Technische Universität München
Chair for Network Architectures and Services
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Master's thesis

MOBILE DEVICE LOCALIZATION
A PROVIDER'S PERSPECTIVE

Motivation

Modern mobile devices usually have GPS functionality for satellite-based positioning. Localization is often supported by supplemental techniques such as assisted GPS, WiFi-based localization or cellular tracking.

However, GPS is only available in open spaces and even with network assistance (A-GPS) can take many seconds before calculating an accurate fix. WiFi localization is only applicable in urban areas, where WiFi APs are extensively available. Cellular localization is very fast and available in (nearly) all areas, however it usually lacks the localization accuracy compared to WiFi and especially GPS positioning.

Your tasks

The goal of this thesis is the improvement of the cellular network localization capabilities. For that, you will draw on productive data sets given by a large mobile phone carrier. These data sets also include antenna parameters like orientation and angle of radiation.

Evaluating the data
In a first step your task is to cross-check the data sets with measurement data stemming from the *measrdroid* framework developed at our chair. This data set can be used as a ground truth and comprises more than a million GPS positions and cell measurements, mostly obtained in the greater area of Munich.

Developing the localization mechanism
In a next step your task is to develop a localization mechanism on a server within the measrdroid framework. This mechanism should be able to use either the measrdroid or cellular data sets for its localization functionality. The localization request itself will originate from a cell phone, delivering cell and neighboring cell information.
The goal is to achieve a fairly accurate localization using your developed algorithm (in urban areas <100m, in rural areas <500m).

.msg systems

The Master's thesis will be co-supervised by *msg systems*. A temporary employment as a paid student trainee with *msg systems* is intended. Non-disclosure agreements will be requested for provider-internal data sets.

Requirements

- Independent work style and explorative nature
- Willingness to cooperate with industrial partner
- Programming experience (Python)
- Background knowledge on computer networks and mobile technology

Keywords

Mobile positioning, GPS, cellular networks, data analysis