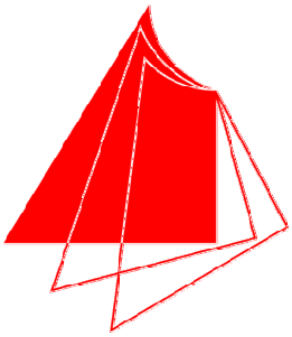

Hochschule Karlsruhe
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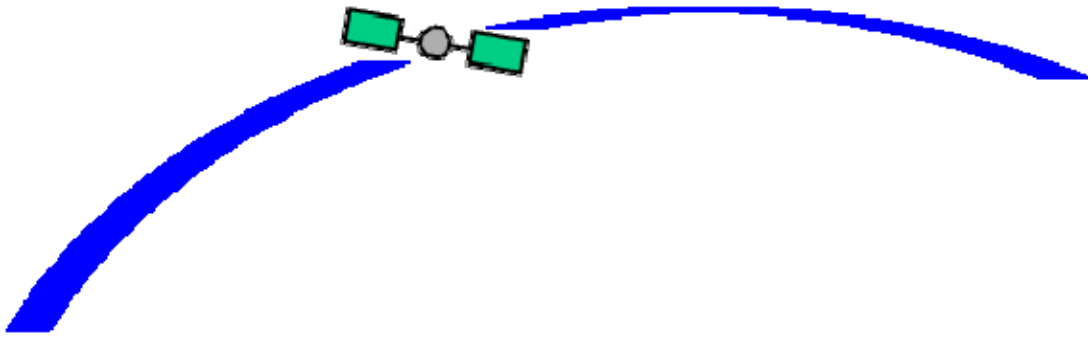
GOCA-GNSS-Control



Control-, data capture and processing software
for GNSS-sensors

www goca.info

GNSS-Control Version 1.6

Autors: Reiner Jäger, Peter Spohn

Geo-monitoring

With the worldwide use of newer and more efficient construction methods, the demand for geodetic supervision rises. In the past, buildings were constructed with the highest possible effort regarding safety and stability. Today, however, for the planning of constructions, new methods are introduced which are edging technical feasibility. These new methods require an increase of measurement accuracy and also a decrease of the epoch timespans, aiming to a continuous online geodetic monitoring of the building or construction. Otherwise, the security for man and building cannot be guaranteed.
Global climate changes, population growth and the successive expansion of general land-use area lead to a conflict between land use and prevention of natural hazards, such as slopes or thawing permafrost zones. This conflict can also be transferred to generally critical areas, like regions with volcano activities or earthquakes.
Geodetic geo-monitoring starts with the storage of original measurements and ends with their reporting, - or in case of emergency, with the alarming of responsible persons. Completely automated, it also reduces permanent costs.

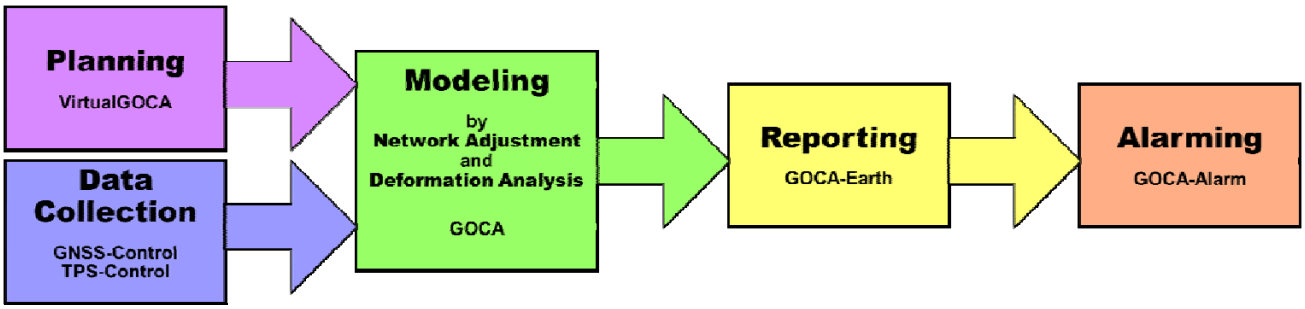


Figure 1: General scheme of an automatic geo-monitoring system

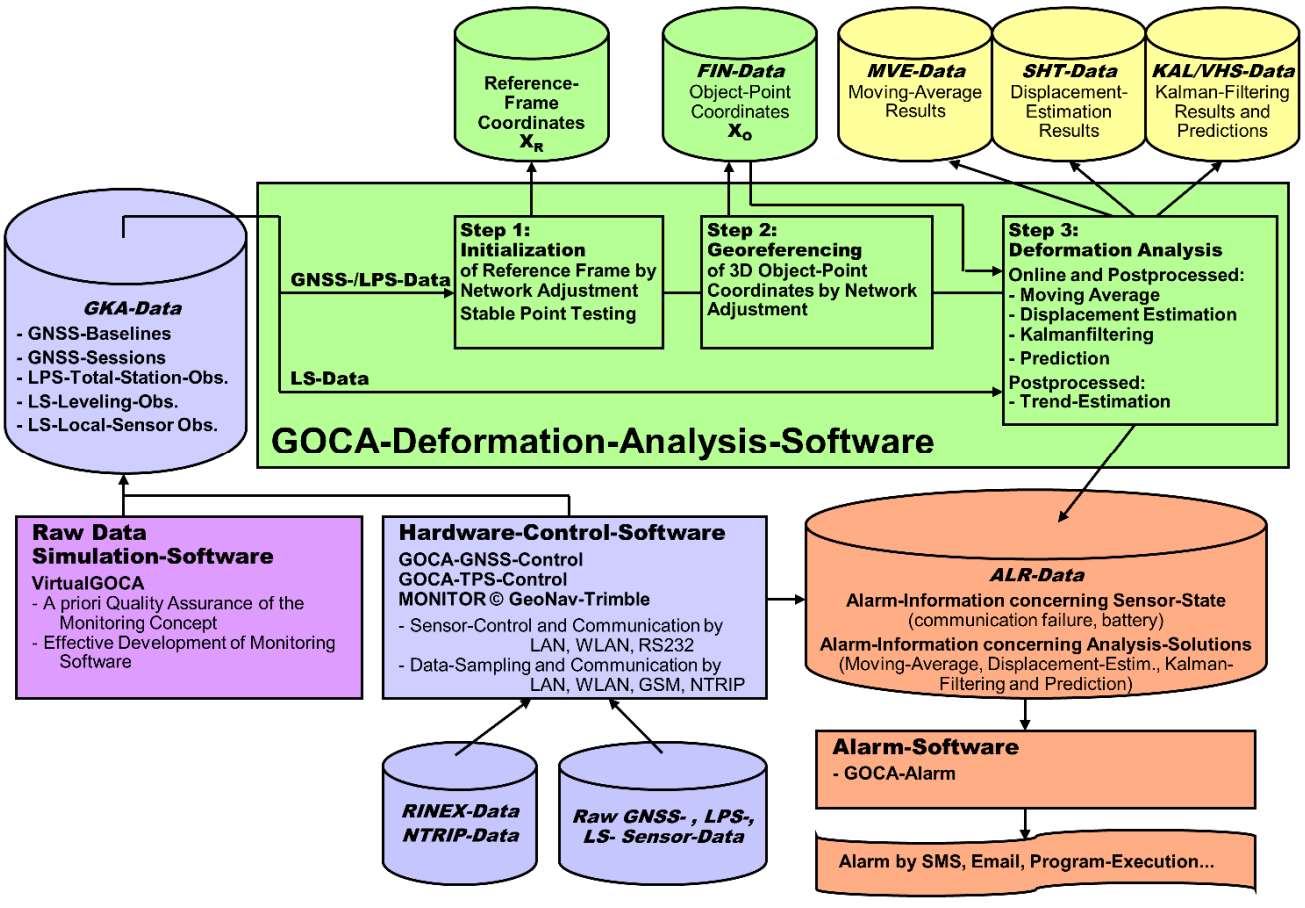


Figure 2: Scheme of a deformation analysis with GOCA

GOCA

The GOCA-system is a multi-sensory system with GNSS receivers, terrestrial total stations or local sensors that are installed inside the observed object itself or temporary attached to it. Its sensors can be freely configured and combined in a GOCA online monitoring project.
GOCA can serve as a rapid alert system for natural hazards (e. g. earthquakes or volcano activities, etc.) or it can supervise geo-technical constructions or buildings such as mines, dams or tunnels. All over the world, GOCA has been installed over 30 times.
The deformation analysis software GOCA performs measurement data processing and a deformation analysis in consecutive adjustments. After initializing the reference frame (step 1), the simultaneous adjustments follow. In step 2 the object points are geo-referenced and in step 3 Kalman filtering and displacement estimations are performed. If the values are critical, a warning is given. In- and output interfaces are opened for further developments (Fig. 2).

GOCA-GNSS-Control

In a geo-monitoring-chain (Fig. 1) the GOCA-GNSS-Control software is responsible for the data collection with GNSS sensors. Different receivers by different manufactures are supported and it's possible to maintain, supervise and roundup them into GNSS-sensory-arrays. The data communication to the GNSS-receivers is carried out via a TCP/IP-port. Due to the free and flexible build-up of these networks, connections via local LAN/WLAN-networks, as well as the globally available internet, are possible. And as a result of today's possibilities for accessing the internet, even greater, regional GNSS-sensory-networks can be realized by GNSSControl without great difficulty.

An independently developed communication box for GOCA-GNSS-Control converts the usual RS232-signals into TCP/IP data packets.

Next to capturing original RINEX-observation-data and optionally processing them in a near-online-mode, GOCA-GNSS-Control also supports the building of RTK-arrays for online data processing.

For defining an RTK-Array's active base- and rover configuration, GOCA-GNSS-Control is able to define more GNSS-nets which might be changed iteratively within freely definable time spans.

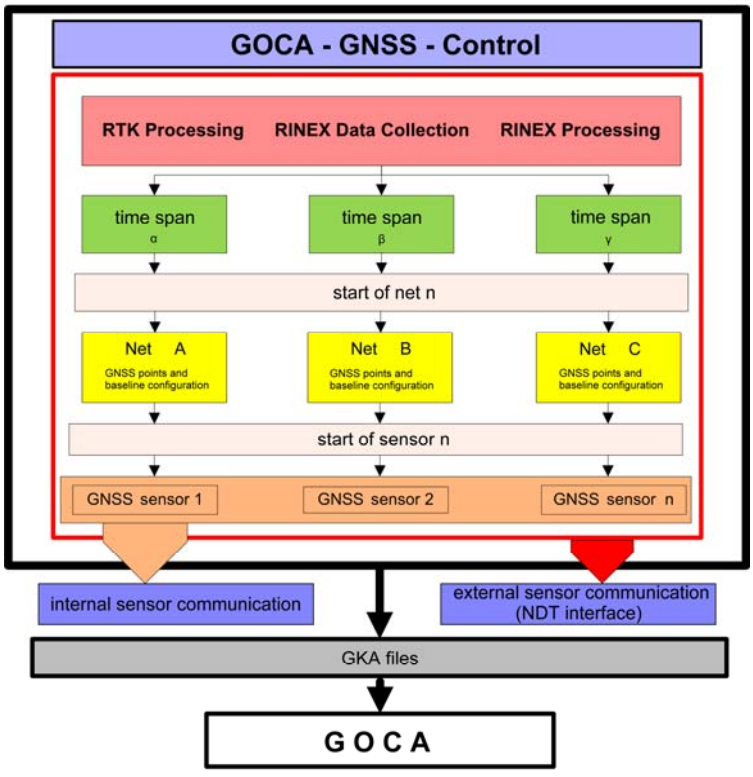


Figure 3: Scheme of the software concept

Together with an extremely flexible and easy to use time management which allows any imaginable combination of GNSS-nets and time spans, GOCA-GNSS-Control comes with an elaborated system in order to respond to failures of the GNSS sensory. Such failures are for example satellite shadowing effects or connective issues. This goes along with an effective alarm management of GOCA-GNSS-Control which corresponds with the alarm software GOCA-Alarm.

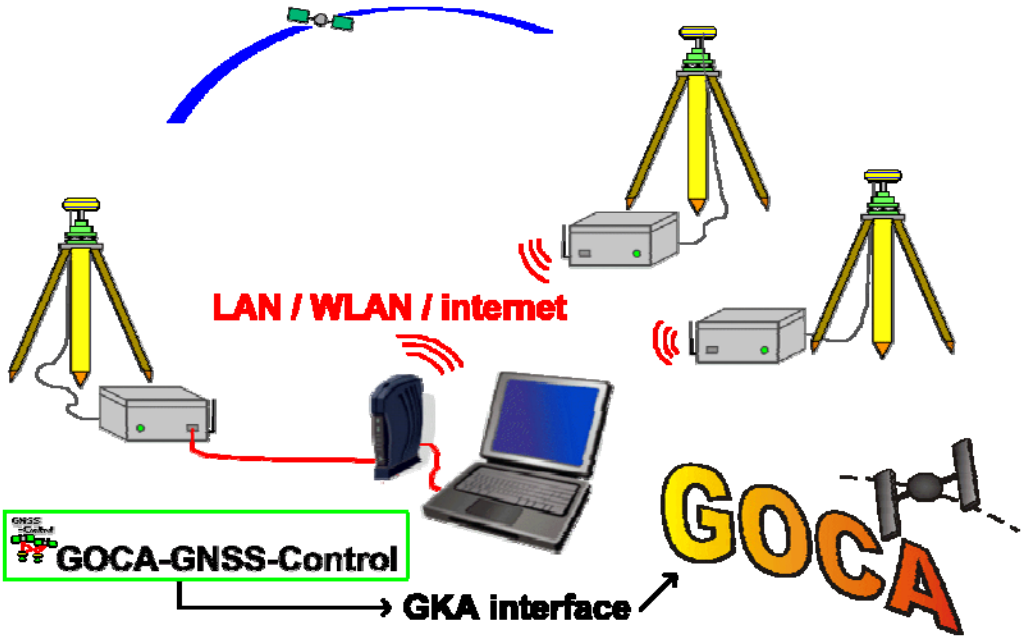


Figure 4: Geo-monitoring chain with GOCA-GNSS-Control

The open network-design- time- manager-interface (NDT-Interface) of GOCA-GNSS-Control allows the control of external GNSS- /RTK-solutions relating the configuration of time, net and sensors. (Fig. 3)
Second to collecting RINEX-data with the „RINEX-datacollection-mode“, the additional modes „RINEX - data-processing“ and „RTK-processing“ allow a near-online or rather real-time GNSS-Baseline procession by external GNSS-processing engines (WA1, RTK-LIB) or via RTK-Solutions of GNSS-hardware manufacturers. The GNSS analysis results (coordinates and covariance matrixes) are provides as GKA - format which is an open ASCII data interface. This way it's possible to process GKA-data or RINEX-data with the GOCA deformation-analysis software smoothly and to further model them with geo-monitoring in a second step (Fig. 1).
GOCA-GNSS-Control has been created with VisualStudio2008 as a DLL-application. This means that it can also be integrated in external programs (Fig. 1).

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