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Implementation of Moving-Base-GNSS in NAVKA Multisensor GNSS/MEMS/Optics Navigation Algorithms and Systems

Introduction

GNSS is the technology that allows us to position ourselves on the surface land. From observations to satellites, you can obtain the coordinates of a point on the surface. The basis of GNSS is to obtain the position of the satellites, that is, to obtain their coordinates in a reference system, in order to be able to calculate, from said coordinates, the position of the receiver.

The present investigation deals with the Implementation of Moving-Base-GNSS in NAVKA Multisensor GNSS/MEMS/Optics Navigation Algorithms and Systems. The main objective is to develop and improve a series of algorithms that allow obtaining better results in different platforms with GNSS sensors.

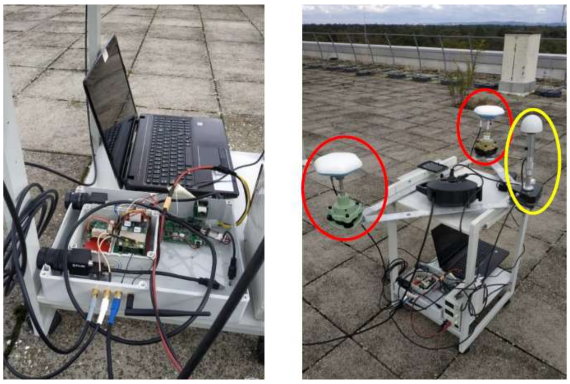

Figure 1: Test platform configuration.

Algorithm "MC - LAMBDA"

GNSS carrier phase ambiguity resolution is the key for precise relative positioning solutions. For these applications, a frame of GNSS antennas is firmly mounted onboard the platform, at known relative positions.

MC-LAMBDA allows to resolve ambiguities by incorporating restrictions which requires a non-trivial modification of the LAMBDA method.

The function that should be minimized when applying the ILS principle is modified with respect to the unrestricted case, which makes the whole procedure more complex.

Implementation

A series of functions and routines have been implemented in C++ and subsequently integrated into the RTKLIB open source library, in order to obtain ambiguity resolution for the Moving Base mode using the MC-LAMBDA algorithm.

The calculation of the coordinates of the rover from the coordinates of the master receiver has been improved taking into account that the master receiver is in motion together with the rover, and therefore, Python software has been developed that allows, from the coordinates of the master receiver, previously calculated with RTKLIB (DGNSS, PPPK) and the lines base between the rover and the master receiver, calculated with the MCLAMBDA routine, calculate the final coordinates of the rover in the e-frame.

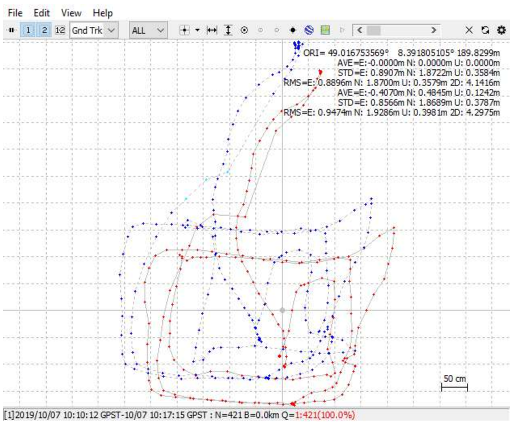

Figure 2: Ublox and antenna 2 Novatel trajectory.

Finally, a test with an Ublox and a Novatel dual-antenna sensors was performed with the objective of evaluating the developed algorithms. In the previous figure it can be seen the result of the trajectory of the rovers through the resolution of MC-LAMBDA and with the master receiver in DGNSS.

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