

Description for the general public

The *Global Navigation Satellite Systems* (GNSS) have become standard measurement sensors in the modern geodesy and navigation. In recent years, dynamic increase of the overall number of satellites available, the modernization and continuous improvement of their functioning, and the modernization of the ground-based augmentation services have allowed to determine a GNSS receiver's position accuracy at centimeter-level. However, the broadening possibility of the use of GNSS navigation for the applications with the high accuracy and reliability level is required, especially for safety-critical applications (e.g landing procedure in aviation). Studies on position determination have particular importance for high dynamic vehicles (kinematic solution), where the number of available observables is usually very limited.

In the proposed draft the scientific activity will concern the enhancement of the mathematical models for the kinematic positioning, and especially its stochastic models. The stochastic model represents the noise characteristics of the GNSS observations and the relationship between them (correlations). The precise definition of the model is a necessary condition for accurate and reliable position solution. However, the individual character of the quality of observations and their dependency on both the measuring equipment used and the conditions of observation have introduced several difficulties in the methodology of the definition of the stochastic models in the field of satellite geodesy and navigation.

The planned research activities will primarily focus on the definition of individual stochastic model (in the terms of observational environment and positioning application) for a given set of measurements. Existing methods for the definition of stochastic models will be examined. Furthermore, a new methodology and algorithms for specific purposes: instantaneous positioning, positioning in the presence of strong ionospheric disturbances and positioning with the use of integrated navigation systems for the definition of stochastic models will be developed. Moreover, a new methodology for the validation of GNSS receivers in the terms of the evaluation the reliability of the measurements will be elaborated.

The performed studies will contribute to the development of the satellite techniques used for precise positioning. They will increase the accuracy and reliability of the solution, broadening the applicability for the purpose of the safety-critical applications, where the reliability and precision become critical issues.