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Optimising terrestrial LIDAR field deployment

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Terrestrial laser scanners (TLS) are increasingly used to determine 3D topographic data for a variety of geoscience requirements such as hazard assessments and geomorphological studies. Very long range TLS instruments can be used at distances of up to several kilometres, enabling the capture of high spatial density topographic datasets of inaccessible terrain. Despite the wide-ranging and rapidly increasing use of TLS, the availability of tools to efficiently plan and manage scanning projects lags behind the current developmental state of scanner hardware. TLS measurements require line-of-sight visibility between the scanner and the target and, as such, acquiring datasets in dynamic, rugged terrain typical of many field sites can be a complex task presenting significant project planning challenges. In most cases, scan data need to be acquired from multiple locations in order to capture the full geometry of the target. Identifying site locations that maximise target coverage whilst minimising both the number of times the scanner needs to be relocated and the time taken to perform each individual scan is critical in order to increase efficiency in the field.

Here we present a set of a set of survey project planning tools designed to optimise TLS field deployment. These tools use pre-existing, but low-resolution, digital elevation models to estimate an optimised scanner deployment configuration and to calculate the scan parameters required to automate data capture in the field. Using geospatial processing based on viewshed analysis, predictive maps are derived that identify a set of potential scanner deployment locations to maximise coverage of the target at a required spatial resolution. The appropriate instrument scan parameters are also determined, allowing quick setup at each site and optimised scan coverage of complex topographic targets.

We aim to use the project planning tools to acquire repeat, sub-hourly, surveys of active lava flows at Mount Etna, Sicily. By optimising the TLS data acquisition process, survey times will be reduced sufficiently enough to enable short-term variations in flow dynamics to be captured.