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MULTIPATH DETECTION AND LOCATION METHODOLOGY FOR GROUND BASED AUGMENTATION SYSTEMS

Abstract

Multipath is a phenomenon that accounts for a dominant source of error in precise global positioning. In dynamic environments such as large and complex airports, it changes rapidly so it is difficult to detect, predict, or control. It is complicated to mitigate the multipath by models, because it strongly depends on the local environment, the influence of a given signal and receiver parameters, and moving reflective surfaces. The automatic identification of multipath and localization of the sources are expected to exclude hardware problems, reduce on-site inspections, and provide support for antenna siting assessments. Within this research, two ray-tracing models for simulation of Global Navigation Satellite System (GNSS) signals reception at airports were developed. For each satellite, the algorithms determine whether the signal has arrived at the receiver through a direct path or after multiple reflections. Furthermore, the algorithms are able to estimate the number of multipath reflections and the coordinates of the reflection points within the 3D environment model. The reference scenarios are using simulated and field measurement data against which the multipath location models are validated including multipath caused by a construction site or maintenance vehicles on the ground. They are especially designed to efficiently install, maintain, and operate the Ground Based Augmentation Systems (GBAS) system at large and complex airports and support the GBAS siting activities.