides, we implement server side localization functions to increase the feasibility and reliability of indoor localization system. The Android application can only be used as android platform. For the devices running on other operating system or MWCs, they cannot use the indoor localization system. To provide localization function to these devices, server side localization function is the solution to solve the problem. The devices only need Wi-Fi access to the server, the server can provide location information to base devices. The indoor localization system no longer only serves Android users but also all other users.

System Block Diagram

Project Task

1. Implement server program (serial line interface).
2. Implement server-client communication (file streaming and text message) through socket programming.
3. Implement Update Android devices’ database functions.
4. Implement server side indoor localization function by extract localization location from Android application and put it in server side.
5. Implement data statistic functions.
6. Analyze localization algorithm.

Result

We have finished the project tasks and the performance of data processing comparison between server and android clients. The result is shown as follow: