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: How effective are lidar datasets in mapping land features such as roads and buildings?

Answer: Constructing two-dimensional and three-dimensional building models and other land features requires accurate delineation of sharp building edges and this traditionally has been accomplished using photogrammetric stereo compilation. All past attempts to automate the extraction of ground features from dense lidar datasets with a post spacing of one to three meters for the purpose of planimetric mapping have failed for one reason: the rounded and jagged edges of delineated buildings and other manmade features. Despite some software efforts to employ smart algorithms that correct the geometrical shape of objects, this type of modeling remains less appealing to service providers and customers alike as it does not meet horizontal map accuracy requirements for large-scale mapping. The ASPRS standard requires buildings be placed within one foot of their true ground position when compiled from a map with a scale of 1"=100'. Recent advancements in lidar systems enable the collection of ultra-dense lidar datasets with point density of five to eight points per square meter (ppsm), which makes the data more suitable for use in the aforementioned modeling algorithms. The downside of such demanding software requirements is the high cost associated with the aerial acquisition due to the additional flight lines required to collect the ultra-dense lidar data. Traditionally, a lidar dataset used for terrain modeling is collected with a nominal post spacing ranging between one meter and three meters or a point density ranging between one ppsm and 0.11 ppsm. The ratio between the data densities of the normally collected dataset and the ultra-dense dataset ranges from 20:1 to 32:1. This is true if we assume the normal density dataset is collected with two meter post spacing or 0.25 ppsm. This does not necessarily translate to the same ratio in cost increase, but it could come very close. In many cases the high cost of acquisition coupled with the massive amount of resulting lidar data prohibits the use of ultra-dense lidar data for accurate building modeling and may encourage providers and customers to consider other means, such as traditional photogrammetric modeling, for this purpose. Finally, while ultra-dense lidar datasets may not currently be cost-effective for large-scale modeling, the technology is impressive in the sense of delineating details. A recent acquisition of an ultra-dense lidar dataset with about six ppsm over the city of Baltimore, Maryland, reveals great details of the baseball game underway in the Camden Yards baseball stadium, as shown in Figures 1 through 3. Baseball fans can easily observe which base was occupied at that moment!.

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Figure 1 Detailed lidar-derived 3D Map of a Baseball game at the Oriole Park at Camden Yards , Baltimore, MD – Image like shaded relief of lidar dataset.

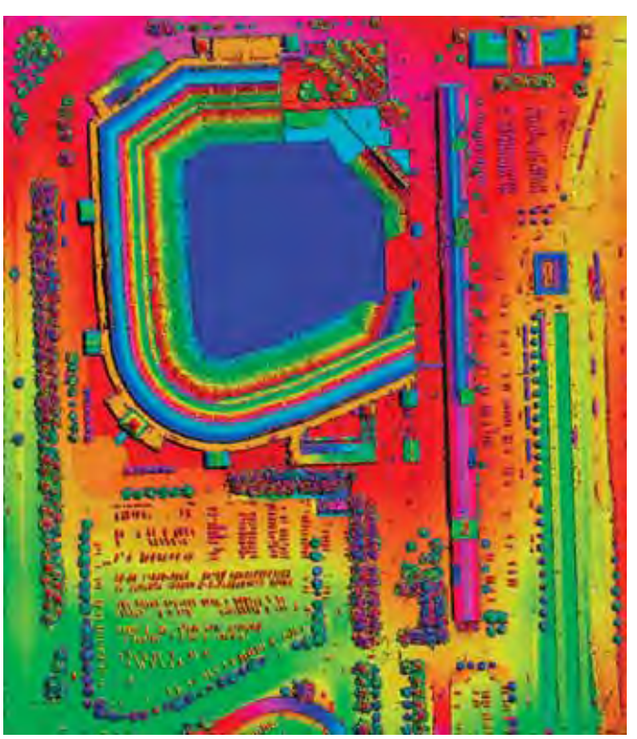

Figure 2 Detailed lidar-derived 3D Map of a Baseball game at the Oriole Park at Camden Yards , Baltimore, MD – Colored shaded relief TIN

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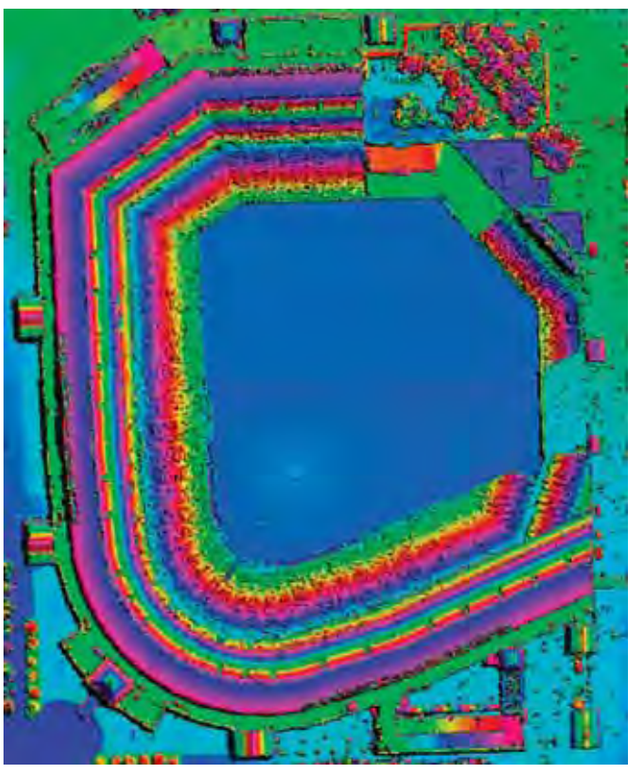

Figure 3 The Baseball Game, a closer look.

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