Multi-constellation GNSS data processing using the MAFA method

MSc Eng Dawid Łukasz Kwaśniak

Abstract

The main research objective of this study is to develop a mathematical model of MAFA (*Modified Ambiguity Function Approach*) to enable determining the inter-system bias. Four research tasks were set: (I) to modify and to test the mathematical model and MAFA algorithms which enable estimation of the inter-system bias and to modify the search area of MAFA; (II) to quantify the inter-system bias and to compare the estimation results obtained by the MAFA and LAMBDA methods; (III) to analyse the stability of the inter-system bias over time and (IV) to assess the impact of the inter-system bias on the computation process and the impact of using the parameter as a constant in computation. Observations of the GPS (*Global Positioning System*) and Galileo were used to accomplish these tasks. The main thesis of the paper, which can be verified by accomplishing the main study objective, is: developing the MAFA mathematical model will allow for estimation of the inter-system bias without having to link this parameter to the ambiguities of the phase measurement.

The findings and the analyses show that it is possible to develop the MAFA to enable determination of the inter-system bias. However, this parameter does not have to be linked to the ambiguity of the phase measurement, as is the case in methods based on solving ambiguities. This can help to make satellite observation processing more effective.

Key words: *GPS, Galileo, GNSS, ISB, inter-system bias, MAFA method*