



High-rate RTK and PPP multi-GNSS positioning for small-scale dynamic displacements monitoring

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The monitoring of dynamic displacements and deformations of engineering structures such as buildings, towers and bridges is of great interest due to several practical and theoretical reasons. The most important is to provide information required for safe maintenance of the constructions.

High temporal resolution and precision of GNSS observations predestine this technology to be applied to most demanding application in terms of accuracy, availability and reliability. GNSS technique supported by appropriate processing methodology may meet the specific demands and requirements of ground and structures monitoring. Thus, high-rate multi-GNSS signals may be used as reliable source of information on dynamic displacements of ground and engineering structures, also in real time applications.

In this study we present initial results of application of precise relative GNSS positioning for detection of small scale (cm level) high temporal resolution dynamic displacements. Methodology and algorithms applied in self-developed software allowing for relative positioning using high-rate dual-frequency phase and pseudorange GPS+Galileo observations are also given. Additionally, an approach was also made to use the Precise Point Positioning technique to such application. In the experiment were used the observations obtained from high-rate (20 Hz) geodetic receivers. The dynamic displacements were simulated using specially constructed device moving GNSS antenna with dedicated amplitude and frequency. The obtained results indicate on possibility of detection of dynamic displacements of the GNSS antenna even at the level of few millimetres using both relative and Precise Point Positioning techniques after suitable signals processing.