Assessment of CORS Real-time Kinematics (RTK) Measurements on Geodetic GNSS Receiver and Unmanned Aerial Vehicle (UAV) in Sri Lankan Survey Perspective

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Utilizing the CORS corrections on GNSS and drone surveys improve the productivity of surveying, serving as an ultimate solution for the demand of fast, high-detailed and effective surveying. Though, the manufacturers demand sub-centimeter accuracy,it is important to investigate the achievable real-time accuracy of UAVs, replicating the real-world surveying scenario in Sri Lanka. This study comparatively analyses the accuracy and suitability of (i) short-baseline (SBRTK) of 0.70 km, (ii) long-baseline (LBRTK) of 40 km and (iii) network-based RTK (NRTK) in VRS mode for drone solutions with that of GNSS and total station measurements. A field survey was performed within 0.5 Ha commercial area equipping Leica manual total station, Stonex S900 GNSS receiver and DJI Panthom-4 RTK drone. Flight height of 50 m was maintained with 70% and 80% of side and front overlaps respectively utilizing the RTK corrections of CORSnet, SULECO (Pvt) Ltd. Solutions of GNSS and drone surveys were statistically compared with that of terrestrial survey measurements. Results indicate convincing performance of GNSS-RTK and RTK-Drone survey with centimeter-level accuracy. An ambiguity "Fixed solution" was obtained with an average of 27 common satellites during SBRTK and LBRTK where it was only 12 on NRTK which could be due to the process of integer ambiguity fixing. The GNSS survey on NRTK provided better results (maximum standard-error (SE) of ±6.4 cm)in comparison with SBRTK and LBRTK solutions and the Standard Deviation (SD) decreased as LBRTK (2.3 cm), NRTK (1.7 cm), and SBRTK (1.6 cm). The results of RTK-Drone survey were irrespective of the solution mode witha maximum SE of ±5.0cm in north and ±4cm in east and the SD was within a marginal variation between 0.9 to 1.3 cm. Though establishment and maintenance costs of NRTK are comparatively high, it provides better accuracy irrespective of the survey method. The drone survey yields, comparatively better accuracy than GNSS-RTK survey irrespective of solution types in drone friendly environments.

Keywords: *CORS, GNSS, Network RTK, Surveying, UAV*