WHITE PAPER

TRIMBLE SURESCAN TECHNOLOGY WHITE PAPER

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ABSTRACT

Spatial Imaging has emerged as a powerful tool that allows users to gather large quantities of rich data in relatively short periods of time compared to more traditional data acquisition methods. This has lead to new surveying opportunities as well as increased efficiency of current survey field techniques. However, speed (points per second/PPS) and number of points (total) gathered in the field are rarely true and accurate measures of productivity. The total amount of time for a 'field to finish' deliverable is a major consideration when considering the use of Spatial Imaging technology. This involves everything from project planning to execution to office processing.

This paper describes Trimble® SureScan™ technology, a new mode of scanning that allows users to define a uniform resolution for an entire scan in one simple frame, giving a consistent spacing between 3D points over a framed surface. It also discusses the benefits that this latest advancement in Spatial Imaging brings.

INTRODUCTION

When defining a resolution for a scan, users currently have the ability to set a grid spacing at a specific distance, or set an angular resolution. However, scans will rarely focus on a single object or area of interest at a specific distance, and consequently, with both the angular and spatial resolution methods, the density of the scan varies significantly depending on the distance from the instrument. This causes inconsistencies in the spacing of the points, complicates the framing process, and creates problems when attempting to optimize scanning time. Even the most advanced choice currently only allows the user to set a different resolution for the vertical and horizontal components of the scan.

To understand the significance of using Trimble's SureScan mode, we need to look at Spatial Imaging from a wider perspective than just the speed of data acquisition. A Spatial Imaging job typically involves both a field and office component to produce a

deliverable. If we minimize the amount of unwanted or superfluous data captured in the field, we can reduce the field time for data capture, and also greatly reduce the amount of time needed in the office to process the data, and produce a deliverable. With 3D scanning technologies the focus has often been on the speed of data acquisition and the amount of data captured, with little attention being paid to the techniques and tools used to gather this data. By considering the benefits of SureScan we will see how important it is to have the right tools to improve the overall speed, efficiency and simplicity of completing a project.

TRIMBLE SURESCAN TECHNOLOGY

SureScan uses a real-time algorithm that automatically adapts the scanning grid according to the geometry of the scanned object. The goal is to control the scanning movement in order to keep a consistent space between points in 3D. Users can express directly their need: x mm over every part of the scanned object. SureScan mode is optimized for horizontal surfaces and is therefore ideal for measuring terrain, roads and tunnels.

The basic principle of SureScan is to predict the next position of a 3D point based on the information that is available. Linear regression predicts point locations along lines by making comparisons with previous scan lines which dynamically improve the robustness of the algorithm. The most recently captured points are analyzed in real time to assist the prediction of point spacing. As the scan continues and more data becomes available the scan is adapted to reflect the nature of the surface and accurately position the laser for optimum results.

Trimble SureScan, with the possibility for the surveyor to precisely define a desired point density, offers many benefits over conventional measurement methods.

With this technology, you are now able to instruct the instrument to measure only those points that would be useful when generating the output you want to deliver. Because the density needed to achieve a desired output is known, for example to make a cross section, DTM, or contour map, a surveyor can enter this value in the program dialog and scan with confidence. The desired scan density will be achieved over the whole surface and that has immediate benefits both in the field and in the office. Firstly, it can reduce the time taken to scan, because the spacing of the point cloud over the entire scan area has been optimized. Secondly, it will reduce the time taken to process that data in the office. Because the field data much more closely matches what is needed, it therefore needs much less preparation and handling before being used to create the desired output. With homogenous point clouds, the office tools not only become easier to use, but also give better balanced results for applications such as meshes and DTMs.

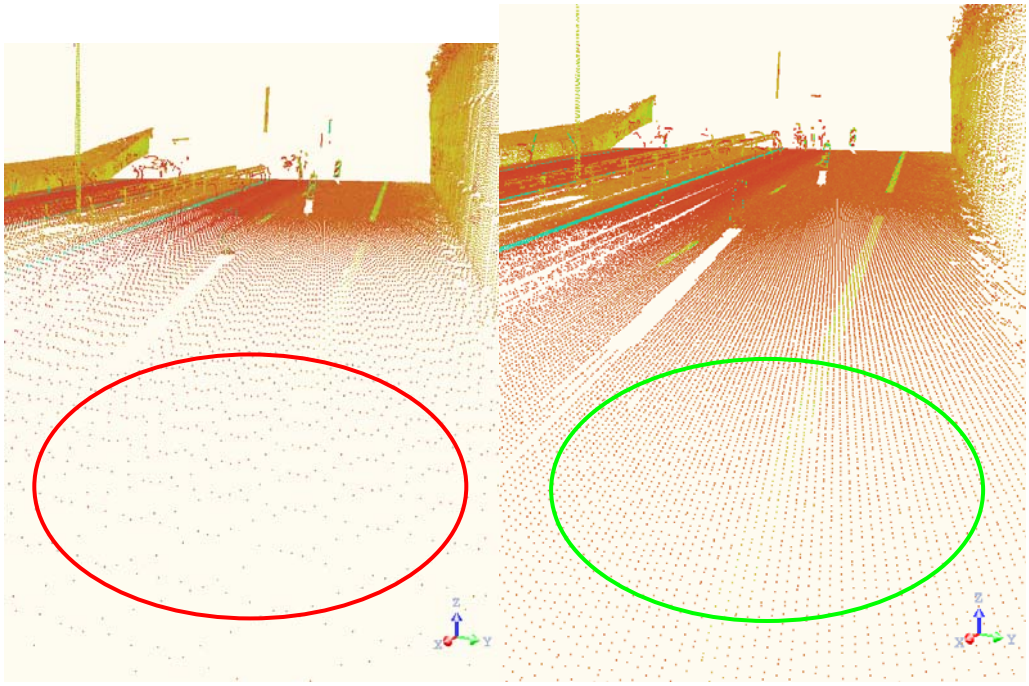

Fig 1. SureScan (right) highlights the increased coverage and uniformity of the data captured on a road surface.

There are other advantages. Only collecting the points that will be useful means that computer resources will be maximized. Valuable storage and processing memory will not be wasted or filled with unnecessary points, which means a general increase in computer performance, especially with respect to graphics.

The field techniques have also been simplified, which helps from a perspective of training, speed, and coverage. With SureScan, a single polygonal frame will be used for areas that contain a diverging range of distances. Previously, such a job could be done by making multiple frames in an effort to produce a more homogeneous point cloud. The areas of interest at short range would be framed separately from those at longer distances. When using Trimble SureScan™ technology, a single frame will be used, as well as a single parameter set. An operator can therefore be trained more easily, the speed to end result is improved, and the risk of missing an area of interest, or conversely capturing an area of data twice, is removed.

Finally, since SureScan can automatically scan with the smallest grid when required, the correct point density is retained even at the highest reachable range. Using the full potential of the instrument, the surveyor can complete more work at a single station, thereby reducing the amount of setups required, resulting in time savings over the course of a survey job.

SureScan is suited to applications with a high dynamic range (minimum and maximum distances vary greatly), for example, on road surfaces, highways or raceways.

Other applications suited to SureScan include terrain modeling, such as measuring a golf course for the purposes of drainage analysis, as well as tunneling applications, as they are also situations where there is a high dynamic range, together with a need for a regular distribution of points.

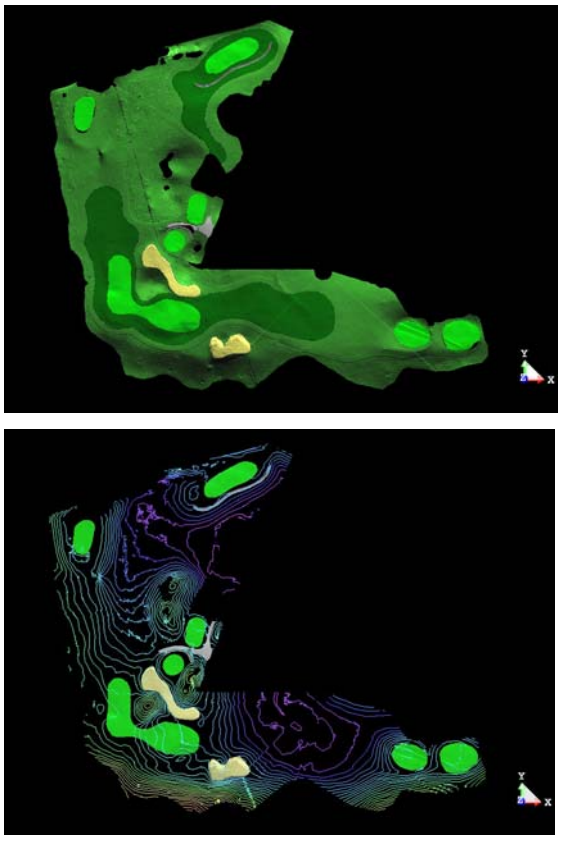

Fig 2. SureScan optimizes data acquisition on a golf course for drainage analysis.

CONCLUSION

Trimble SureScan technology is yet another innovation that provides surveyors with the ability to increase overall survey productivity, saving time in the field, saving time in the office, and decreasing valuable data storage space.

The ability to easily define a single framed area and set a consistent resolution leads to considerably improved productivity. Field time is decreased by minimizing the amount of point data and number of setups required while office data processing is facilitated, thanks to cleaner more usable initial data sets.

To learn more about how Trimble Spatial Imaging solutions can help you and your business, please contact your local Trimble authorized distribution partner. Locate a dealer on the Trimble website at http://www.trimble.com/locator/sales.asp.

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