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AN INTEGRATED APPROACH TO ACCURATE DEM GENERARTION USING AIRBOREN FULL WAVEFORM LIDAR DATA

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Abstract. In this study, full waveform LiDAR data were exploited to improve the generation of a large-scale digital elevation model (DEM). Building on the methods of progressive generation of triangulation irregular network (TIN) model reported in the literature, we proposed an integrated approach. In this method, echo detection, terrain identification, and TIN generation were performed synergically and iteratively, instead of their separate determinations as in most DEM generation methods. This method started with a TIN model made up of terrain points detected using a morphological opening operation and a curve matching method. For any given TIN facet, the full waveforms of the return associated with the laser pulses interacting with this TIN facet were examined near the surface for any terrain echoes. The TIN was then updated using the newly detected terrain points. These processes were iterated until no new terrain points were identified. The developed method was tested on a data set collected by a Riegl LMS Q-560 scanner over a study area near Sault Ste. Marie, Ontario, Canada (46 $^{\circ}$ 33'56''N, 83 $^{\circ}$ 25'18''W). The results demonstrated that 30% more terrain points were identified under shrubs and trees using this integrated approach, compared with the commonly used Gaussian decomposition method. The DEMs generated by the developed method exhibited more details in the terrain for two test sites than those obtained by using the TerraScan software.

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