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# SuperGeos - Sensing by drones and analysis with AI to make us better geoscientists

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Micro-unmanned aerial vehicles (UAVs <25 kg in take-off weight) are becoming ubiquitous in the Earth Sciences, particularly for 2D/3D digital geological mapping of landscape and outcrops, using the Structure-from-Motion (SfM) photogrammetric technique. However, micro-UAVs are capable of far more than SfM photogrammetry. Here we review a range of the different types of sensors becoming available, including aeromagnetic, lidar, thermal infrared, multispectral/hyperspectral and gamma spectroscopy. We also introduce Simultaneous Localisation and Mapping (SLAM), which is a relatively new computer vision technique that will potentially surpass SfM photogrammetry as a means of achieving 3D digital models in real-time (e.g. as a UAV flies).

Whatever data type micro-UAVs collect, the resolution achieved can be an order of magnitude greater than that achieved by aerial or satellite platforms. This enables UAVs to become an essential tool in addressing the issue of upscaling or downscaling of data, between ground and satellite surveys. While advantageous, the resolution of UAV data also presents a significant problem, in that a common rate-limiting step becomes the analysis of the data in a timely manner. We briefly outline the least-cost method to significantly enhance geological mapping in point cloud and GIS datasets, as well as preliminary results using convoluted neural networks to automatically generate geological maps from imagery in minesites and outcrop.

Finally, we outline a new facility available to the Earth Science community, that brings together a variety of sensing techniques, long flight duration multirotor UAVs and AI approaches to geological interpretation.