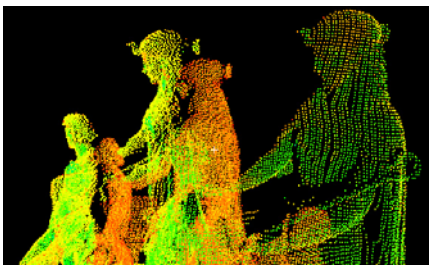
3D Terrestrial Laser Scanning

Prepared by the Geospatial Engineering Practices Committee

Information note

How does it work?
The rapid development and take up of digital cameras in recent years has made us familiar with the concept of pixels where all scenes are made up of a series of pixels with their associated colour values. In 3d scanning a point is analogous to the pixel and the scanner measures the distance to the point together with the horizontal and vertical angles to record the position of the point in space.

Many points make up a pointcloud, the typical product of a 3d scanner. Pointclouds can be joined together and registered to a coordinate system such as a site grid and datum. The closer the points are together the more the image resembles a photograph.



The scan on the left has 1m points while the scan on the right contains 43m points.

What does it do?
A 3d laser scanner is used like a camera from a tripod. Most scanners have a field of view of 360deg horizontally and 270deg vertically. The only area that does not get scanned is the ground that the scanner is set up over.

Several scanner locations may be needed in order to fully record the plant, room, building, structure or object that is being scanned without any details being hidden. The pointclouds are registered together to produce a complete 3d model of the site that is typically accurate to better than 5mm.

What can it be used for?
The pointcloud is a true to scale 3d representation of the scene. It can be imported to most CAD software or it can be viewed in bespoke software from which dimensional and positional data can be abstracted into the CAD packages such as AutoCad, Microstation etc. Bespoke software has full modelling capabilities for pipes and plant.

It can be used to drape digital colour photography to provide a virtual reality scenario or just as a background for asset management.

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Types of scanners

There are two types of scanner currently available and each uses a different measuring system. Time of Flight scanners are low noise, high accuracy and generally longer range scanners but are fairly slow and measure less than 5000 points per second.

Phase comparison scanners are higher noise and therefore slightly lower accuracy and have less range but will measure up to 625000 points per second. Time for a single scan can therefore vary between 3minutes and 3hours depending on the type of scanner and the point density setting.

Typical Specifications

Time of Flight	Accuracy at 50m<5mm	2000pts/sec	Range up to 200m
Phase comparison	Accuracy at 50m<3-7mm	625000pts/sec	Range up to 56m

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