STRUCTURAL DEFORMATION MONITORING USING LOCATA'S RADIO-LOCATION TECHNOLOGY

Joel Barnes, Chris Rizos, Mustafa Kanli, Anuj Pahwa
School of Surveying and Spatial Information Systems
University of New South Wales, Sydney, NSW 2052, Australia
joel.barnes@unsw.edu.au
Joël van Cranenbroeck
Leica Geosystems AG
BU Engineering - Surveying & Engineering Division
Heinrich Wild-Strasse, CH-9435 Heerbrugg
Locata Corporation Pty Ltd
401 Clunies Ross Street, Acton, ACT 2601, Australia

Abstract: GPS has proven to be a useful tool for precision deformation monitoring applications, in both physical geodesy, and more recently for structural engineering. For continuous structural deformation monitoring (on an epoch-by-epoch basis) it is desirable for the measurement system to deliver equal precision in all position components, all of the time. However, the quality of GPS position solutions is heavily dependent on the number and geometric distribution of the available satellites. Therefore, the positioning precision is not the same in all three components, and during a 24-hour period the positioning precision varies significantly. This situation becomes worse when the line-of-sight to GPS satellites becomes obstructed due to trees or buildings in urban environments, reducing the number of visible satellites (often to less than 4).

Locata positioning technology was developed to address the shortcomings of current technologies for reliable positioning in challenging environments such as when GPS satellite coverage is poor or not available. The Locata solution is to deploy a network of terrestrial based tranceivers (*LocataLites*) that provide time-synchronised ranging signals to a user receiver. Previous research in this area has demonstrated proof-of-concept for the *Locata* technology using a first generation prototype system. In this paper details of *Locata's* current system are discussed, which incorporates a proprietary signal transmission structure that operates in the 2.4GHz ISM band (license free). With complete control over both the signal transmitter and receiver comes enormous flexibility. This has allowed the limitations in the prototype system to be addressed with a completely new design for both the *LocataLite* (transceiver) and *Locata* receiver. This paper will investigate (for the first time) the use of *Locata's* current system for structural deformation monitoring type applications and demonstrate cm-level positioning results through experimental trials.