

The Art of LIDAR Feature Extraction Becomes Smooth as “SILC”

Within the last year or so, there has been a trend among a handful of aerial LIDAR service providers to commoditize the acquisition and processing of LIDAR data. Unfortunately for the customers, and the industry in general, nothing could be further from the truth.

In reality, the creation of LIDAR information products is as much art as it is science. On the science side, the technology *has* pretty much become commoditized: the LIDAR instruments, GPS, and aerial platforms do not provide great differentiation in the final product. So what really sets LIDAR providers apart?

It is the “Art” of processing the data, and the ability to add value to the information, that provides what customers actually need.

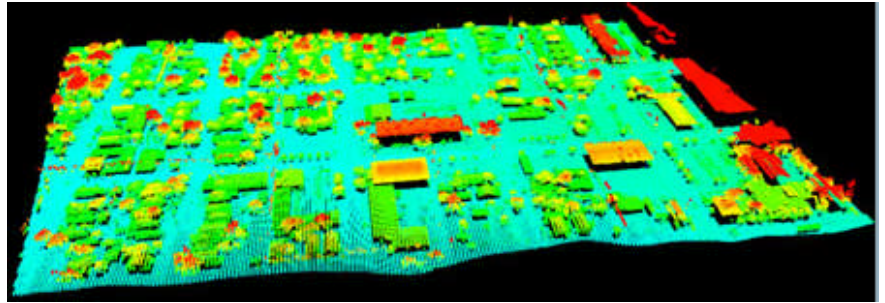
The processing of the data is the most critical element in the creation of a final LIDAR product whether that would be contours, Digital Terrain Models or feature extraction. The quality, accuracy and value of the LIDAR derived information product, are quite simply, a matter of the “Art” of processing LIDAR on the part of the service provider, rather than science. And, it is far from a commodity.

One of the most innovative, and effective, techniques for processing LIDAR was developed by Spectrum Mapping located in Denver, Colorado.

Spectrum Mapping, LLC is a full-service mapping, software development, and GIS company with six offices located throughout the United States and Canada. They have been acquiring and processing LIDAR data since 1996 and have developed a process called *SILC* (*Spectral Imagery LIDAR Composite*). For the automatic classification of LIDAR points, multispectral pixels are associated with individual XYZ values to discriminate between roads, buildings, trees, water and other features to facilitate the editing and quality control process.

“It has always been our contention that you cannot “blindly” filter LIDAR data,” said Don Wicks, president of Spectrum Mapping. “The digital imagery is vital to the successful classification of the LIDAR points and is used to quality control the bare earth surfaces derived from the LIDAR data.”

SILC is only available with Spectrum Mapping's integrated LIDAR and Color / CIR digital camera systems called NexVue™. The precise calibration and alignment of these two subsystems are vital for the software to calculate, display and manipulate spectrally attributed formatted LIDAR data.



LIDAR Returns Colored by Elevation Perspective View

- Partial flight line in LAS format LIDAR points color coded by elevation
- Trees, buildings and roads are fairly discernable
- Are the little bumps near/on the roads cars?

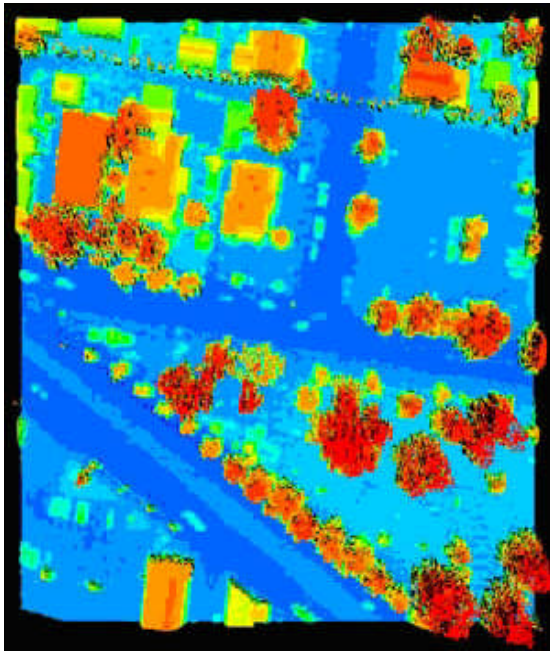


Elevation Perspective View, RGB Enhanced LIDAR Returns

- LIDAR points are attributed with RGB values and displayed much like a 3-D real-time ortho which can be edited
- Trees, buildings and roads are obvious - structures, cars, paint stripes, parking lots, walkways and park benches are easily identified



ABOVE: Color/IR SILC Enhanced Data
BELOW: LIDAR Returns Colored by Elevation



Traditional Feature Extraction

Automated feature extraction has long been a goal for the photogrammetric mapping industry. To date no method has been perfected to automatically extract features such as building footprints, edge of roads and walkways, vegetation, or bodies of water. The process requires very high-resolution imagery, with analysis performed largely in a 2-D environment requiring significant manual editing. Incorporating 3-D data and information into the process greatly aids in the analysis and extraction efforts.

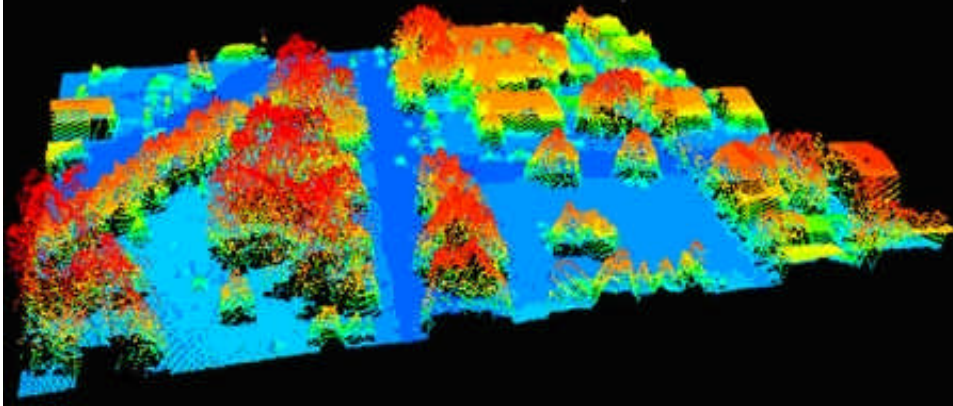
Like the photogrammetry industry, LIDAR providers have faced similar issues. Spatial analysis alone is often inconclusive when attempting to determine whether a LIDAR point has hit a small bush, fire hydrant, boulder or a ground surface anomaly. Conventional surface classification filters can only go so far when removing above-ground phenomena, as natural and artificial objects may be spatially interpreted similarly and subjectively removed, inadvertently eliminating valid surface detail without differentiation.

SILC Overview

The SILC process allows multispectral pixels to be photogrammetrically associated with individual X,Y,Z values. The imagery is not 'draped' to the surface, rather each LIDAR return is mathematically projected through collinearity equations onto its proper position on the frame array taking into consideration the camera model using photogrammetric techniques.

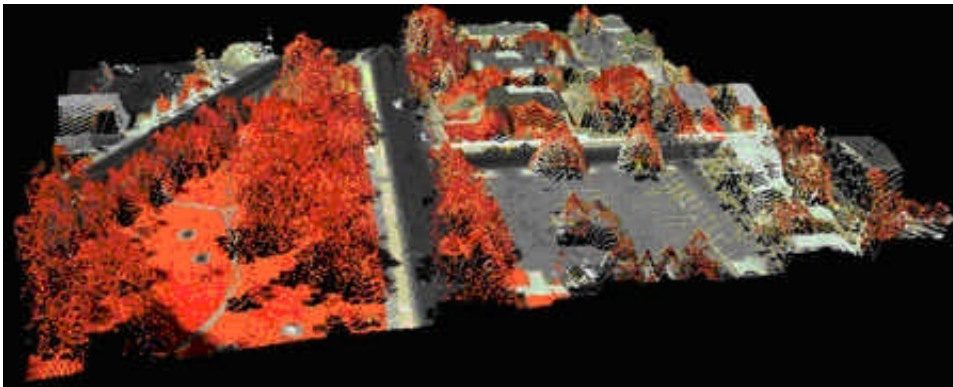
Wicks explains "Because image pixels outside the near-nadir area cannot be accurately correlated with the LIDAR points, traditional film and large format digital cameras are impractical for the collection of imagery for this application. Spectrum Mapping's medium format digital camera system is ideal for this innovative treatment of LIDAR data." He adds, "The longer focal length and smaller field of view of our digital camera virtually eliminates building "lean" and matches the swath width of the LIDAR system allowing the proper alignment of LIDAR data and pixels."

"By using imagery acquired simultaneously with the surface data, each surface point possesses an accurate spectral signature assigned to its location, allowing accurate classification of features using conventional remote sensing techniques." Wicks concludes, "Through the element of color, SILC data allows urban terrain, forested terrain, agricultural lands, mountains, cliffs, ravines, and wetlands to be subjectively masked and classified, providing vastly improved bare-earth surfaces and feature extraction."



LIDAR Returns Colored by
Elevation Perspective View

“The SILC methodology allows for accurate feature classification, a surface correctly modeled and the best representation of the bare earth terrain.”



CIR Enhanced SILC Data
Perspective View

SILC may not be the Holy Grail of automated feature extraction for which the mapping industry has been searching since the advent of soft-copy photogrammetry. But, it certainly enhances the art of LIDAR processing by providing high-quality bare earth generation and improving the accuracy of feature classification.

About Spectrum Mapping, LLC:



Spectrum Mapping, LLC is a full-service mapping, software development, and GIS company with six offices located throughout the United States and Canada. Spectrum’s full-service mapping core competencies are in the fields of LIDAR; Photogrammetry; Remote Sensing Services; Digital Camera Development and Sales; and Software Development. With over 25 years experience, Spectrum Mapping is unique in the mapping

industry because of the wide range of technology it has access to internally. With LIDAR and hyperspectral imaging systems, digital cameras, and extensive photogrammetric equipment, Spectrum is one of the largest mapping companies in the U.S. Being able to work with various sensors and successfully exploring new and innovative solutions for how to fuse and develop new products using geospatial data, has given Spectrum a large competitive advantage in the mapping industry.

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Additional information on SILC can be found at:

<http://www.spectrummapping.com/rem-lidar-silc.html>