Data Curation and Data Sovereignty for Global Digital Twins
A Methodological Framework for Accuracy Validation Using National DGNSS-Enabled Drone Programmes

Mark Abrams (USA), Clinton Heimann and Minnie Stephanus (South Africa)

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SUMMARY

A foundation digital twin (FGT) provides all the necessary information to create a photo-realistic, accurate, and current 3D site model suitable for Augmented Reality (AR) and Mixed-Reality (MR) exploration and provides an absolute foundation for geospatial knowledge exploitation for both location-based services (LBS) and authoritative services for local and national governments. DGNSS-enabled drone collections provide an affordable bridge between legacy databases that are misregistered at the 1-30 m level, by offering a single, authoritative, and geolocated local model with 5 cm precision and accuracy.

Simultaneously, these site models can enable global registration and accuracy testing of satellite imagery. Global accuracy testing of satellite imagery requires a global network of highly accurate test sites, precise, accurate, current 3D imagery, and geodetic control. Historically, these control sites and networks are not photo-recognizable and require survey teams to establish and maintain them. As an alternative strategy, we have demonstrated DGNSS-enabled drone surveying to establish absolute local control tied to the South African geodetic framework in rural South Africa. The aerial survey provides high-resolution (1-5 cm) geocoded 3D imagery for property mapping, suitable for geodetic tests and evaluation of satellite imagery, with a horizontal accuracy of 5-10 cm and vertical accuracy of 10-30 cm.

The Republic of South Africa is uniquely positioned to create nationally certified test and evaluation sites as part of a national survey program under the leadership of the Surveyor General. The RSA is mapping 836 tribal regions and bringing those communities directly into the digital economy. By combining highly accurate 3D control data of previously under-mapped regions with open-source satellite image processing software, such as the Ames Stereo Pipeline (ASP) and QGIS, an opportunity arises to automate the integration of terrestrial, aerial, and satellite imagery

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with accuracy beyond what has been traditionally available which enables a digital ecosystem that permits integration of all available data into a common, accurate, interoperable foundation digital twin.