

Real-time Quality Control Monitoring for the GPS coordinates

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This paper examines the application of the Statistical Process Control for monitoring the quality of GPS-coordinate time series in real time. Quality control is constrained to monitoring the location (i.e., mean value) and scale (i.e., accuracy) of the available data in one-dimension.

The detection of failures or changes of small magnitude in GPS coordinate solutions is critical for applications requiring continuous and reliable results. Examples include real-time deformation monitoring for dams, high-rise buildings, bridges, earth surface tectonic movements, landslides, etc.

Control charts are implemented as modules in a software package being developed at the Crete Tech University, Greece. The software has been designed to monitor data in real time and triggers alarms whenever predefined critical values are exceeded. The conventional cumulative sums and the adaptive Cusums have been applied to Real-Time-Kinematic GPS data, as produced in an experiment. An abrupt shift in data has been assumed to vary between 0.5 to 2 standard deviations from a target mean value.

Comparative results show that the conventional Cusums are suitable and efficient tools in monitoring quality of the RTK-GPS data. Results also show that the control charts for the detection of location shifts should also be accompanied by control charts on the scale.