

Case study: 3DMSI

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Project Partner

3D Mine Surveying International Ltd (3D MSI) offer a wide range of surveying services for the creation of 2D plans and 3D models. These include surveys of mines, residential and commercial buildings and infrastructure, archaeological sites and using their office location to specialise in the scanning and visualisation of ship and boats. 3D MSI use the latest 3D laser scanning hardware and software to capture cultural and natural object geometries with high accuracy and precision. 3D MSI have the capabilities to tailor datasets produced to the client's specification and be in compliance with Building Information Modelling (BIM) legislation.

Project Rationale

Many point clouds derived from laser scanning systems use a local coordinate system that is only relevant to the site being surveyed. Integrating regional scale surveys, such as Tellus South West survey (Tellus SW), with re-projected local scale surveys in true 3D space a greater understanding of the site in the regional context can be appraised. Demand for aggregate has increased with government backed public infrastructure spending and housing demand. In order to meet these demands quarries are having to better plan future extraction and quarry design especially in environmentally sensitive areas. Repeated LiDAR surveys during quarrying can be used to rapidly monitor the quarry and calculate the volume of extracted rock. These datasets can also inform future development of the quarry and safety, either for further extraction or for remediation following closure. Cornwall has a long history of mining dating back to pre-roman times. In the last century a number of extensive deep mines were constructed. The structure of the mines were extensively documented but the true 3D shape and extent of the mine workings has only recently been made available. By integrating these in 3D space a greater understanding of mineralisation processes, risks to future mineral and hydrothermal exploration and construction may be assessed.

[File:3DMSI fig1.jpg](#)

Surveys

The LiDAR DSM from the Tellus SW can be processed and visualised in Geographical Information Systems such as ArcMap and 3D virtual reality systems such as GeoVisionary. A recent ground based LiDAR survey of the Pendennis Castle was conducted in local coordinates and there was a need to visualise the castle in the broader context of the region and surrounding area. Data from 3D MSI of the Pendennis Castle was merged with the Tellus SW LiDAR DSM to locate the Castle in GeoVisionary. Pendennis Castle data was translated and rotated to the correct location in British National Grid projection system which allowed for further integration with other Tellus SW datasets and other data.

[File:3DMSIfig3.jpg](#)

Quarrying

To understand the changes in an aggregate quarry the Tellus SW LiDAR data was integrated and compared to local ground based LiDAR scans. The two surveys were overlaid and the difference between the surfaces highlight changes in the quarry through the extraction of aggregate. By visualising these datasets together into GeoVisionary it was possible to assess current quarrying activity and plan for future developments and assess the risks and life expectancy of the quarry. The integration of the baseline Tellus SW LiDAR data with high resolution local ground based LiDAR survey at a working quarry allows the quarry owners to assess the quarry work schedule and plan future work. It also allows local authorities to assess extraction rates and licensing regulations.

[File:3DMSIfig4.jpg](#)

[File:3DMSI fig5.jpg](#)

Disused Mines

Keith Russ (Western United Mines Ltd) has constructed a 3D dataset of former underground mine workings which extend for hundreds of kilometres in the subsurface of Southwest England. The difficulty with this large dataset was the visualisation of the extent of the mines and the ability to relate the subsurface mines with surface structures and data. A methods was developed to import the 3D mine data and visualise the data more efficiently in the 3D system GeoVisionary. The mine data was transformed into a series of 3D tubes to represent the mine tunnels instead of surfaces that are computer intensive. By integrating the mine data with surface and subsurface data, management of the subsurface and surface will be improved by being able spatially relate these mines with the geology, infrastructure and built environment.

[File:3DMSI fig6.jpg](#)

Conclusions and Future Opportunities

The Tellus SW LiDAR data acts as a baseline standard/snapshot and subsequent surveys can be assessed against this to monitor changes in the landscape due to environmental or human changes. It can also be used by planners and regulators to manage building projects and ensure that regulations are followed so as to minimise disturbance in environmentally sensitive areas.

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