



POINT ATTITUDE DETERMINATION USING INCLINOMETER AND GPS FOR HIGH RISE BUILDING MONITORING PROJECTS

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Abstract: Traditionally structural response of high-rise building due to severe conditions has been measured using accelerometers only.

The new generation of dual axis digital inclinometer and a loose integration with GPS-RTK receiver can bring a better answer for those who are interested in monitoring such structure.

An inclinometer provides an absolute dual-axis inclination measurements referring to the main gravity vertical. GPS-RTK offers direct relative displacement measurements for dynamic monitoring, but it has its own limitations. The measurement accuracy can be affected by multi-path and are influenced directly by the satellite constellation geometry. Moreover the altitude delivered by GPS needs to be expressed in an orthometric reference frame.

In this paper a new technique will be described that uses the correlation signals directly detected from a GPS-RTK receiver and an high accurate inclinometer to produce an optimal unbiased estimation of the point attitude (dx, dy, dz, roll, pitch and azimuth) variation.

The methodology consists of Fast Fourier Transform (FFT), a filtering technique, and velocity linear trend estimation from both GPS and inclinometer measurements.

Several types of datasets have been tested from equipment deployed on high-rise towers and the results will be presented.

Because of redundancy within the loosely integrated GPS-RTK and inclinometer system, the authors opinion is that a much more robust quality assurance in monitoring structural deformation for high-rise building can be achieved paving the way for new applications as well.

Key words: high-rise building, monitoring, point attitude, inclinometer, GPS.

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