



Doctoral Thesis Title: Residual error mitigation in GNSS precise positioning in smartphone and mass-market sensors.

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Abstract:

The development of low-cost GNSS chips has generated a revolution in services based on positioning, navigation, and synchronization, which has generated an emerging market for the use and exploitation of services for millions of users who depend on location-based applications. Initially, the only specific devices capable of providing centimeter or even millimeter level accuracies were geodetic equipment, which due to the quality of construction and protection against interference avoid the deterioration of the satellite signal received, to date most smartphones incorporate a GNSS chip in its architecture, however access to raw data was inaccessible and since the announcement of the release and access to GNSS information, the development of positioning techniques by developers increased considerably.

The Android operating system uses programming interfaces (APIs) as communication tools and collection of protocols that allow users to access the system's functionalities, in the case of GNSS, APIs allow the extraction of clock data, observables and localized ephemeris inside the Android.location API. This tool is available as well as the source code for the extraction and direct conversion of the raw data to RTCM or Rinex format. It should be considered that only some devices can provide navigation data, it all depends on the architecture of the GNSS chip and the antenna if they support L1, L1 / L2 and multi-constellation.

The correction of errors on the GNSS signal is essential to increase the degree of precision in the final position, previous works have shown that the implementation of algorithms where GNSS observations are combined allows to eliminate common errors. To achieve high-precision positioning on smartphones or low-cost sensors, the precise positioning technique (PPP) provides centimeter-accurate positioning solutions using all available GNSS constellations, combining precise orbits and clocks of the satellites in conjunction with non-observables. differentiated, dual frequency, pseudo range and carrier phase without the need for a base station.

A proposal is proposed that encompasses the study and analysis of the PPP technique and the creation of algorithms that increase positioning accuracy using smartphones and low-cost sensors with GNSS data extraction tools and APIs for information processing.

Available Means: API's, Smartphones, mass-market sensors, Data processing programs. Programming languages for Apps. Departamento de Ingeniería Cartografía y Fotogrametría

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