Improvement of GNSS Positioning Accuracy Under Urban Environment by Multipath Mitigation Methods

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SUMMARY

Accuracy of GNSS positioning is easily degraded under severe conditions such as urban streets surroundings due to the blockage of the signals from GNSS satellites by tall buildings. Multipath effect, which is one of the causes of GNSS positioning accuracy degradation, is a known phenomenon that occurs in the urban area. In order to improve accuracy of the GNSS positioning under such environments, we developed three methods for multipath mitigation by employing three promising techniques from previous studies: (1) application of a cutoff mask model that is produced from the distribution data of obstacles in the urban area, which cause the blockage of GNSS signals. The distribution at each site is identified from photos over the sky (e.g. fish-eye lens photo), and the elevation cutoff mask model for each site is individually produced and applied to eliminate the multipath signals. (2) consistency check of L1 and L2 Doppler observables. If the observation data contain noises such as multipath, the L1 and L2 Doppler observables become inconsistent. Once inconsistency between the L1 and L2 Doppler observables is detected, the data are rejected as bad observations. (3) application of another cutoff mask model produced from the distribution of the buildings that is identified from 3D maps. These three methods enable observers to select proper satellites more certainly and perform more accurate positioning by identifying the low quality observation data to be rejected. In this presentation, the effect of these methods are mainly reported.
