Abstracts - Technical Presentations

1st Joint LiDAR Workshop
29 June 2016

10:30 AM
Title: The "Finer" details: Processing algorithm adjustment and point cloud/survey data statistics in wetlands.
Authors: Sandra Fox (SJRWMD), Paul Finer (SJRWMD), Stephen Speaks (SJRWMD), Kevan Adams (UF) and Keith Patterson (Dewberry)

Abstract: Problems with LiDAR-derived DEMs have been documented in wetlands. In comparison to survey data, the LiDAR-derived surface may be too high (true ground obscured by dense vegetation), too low (inappropriate processing of LiDAR point cloud), or confounded with standing water (flight deployment issues). These problems revolve around the specifications for data collection (i.e. aggregate nominal point density; checkpoint requirements; "fly when it's dry") and data processing algorithms (often proprietary).

A common approach is to lower the DEM's accuracy standard for wetland areas. DEM users then have the option of correcting the DEM in wetland areas, a major undertaking. But, what's going on with the point cloud? Are any of the returns in wetlands actually representative of "true ground"?

Point cloud statistics in wetlands are compared with survey data for two projects in the Upper St. Johns River Basin, one at an aggregate nominal point density (ANPD, pls/m2) of 2 and the other at 6 ANPD. Additionally, a 7,500-acre areal portion of the 6 ANPD point cloud was re-processed, producing a DEM with a balanced error model (mean difference between survey and LiDAR-derived DEM = 0.037 ft) where the originally delivered DEM was heavily skewed, with a mean error of -0.42 ft (DEM consistently lower than survey). This demonstrates that sufficient true ground returns were contained within the 6 ANPD point cloud and the error in the original DEM was due to the processing algorithm used by the original vendor.

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10:50 AM
Title: Adjusting Lidar-Derived Digital Terrain Models in Coastal Marshes
Author: Stephen Medeiros, PhD, PE

Abstract: Digital elevation models (DEMs) derived from airborne lidar are traditionally unreliable in coastal salt marshes due to the inability of the laser to penetrate the dense grasses and reach the underlying soil. To that end, we developed a novel processing methodology that uses ASTER Band 2 (visible red), an interferometric SAR (IfSAR) digital surface model, and lidar-derived canopy height to classify biomass density. Elevation corrections associated with aboveground biomass density were applied to adjust lidar-derived elevation values closer to true bare earth elevation. The performance of the method was tested on 229 elevation points in the lower Apalachicola River Marsh. The method significantly improved the accuracy of the lidar DEM, reducing the high bias by approximately 49%. A brief survey of salt marsh elevation adjustment will also be presented.

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11:10 AM
Title: Application of LiDAR data for Wet Channel Network Extraction
Author: Milad Hooshyar, PhD Candidate

Abstract: The temporal dynamics of stream networks are vitally important for understanding hydrologic processes including surface water and groundwater interaction and hydrograph recession. However, observations of wet channel networks are limited, especially in headwater catchments. Near infrared LiDAR data provide an opportunity to map wet channel networks owing to the fine spatial resolution and strong absorption of light energy by water surfaces. A systematic method is developed to map wet channel networks by integrating elevation and signal intensity of ground returns. The signal intensity thresholds for identifying wet pixels are extracted from frequency distributions of intensity return within the convergent topography extent using a Gaussian mixture model.

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11:30 AM
Title: Geostatistically Modeling LiDAR Bare Earth Data to Improve Landscape Visualization for Wetland Delineation
Authors: Rex Ellis (SJRWMD), Travis Richardson (SJRWMD)

Abstract: Light Detecting and Ranging (LiDAR) can be used to improve wetland delineation for regulatory compliance, but existing LiDAR products are noisy in and around heavily vegetated areas such as wetlands. While point density is clearly an underlying issue in these areas, this can be overcome by changes in LiDAR point modeling. The default triangular irregular network (TIN) approach used for spatially interpolating a bare earth data set into a raster digital elevation model (DEM) often results in a rough surface texture that confounds landscape visualization. This work compares DEM LiDAR products derived using smoother interpolation techniques such as kriging and polynomial trend surfaces. Elevation contours extracted from these and the TIN-based DEMs were compared to field-delineated wetland boundaries. Polynomial trend surface DEMs provided an improved visualization of the land and generally agreed with the field delineations. The TIN-based DEMs were noisiest and most confusing near wetlands.

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11:50
Title: An Application for Topo-Bathymetric Lidar on the Springs Coast of Florida
Authors: Alvan Karlin, Ph.D., CMS, GISP - Southwest Florida Water Management District
Amar Nayegandhi, CP, CMS, GISP – Dewberry

Abstract: The "Springs Coast" of Florida extends from Anclote Key northward through the Gulf of Mexico where numerous 1st and 2nd order springs emerge as a result of the karst topography. While terrestrial karst presents challenges for terrestrial lidar, off- and near-shore karst pockets tend to accumulate debris which present additional challenges to bathymetric mapping. Although the Southwest Florida Water Management District (SWFWMD) has been collecting near-infrared (1064nm) lidar data since 2003 for topographic mapping, the first topobathymetric (532nm) lidar study was performed in 2013. The success of this project, led the District to engage in a pilot project to determine the efficiency of using topobathymetric lidar to map a small cluster of coastal springs. Through a cooperative pilot project with the Joint Airborne Lidar Bathymetric Technical Center of Expertise (JALBTCX) and Dewberry, a Teledyne/Optech Coastal Zone Mapping and Imaging lidar sensor was used to collect lidar data for the Kings Bay/Three Sisters springs system in Citrus County, Florida during the Spring of 2015. This discussion highlights the results of the recent study and compares the results to more conventional hydrographic survey conducted with single-beam sonar and pole-soundings.

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