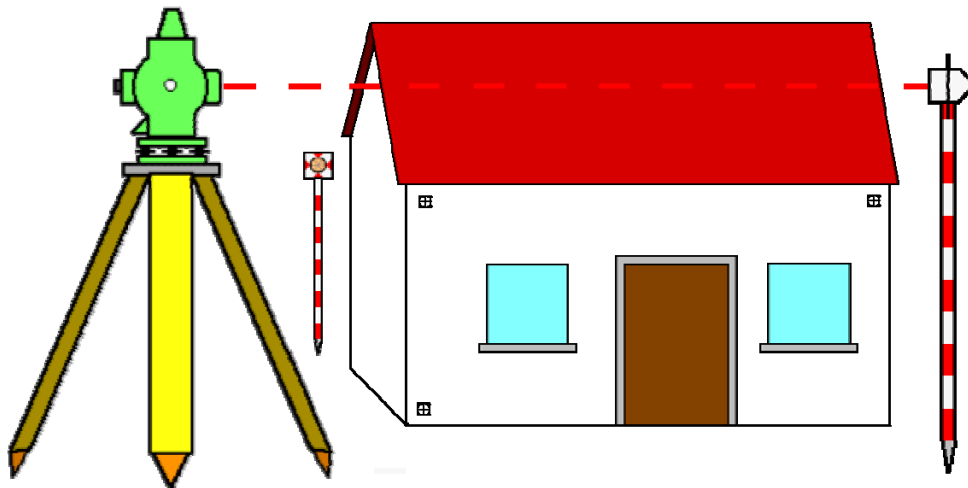


**Hochschule Karlsruhe  
Technik und Wirtschaft**

**UNIVERSITY OF APPLIED SCIENCES**

# GOCA-TPS-Control



**Control-, data capture and processing software  
for TPS-sensors**



[www.goca.info](http://www.goca.info)



TPS-Control Version 1.6

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# 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.

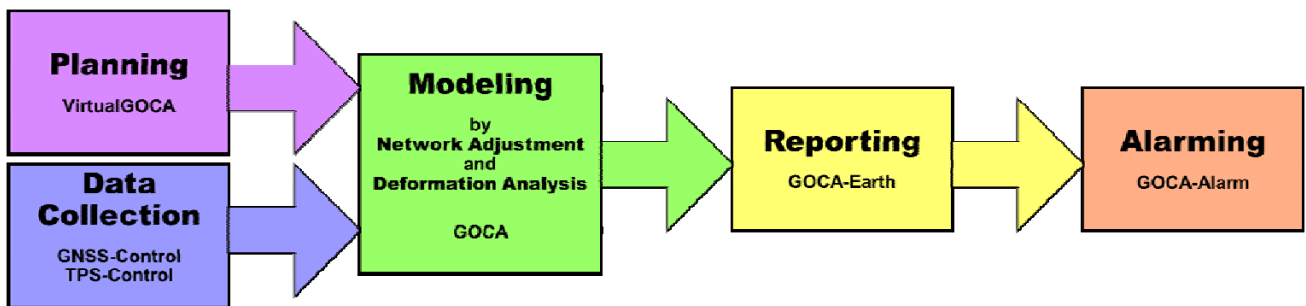


Figure 1: General scheme of an automatic geo-monitoring system

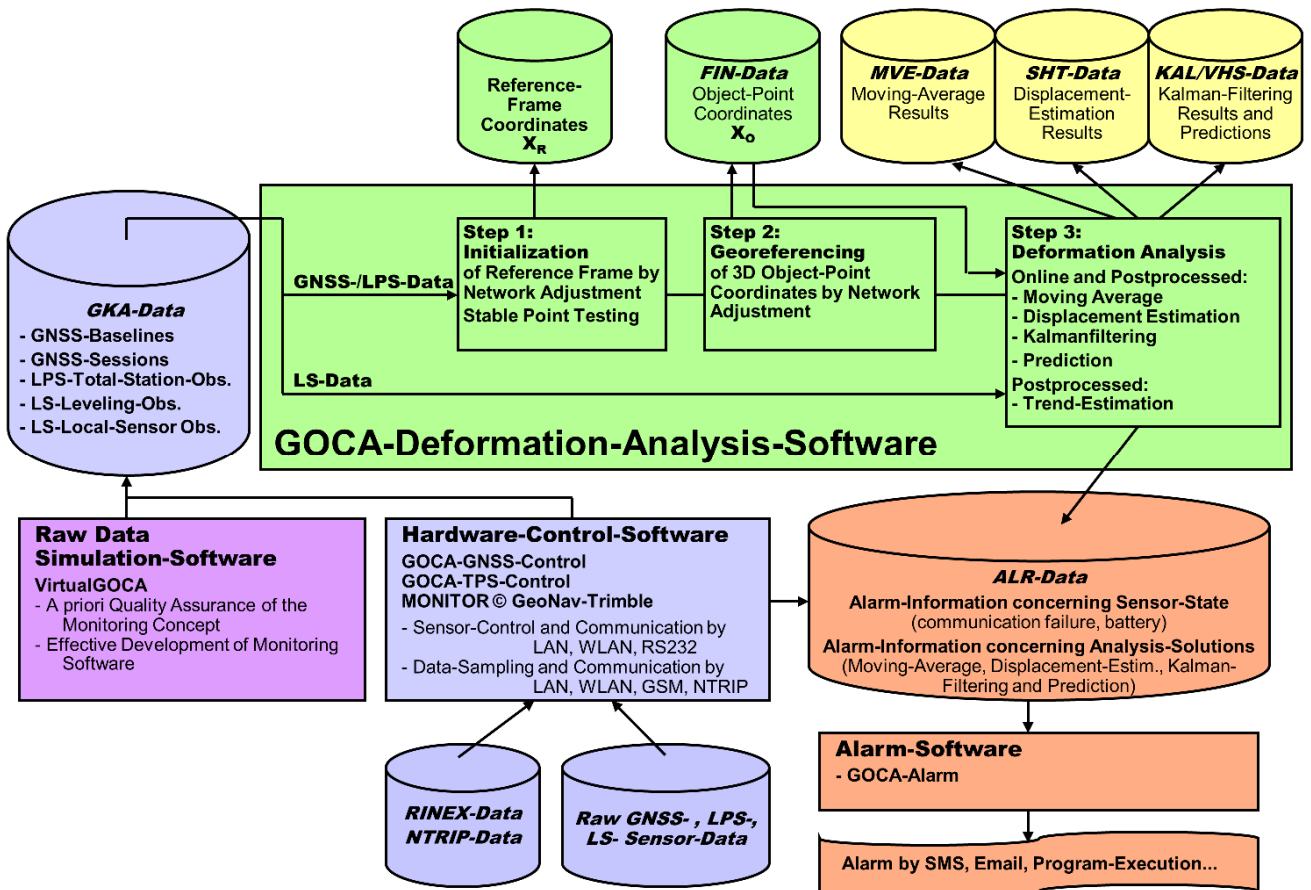


Figure 2: Scheme of a deformation analysis with GOCA

## 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-TPS-Control

In a geo-monitoring-chain (Fig. 1) the GOCA-TPS-Control software is responsible for the data collection with total stations. Different robotic total stations by different manufactures are supported and it's possible to maintain and supervise them. The data communication to the total stations is carried out via a direct RS232 connection or 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. As a result of today's possibilities for accessing the internet, even a remote control over great distances can be realized by GOCA-TPS-Control without great difficulty.

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

Next to independently accessing the total stations and to capture original observation data, GOCA-TPS-Control also supports an automatic measurement of targets (e.x. reflective sheets) in geodetical modes. There is also a special measuring mode for an optimized reducing of zenith angles. Likewise, GOCA-TPS-Control also supports total station internal atmos-pheric settings in order to reduce the slope distances correctly. Additionally, external meteorological stations over TCP/IP are supported. This way, a continuous capture of all current meteorological data is granted which is indispensable for high-sensitive monitoring tasks. For a retrospective analysis, these meteorological data can also be saved in plain text format files.

Together with an extremely flexible and easy to use time management which allows any imaginable combination of time spans, GOCA-TPS-Control comes with an elaborated system in order to respond to failures of the TPS sensory. Such failures are for example temporary or permanent target shadowing or connective issues. This goes along with an

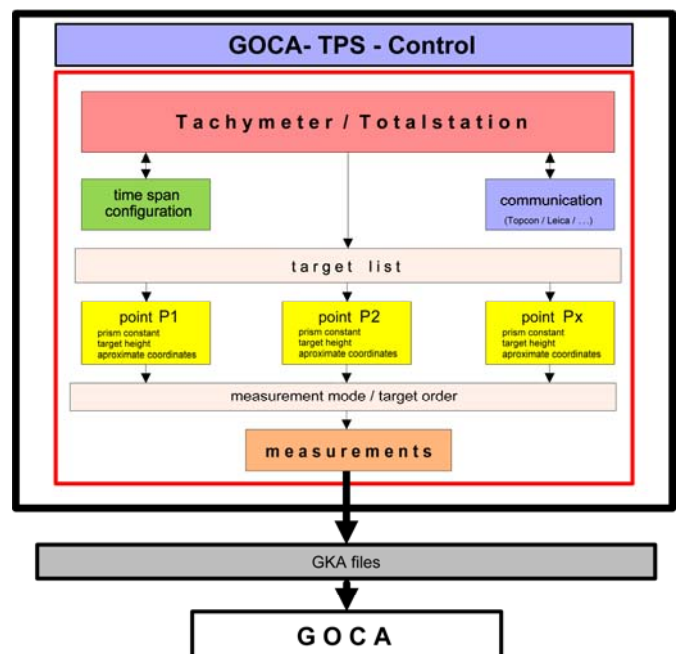


Figure 3: Scheme of the software concept

effective alarm management of GOCA-TPS-Control which corresponds with the alarm software GOCA-Alarm.

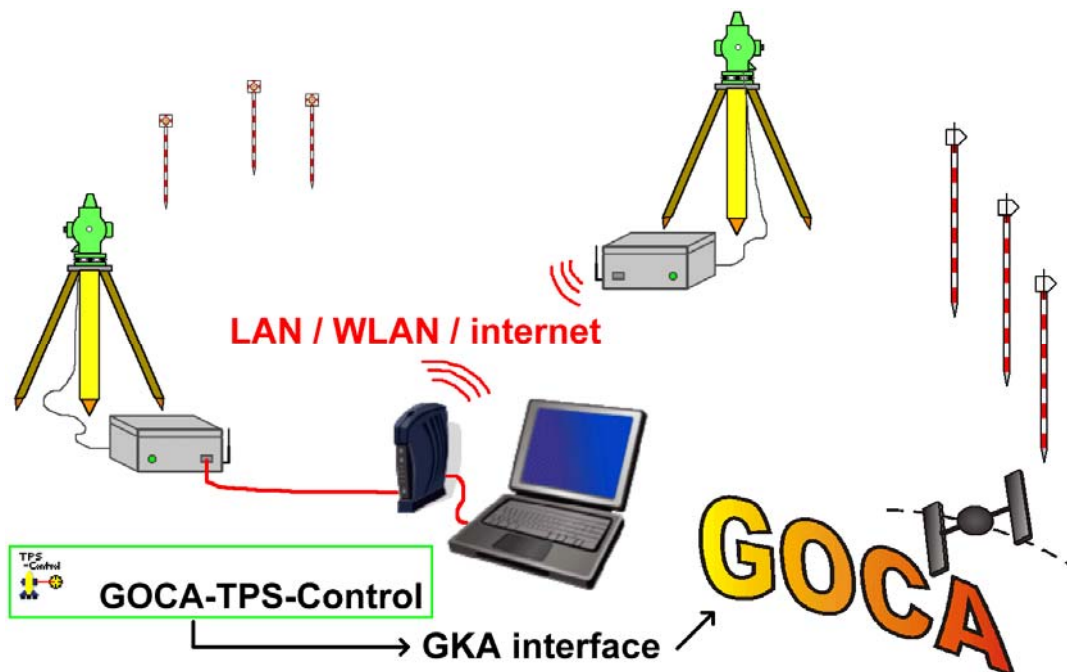


Figure 4: Geo-monitoring chain with GOCA-TPS-Control

GOCA-TPS-Control is programmed in an object orientated way. So every total station of each manufacturer is an independent object/class. In this way it is possible to implement a new total station to the software in a very short time. The TPS measurements (distances, angles and their variances) are provided as GKA - format which is an open ASCII data interface. This

way it's possible to process the GKA-data with the GOCA deformation-analysis software smoothly and to further model them with geo-monitoring in a second step (Fig. 1).

GOCA-TPS-Control has been created with VisualStudio2008 as a DLL-application. This means that it can also be integrated in external (Fig. 1).

Directly supported manufacturers:



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