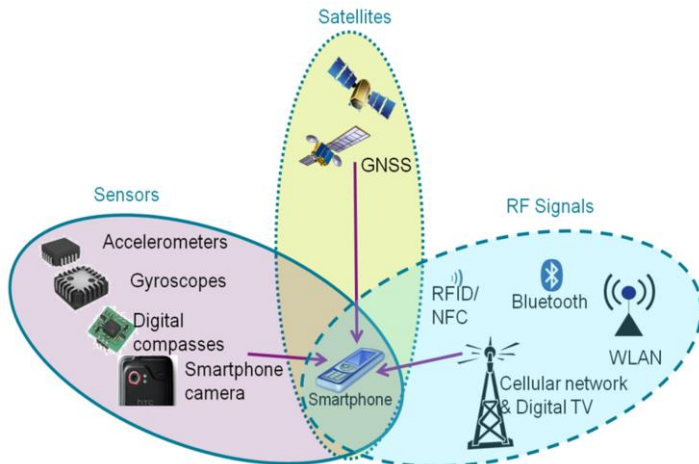


Smartphone-based dm-level positioning



Pei et al. (2013)

Background information

“Where are you?” is the question that has been researched in the navigation and positioning fields for many decades. However, when making use of smartphones, the answer might be not trivial and their accuracy far from precise positioning applications. Three principal families of positioning solutions currently exist: satellite-based, sensors-based and RF signals-based.

Since May 2016, **raw GNSS data** has been made available on Android devices, along with other sensors (i.e. accelerometers, gyroscope & magnetometer). In September 2017, dual-frequency capabilities were also enabled, extending smartphones interest for medium/high-accuracy positioning. Only in 2020, almost 1000 research papers have been published on the topic, and in some cases cm-level accuracy was achieved in static conditions. When looking at dynamical tests, the dm-level remains a challenge.

Data availability

In December 2020, Google has released 39 datasets, relatively to different Android devices, as collected in San Francisco Bay Area, (California, US). In each one, raw GNSS data is available, along with other sensors and ground truth reference acquired in vehicle dynamical tests. These provide indeed a valuable opportunity to investigate Android real data positioning performances, so further pushing down the limits in smartphone-based positioning.

Description of tasks

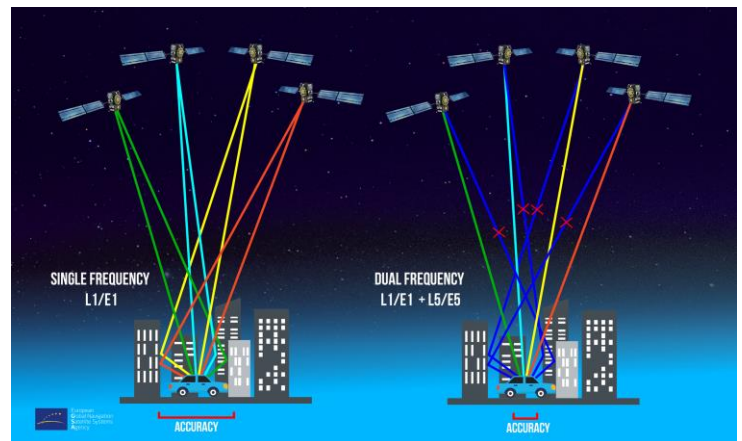
The candidate will initially perform a concise literature study on raw GNSS & sensors measurements available in recent Android devices. In a first phase, additional raw GNSS data being retrieved from static tests over a geodetic pillar might be considered, such to experiment with GNSS dual-frequency positioning.

The research objective is to exploit the availability of GNSS and additional sensors data in the best way possible to enhance the positioning accuracy of a few different devices in dynamical test conditions. This investigation should also provide a comparison between a GNSS-only and a GNSS+Sensors configuration, thus evaluating with real data to what extent those sensors can support the GNSS precise point positioning (PPP).

In a more advance stage, the candidate might consider whether additional sensors can also enhance integer ambiguity resolution capabilities, e.g. by performing a formal analysis on success rate and the expected improvements in precision within the positioning domain. At the end, main current limitations shall be delineated and recommendations for future research shall be provided.

Requirements

The candidate shall have very good programming skills (MATLAB or Python), and sufficient knowledge of fundamental principles for the GNSS data processing and user positioning algorithms.



Courtesy of EUSPA (2020)

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