Ambiguity resolution and validation in Precise Pseudolite Postioning

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ABSTRACT

Global Navigation Satellite Systems (GNSS) based positioning technology is vulnerable in a wide range of environments such as indoors or in urban canyons. Even with high sensitivity GNSS receivers, positioning results are far from being reliable. Therefore, pseudo-satellites or pseudolites, based positioning technology can be an extremely useful complement in such environments. Similar to the GNSS positioning, for precise pseudolite positioning, carrier phase measurements must be taken into consideration. Consequently, carrier phase integer ambiguity resolution and validation issues need to be emphasized.

In this contribution, with double differenced static and kinematic pseudolite data, ambiguity resolution and validation issues for pseudolite positioning are analysed. An overview of current pseudolite positioning technologies is presented at first, and then the parameter estimation procedures by least-squares are introduced. The geometric information of the pseudolites is discussed. To search for the best integer candidates, the efficient LAMBDA method, which is based on the integer least-squares, is utilized. Providing the integer candidates in hand, ambiguity validation procedures are conducted to validate the resolved integer ambiguity. With the validated integer ambiguities, an online stochastic model is implemented to improve the final accuracy. It has been shown that the double differenced pseudolite positioning technology can achieve a centimetre even a few millimetre accuracy.

KEYWORDS: Pseudolite positioning, Ambiguity resolution, Ambiguity validation