

MONITORING DEFLECTION OF VERTICAL SURFACES USING GPS

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Abstract: Monitoring the deformation of engineering structures, characterized by long term deformations and short term deflections provides a challenging application for GPS. While GPS can be very precise for long static datasets, high rate GPS receivers have also been tested to monitor high frequency deflections of engineering structures effectively. The use of GPS, however, is limited to locations with a clear view of the sky to track a sufficient number of satellites. Since clear sky views are available only on top of structures, GPS is not often suitable for monitoring deflections of points having part of the sky blocked out by the structure itself, like building façades. The use of GPS to monitor such difficult locations has received little attention so far, leaving important points on structures practically impossible to be monitored in an absolute frame of reference.

GPS antennas installed close to vertical surfaces such as building façades are subject to extremely high multipath and signals obstructions. Recent software and hardware multipath mitigation techniques have resulted in considerable reduction of multipath noise in the GPS carrier phase observations. The performance of such techniques, however, is not yet confirmed in a high multipath environment such as GPS antenna installed next to a vertical surface.

This paper will investigate the performance of various types of software and hardware multipath mitigation techniques in a high multipath environment. The effectiveness of post-reception adaptive filtering technique for multipath mitigation in such an environment will be investigated. Results outlining the performance of various types of antennas and receivers in mitigating multipath will also be presented.