

GNSS Quality Control

Background

Today, several Global Navigation Satellite Systems (GNSS) are available. These are the American GPS, the Russian GLONASS, the European Galileo and the Chinese Beidou. Users on the earth surface can receive signals from on the order of 40 satellite simultaneously and use these e.g. for positioning, navigation and time transfer. Depending on the type of receiver used, single frequency or multi frequency signals can be used. For any GNSS users it is important to know how reliable the GNSS are, both for scientific and every-day applications in society. But in particular for real-time applications with rather low-cost single frequency receiving equipment for positioning and navigation, the GNSS quality is very important. Therefore, quality control of GNSS in terms of so-called key performance indicators (KPI) is necessary. Such KPI include e.g. the quality of the broadcast orbits, the quality of simple models for tropospheric and ionospheric effects, and the to be expected positioning accuracy. The analysis of GNSS data received at reference stations of land surveying institutions can give access to such KPI and thus allow monitoring the quality of GNSS.

Task description

You will use the open source GNSS analysis software RTKLIB and extend it by corresponding processing modules to determine GNSS KPI. The KPIs shall be determined for all four systems, i.e. GPS, GLONASS, Galileo and Beidou. To do so, data from several stations in the Swedish GNSS network SWEPOS shall be analysed. Corresponding KPI-reports shall be derived with RTKLIB in an automatic, or at least semi-automatic, way. The KPIs of main interest include e.g. the so-called Signal-in-Space-Error (SISE), the User-Equipment-Error (UEE), the User-Equivalent-Range-Error (UERE), the Signal-to-Noise-Ratio (SNR), as well as point positioning accuracy and the accuracy of tropospheric and ionospheric models. The KPI shall be evaluated for all available GNSS frequencies, in single and/or combined use.

Required education and potential course requirements

You should have a solid background in programming, in particular C and C++, and be familiar with both Windows and Linux computer environments. Prior experience in GNSS and corresponding GNSS data processing is of great advantage.

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