A Platform for the Evaluation of Fingerprint Positioning Algorithms on Android Smartphones

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Goals and Contributions
- Build an open Android smartphone platform for positioning and tracking inside buildings
- Integrate two efficient positioning algorithms, RBF\(^1\) and SNAP\(^2\), developed in-house
- Evaluate the performance of several fingerprint-based positioning algorithms in terms of:
  - **Execution Time**: Measure the average time required in practice to perform positioning on smartphones
  - **Positioning Accuracy**: Calculate the mean positioning error pertaining to a test dataset
  - **Power Consumption**: Investigate the actual battery depletion during positioning with the PowerTutor\(^3\) utility

### Positioning System Architecture
**Mobile-based Network-assisted architecture**
- **Low communication overhead**: Avoids uploading the observed RSS fingerprint to the positioning server for estimating location.
- **User privacy & security**: Location is estimated by the user and not by the positioning server.

**Positioning scenario**
1. A User enters an indoor environment, featuring WiFi APs.
2. His smartphone obtains the RSS radiomap and parameters from the local distribution server in a single communication round.
3. The client positions itself independently using only local knowledge and without revealing its personal state.

### Experimental Evaluation @ KIOS Center
**Measurement Setup**
- **560\(^2\)**, 9 WiFi APs
- **105 reference locations**
- **Train Data**: 105 reference locations, 4200 fingerprints (40 per location)
- **Test Data**: 96 locations, 1920 fingerprints (20 per location)

**Features**
- Constructs and distributes the radiomap and algorithm parameters to the clients
- Parses all RSS log files and merges them in a single radiomap that contains the mean RSS value fingerprint per location
- Selects and fine-tunes algorithm-specific parameters iteratively by using validation RSS data

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