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ULTRAHIGH-PRECISION GPS APPLICATIONS USING REAL-TIME KINEMATIC TECHNOLOGY

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RTK (real-time kinematic) processing is a GPS technique pioneered by surveyors and geodesists for determining the coordinates of points with centimetre-level accuracy or better in "real-time". GPS carrier-phase measurements must be used to attain the required positioning accuracies. As improvements are made in positioning accuracies which can be achieved in real-time, RTK techniques are being embraced for an increasing number of applications so that the distinction between navigation and geodesy applications is becoming less distinct. This is evident in high-precision, real-time, scientific and civil applications such as establishing geodetic control networks, mitigating earthquake hazards, monitoring dam and bridge deformation, auto-steering gantry cranes and so on. These applications require positioning accuracies better than a few centimetres with extremely high reliability in either static or kinematic mode and in both post-processing and real-time situations.

The University of New Brunswick (UNB) RTK software, initially designed for a gantry crane auto-steering system at Korea International Terminals' Kwangyang Port in South Korea, is able to provide navigation solutions in real time at an up to 25 Hz update rate commensurate with the dual-frequency data rate. The software works in conjunction with a GPS receiver and 2.4 GHz wireless LAN (WLAN) master unit at a base station and two dual-frequency GPS receivers and a WLAN adapter installed on the cranes. We have explored the capabilities of the software in new GPS applications. Recently, tests of this software for deformation monitoring have been carried out at Highland Valley Copper Mine in British Columbia, Canada. Also, tests to investigate the performance of the software under long-baseline situations including on-land and offshore environments are planned. UHF point-to-point, WLAN and LAN

communications will be used for real-time testing.

In this contribution, we introduce the UNB RTK approach. Technical and scientific aspects of the RTK software, especially in handling biases and errors for different applications (such as auto-steering gantry cranes, deformation monitoring at an open-pit mine, and long-baseline RTK) are discussed. Results of tests carried out on site for different applications and on the UNB Fredericton campus are presented.