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An Enhanced Technique for LIDAR Data Reduction

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Abstract

Light detection and ranging (LIDAR) is a remote sensing system. It can be used to acquire ground information and stereo information of ground objects through the whole day. It relies on laser beams launched by the sensors at specific angles and on specific dimensions so as to get the desired quality.LIDAR system produces optic pulses in direction to the surface, where they are reflected off and returned to the receiver. The receiver accurately measures the travel time of the pulse from its start to its return. As the pulse travels at the speed of the light, the receiver senses the return pulse before the next pulse is sent out. Since the speed of the light is known, the travel time of the pulse can be converted into distanceData collected with (LIDAR) provide highly accurate representations of the earth's surface features and are used to produce digital elevation techniques (DEMs).

There is no scope to match data acquisition density during a LIDAR data collection mission, some over sampling is usually inevitable. Thus the processing of large LIDAR data volumes exceeds traditional hardware, storage and software capabilities.Consequently, the strategies for handling the huge volume of terrain data without giving up precision are required given that data reduction should be conducted such that critical elements are kept while less important elements are

removed; hence the key issue is how to evaluate the significance of each data point.

The goal of this thesis is to present a technique for LIDAR data reduction based on Radial Basis Function (RBF). Instead of using multi-quadratic radial basis and thin plate spline, the thesis proposes using the Gaussian interpolation method. Preliminary results show the predominance of the proposed technique over the others with an improvement of 5.3% accuracy. Where the similarity between the DEM that generated using Gaussian interpolation method and original DEM is more than the similarity between the DEM that generated using MQ or TPS interpolation methods and original DEM. However, the processing time is higher than the other approaches. To overcome this problem, the initial selection criteria is altered based on two different feature extraction techniques to obtain a trade-off between accuracy and execution time. Results shows an improvement of execution time relative to the other methods with achieve in accuracy with average difference 3.7 %.