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Development and Integration of an Indoor Localisation System using Multiple Technologies in Android Platform.

ABSTRACT - Masterthesis

The Indoor Localization and navigation have always been the holy grail for location based services makers. As cell phones and other portable devices are getting smarter today, savvy enough to tell you where you are and where to go especially in the places like airports, shopping malls, universities etc. The need for precise indoor based localization services becomes inevitable. Satellite based location technologies, like GPS work superbly in outdoor environment under open sky, where signal bounced from different satellites to receivers on the ground are unrestrained. In in-door spaces or urban canyons with street cutting through dense blocks of high-rise buildings and structures GPS fails to deliver accurate localization data.

Other techniques and technologies that are used for localization, such as WiFi, GSM, Bluetooth and QR-code has their own specific properties and advantages, and of course disadvantages. One of the common disadvantages of many existing localiza-tion systems is the need for dedicated devices and proprietary infrastructure. A lot of research has been done focusing an obtaining a very high localization accuracy with special dedicated hardware. However, more and more people use portable devices which contain an increasing number of internal sensors. This thesis focuses on de-veloping and demonstrating a sensor fusion algorithm, which uses commonly used portable devices. Sensors like Wifi, GPS, GSM, Bluetooth and QR-code (uses camera sensor) are combined with other internal sensors of the device. A Kalman filter is used to imperceptible fuse the heterogeneous sensor data.

Google Maps API version 2 is used to locate user in outdoor environment. For indoor localization several other technologies like, WiFi-fingerprinting, QR-codes are used to find the current location of the users. With the help of a calibration tool (Wifislam) a database has been created containing WiFi signal strengths of all the access points inside the first floor of MZH building. Several QR-codes containing location informa-tion were deployed inside the MZH building. After scanning one QR-code the position inside the building will be fused with the WiFi-fingerprints in the database, to make the position as accurate as possible, with this sensor fusion an accuracy of five meter was calculated.

An Android application, which shows user current location inside the building on indoor map has been developed. Keeping in mind that the goals of this thesis are imperceptible sensor fusion with a good accuracy and additionally to that an easy-to-use user interface in the application.