Method for the determination of satellite correction for precise-point-positioning

Reference No: B77131

CHALLENGE

Precise-Point-Positioning (PPP) for satellite navigation systems is an attractive localization method because it does not require any raw measurements from a reference station and it offers a high accuracy in the determination of the position. However, it requires satellite position and clock corrections, atmospheric corrections and satellite phase and code biases with a total error of at most few centimeters.

INNOVATION

The present innovation consists of a method the determination of satellite correctrions for PPP. The method is based on **grouping the reference stations into clusters to exploit the common satellite visibility** within each cluster **and the integer property of the differential ambiguities** affecting the differential measurements. A reference satellite is also chosen for each regional cluster. First, **single-cluster solutions are performed,** in which the state vector is determined through the following steps:

- **Mapping** of the clock offset of the cluster's reference satellite to receiver clock offsets;
- **Mapping** of the phase bias of the reference receiver to the satellite phase biases;
- **Mapping** of the ambiguities of the reference receiver to the satellite phase biases;
- **Mapping** of the ambiguities of the reference satellite to the receiver phase biases.

Second, **a multi-cluster solution is performed,** in which the state vector estimates for the clusters are combined by an optimized least-square adjustment.

COMMERCIAL OPPORTUNITIES

The present invention can be suitably implemented in a software for GPS-based real-time positioning and navigation. This implementation **does not require any change in the hardware component neither of the base stations nor of the satellites.** The proposed method provides the following advantages:

- A parameter mapping is used, which exploits the integer property of ambiguities both within each cluster and between different clusters and, thereby, enables a **faster convergence of the satellite corrections.**
- **A user can freely choose the type of processing for determining its position,** either by combining measurements or by forming differences of measurements with measurements of a reference base station.
- The application of the method is **not limited to dual frequency measurements,** but supports also GPS, Galileo, Glonass and Beidou with three or more frequencies.

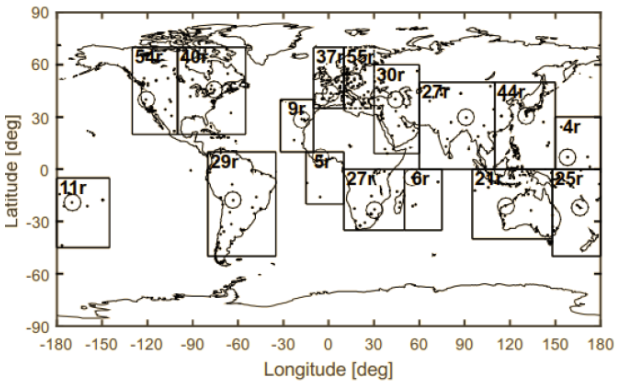

Figure: Map of IGS stations with 16 clusters. The number of receivers per cluster is provided in the upper left corner of each cluster. The reference receiver of each cluster is additionally highlighted.

REFERENCE:

1 P. Henkel et al.; „Satellite Phase Bias Esitmation with Global Networks and High-Dimentional Integer Ambiguity Fixing"

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