Regional Network Augmented Real-Time Precise Point Positioning For Instantaneous Ambiguity Resolution

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Recent development of integer ambiguity resolution for Precise Point Positioning (PPP) can significantly shorten its initialization time and improve its accuracy. However, it still needs approximate 15 minutes to achieve reliable fixed solutions, which prevents PPP for a large number of applications. In this contribution, a new strategy is developed to augment the current global PPP service with regional networks for instantaneous ambiguity resolution, so that PPP can achieve similar performance as the Network Real-Time Kinematic (NRTK).

Based on the fixed ambiguities of a regional reference network, precise zero-differenced corrections for L1 and L2, which include not only atmospheric delays but also the remaining biases in the orbits and clocks used, are derived precisely for the regional bias representation. The corrections are disseminated to users on the station base in the same way as the IGS stream data via NTRIP. The reference stations are selected automatically according to their distribution and the current user position. After applying the interpolated corrections to the user observations, instantaneous ambiguity resolution can be achieved with the user PPP software.

The new strategy is presented in detail including ambiguity resolution of the regional reference network, the generation and dissemination of the L1 and L2 corrections and their receiving and applying at the user side.

The new strategy works for both cases with and without precise information of a global precise positioning service system. The former one is the augmentation of the global PPP and the latter one is actually a new NRTK method. Both are validated experimentally. The derived and interpolated corrections are investigated. The ambiguity fixing performance and the resulting position accuracy are assessed. The validation confirms that the new strategy can provide a service comparable to NRTK. Therefore, with the new strategy PPP and NRTK can be integrated into a seamless positioning service with an accuracy of about 10 centimeters anywhere, and of a few centimeters with regional augmentation.