The Importance of Engineering Geodesy in the Context of Structural Health Monitoring

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ABSTRACT:

Engineering geodesy was the first discipline to perform monitoring measurements on large scale objects. Within the last two decades many other disciplines introduced monitoring measurements embraced under the name of structural health monitoring. Structural health monitoring encompasses almost any type of structure, being a mechanical structure like an airplane, a civil engineering structure like a skyscraper or a natural phenomenon. The goal of structural health monitoring is to provide information about the state of health of a structure.

This article discusses the role of engineering geodesy in the context of structural health monitoring. Due to the black box characteristic of today's instruments, measurements can be made by virtually everyone. However, it shall not be overlooked that engineering geodesy developed core competencies in the planning of monitoring measurements and the analysis of monitoring data within the last 100 years. These competencies have to be promoted confidently in order to secure and increase the role of geodesy.

A second aspect which is discussed in the paper is the extension of the measurement space from measurements on the surface of an object to embedded measurements within an object. In order to determine the complete deformation behavior of an object internal and external deformation measurements are needed. Traditional strongholds of engineering geodesy are external deformation measurements using well established instruments like total stations or GNSS receivers. In modern monitoring solutions these measurements have to be complemented with internal measurements made for instances with embedded fiber optic sensors. Currently available sensors and analysis methods are discussed in this paper.

In a final section the current trend from monitoring which only observes occurring deformation to object control is discussed. Monitoring examples of high rise buildings are given to highlight how monitoring information can be used to actively change building parameters or steer the construction process.