PhD studentship, Loughborough University - Improving spatial measurement accuracy using UAV imagery

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Small pilotless or “unmanned aerial vehicles” (UAVs) are becoming more cost-effective and provide new vantage points for capturing images. These platforms combined with a new generation of lightweight and cheap digital cameras are creating new opportunities for spatial measurement using automated digital photogrammetric methods.

There are an increasing number of UK companies conducting UAV operations for an extensive range of applications and in a range of economic sectors, including:

- Investigation/monitoring of inaccessible engineering infrastructure/assets.
- Cinematography and film, and police investigations, which are predicted to be a leading market applications of UAVs.
- Meteorology/oceanography, search and rescue, urban planning/surveying, and disaster relief.

Whether these data are used for spatial surveying (3D, to inspect bridges and other structures or for disaster relief and search and rescue applications) an accurate and reliable data acquisition methodology is necessary. Developments in Structure from Motion (SfM) photogrammetry now allow spatial models to be rapidly and automatically generated using freely available server-based software (e.g. Autodesk’s 123D Catch). Although accurate data can be generated, recent tests (Chandler et al, 2015; Chandler, 2013) demonstrate that weak image configurations will generate low quality data, due to inaccurate determination of internal camera geometry. Specifically, traditional vertical image sets generate a distinctive systematic errors surface or dome (Wackrow and Chandler, 2010).

The purpose of this project is to identify minimum image configurations that facilitate appropriate camera calibration and hence allow accurate data to be generated. The research team is seeking a motivated individual to work in this area and finances could be available to provide funding to obtain a Ph.D. The project will involve both field testing and numerical analysis and consequently some understanding of land surveying/photogrammetry/geomatics would be of distinct value.

References:
Chandler, J, Micheletti, N, Lane, S (2015) Is SfM photogrammetry really the tool we’ve waited 30 years for?. In European Geosciences Union General Assembly, Vienna.

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