Mapping Matters

Your Questions Answered

The layman's perspective on technical theory and practical applications of mapping and GIS

By Qassim A. Abdullah, Ph.D., PLS, CP**

Q: What is meant by color or colorized lidar and what is it used for?

Dr. Abdullah: The literal meaning of the terms "color lidar" or "colorized lidar" could imply two different things:

Colorized lidar

The latest topographical lidar data processing techniques utilize imagery to aid in the interpretation and filtering of lidar data. Many vendors are now acquiring digital imagery concurrent with the lidar data mission. Having an integrated lidar/digital camera solution provides many advantages for data providers and users alike. On the data providers' level, the digital imagery, whether natural-color (RGB) or color-infrared (CIR), can be used for:

- Generating simply georeferenced or accurately orthorectified imagery to aid in terrain analysis and interpretation when attempting to convert the lidar data to a bare-earth elevation model. The orthorectified imagery can also be provided to the end user as a useful by-product with minimum cost;
- Assigning the spectral color of the digital imagery to the corresponding lidar returns (points) that fall within the same geographic location of the digital pixel of the imagery. This more sophisticated technique results in pseudo lidar intensity or elevation data that resembles the color digital imagery. Such products can greatly benefit the interpretation and examination of the lidar surface since the human brain functions more efficiently in interpreting colorized terrain data as opposed to black-and-white data sets.
- Applying supervised or non-supervised digital image classification, an advanced concept widely used in remote sensing applications, to spectrally classify imagery and then assign these spectral classes to the lidar data in a fashion similar to the technique described above. Accomplished by using specialized processing software, the spectral classification of the digital imagery delineates with great success the different terrain cover categories, such as water bodies, vegetation types, and impervious surfaces that are difficult to achieve from lidar data alone. Once the results of the spectral classification are attributed to the lidar points, the filtering software utilizes this new attribute information, combined with the spatial property of the lidar surface (elevation and slope), to come up with the most accurate and automated way of classifying and filtering the lidar surface. A technique like this not only enhances the quality of the bare-earth elevation model but also reduces costs by minimizing or eliminating many of the manual editing and filtering efforts.

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Color lidar

The term "green laser" is widely used to describe the bathymetry lidar used for three-dimensional, high precision surveys of seabeds and objects in the water column. Using light energy to penetrate seawater in much the same way as a multi-beam echo sounder, bathymetry lidar systems usually comprise a twin laser generator (red-infrared and blue-green portions of the electromagnetic spectrum) providing an effective depth sounding frequency. The basic laser sounding principle is similar to acoustic methods. A pulse of laser light is transmitted from the system toward the water surface in a predefined pattern. The red-infrared laser light is reflected at the water surface, whereas the blue-green laser light penetrates into the water column and reflects from the objects or particles along the laser path or the seabed, if it makes it all the way there. The water depth is equal to the time elapsed between the two echo pulses, multiplied by the speed of light in water. Typical water depth penetration is in the range 20–40m but, in good conditions, depths as great as 70m are possible.

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