Queensland Spatial Excellence Awards 2017 Citation

Undergraduate Student Award

Leigh Tingle

The use of affordable rotary Unmanned Aerial Vehicles (UAV) technology and the alternative software used to create digital terrain models from UAV images is a recent addition to the industry. This has created a situation where data sets obtained from a UAV can be sold to third parties containing significant errors that the user has no knowledge of, including systematic errors associated with the use of the system.

The research project by Leigh Tingle investigated the legal and practical limitations of the use of the UAV in typical urban environments, conducting two test flights at 15m and 40m above terrain. Thirteen (13) key surfaces were identified and tested to provide an achievable accuracy of the system. A total of 52 data sets were presented and analysed to determine the measurable accuracy of each surface type in various operating conditions.

The preparation for the paper and the procedure was designed around current legal limitations of the use of the UAV, with and without licensing.

Civil Aviation Safety Authority (CASA) regulations for the use of the UAV in Australia were scrutinised, and recent changes to laws surrounding the use were used as the basis for the two test flights, pushing the use of the system to the legal limits within urban environments.

The research identified previous tests of only single surface types, and identified that 13 surface types need to be tested within the same flight to determine each surface type accuracy.

Baseline data for the test was conducted utilising a calibrated Total Station, locating all feature points on the ground.

As a second test, the use of the GNSS rover was implemented as a check, but also to determine the achievable accuracy when paired with the UAV.

Fifty-two (52) data sets were analysed, providing gross error checks against each individual data set.

Through direct research and dealings with the profession, a distinct lack of knowledge regarding the output accuracy of the system was identified by almost all users of this system. In addition, it was also discovered that aligned professionals such as engineers, architects, and even the casual amateur user of the UAV has attempted to sell Digital Elevation Models (DEMs) constructed from the UAV imagery onto third parties. Access to low-cost hardware has also been sold alongside the UAV i.e. GNSS rovers connected to Continuously Operating Reference Systems (CORS), allowing any user of the UAV an opportunity to provide geo-referenced DEMs to clients, potentially bypassing the services of a spatial scientist entirely.

Any user can provide third parties with data sets without fully appreciating or understanding the output accuracy of this relatively new system combined with complimentary systems such as the GNSS rover. A real potential exists for the user to unintentionally provide geo-referenced data with gross or systematic errors.

The final grade attained by Leigh's project is "High Distinction" - the highest possible grade.

Judges' Comments

 "Good project that addresses the need for public education on the limitations and benefits of spatial information."