World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:12, No:12, 2018

Comparison of Data Reduction Algorithms for Image-Based Point Cloud Derived Digital Terrain Models

Authors : M. Uysal, M. Yilmaz, I. Tiryakioğlu

Abstract : Digital Terrain Model (DTM) is a digital numerical representation of the Earth's surface. DTMs have been applied to a diverse field of tasks, such as urban planning, military, glacier mapping, disaster management. In the expression of the Earth' surface as a mathematical model, an infinite number of point measurements are needed. Because of the impossibility of this case, the points at regular intervals are measured to characterize the Earth's surface and DTM of the Earth is generated. Hitherto, the classical measurement techniques and photogrammetry method have widespread use in the construction of DTM. At present, RADAR, LiDAR, and stereo satellite images are also used for the construction of DTM. In recent years, especially because of its superiorities, Airborne Light Detection and Ranging (LiDAR) has an increased use in DTM applications. A 3D point cloud is created with LiDAR technology by obtaining numerous point data. However recently, by the development in image mapping methods, the use of unmanned aerial vehicles (UAV) for photogrammetric data acquisition has increased DTM generation from image-based point cloud. The accuracy of the DTM depends on various factors such as data collection method, the distribution of elevation points, the point density, properties of the surface and interpolation methods. In this study, the random data reduction method is compared for DTMs generated from image based point cloud data. The original image based point cloud data set (100%) is reduced to a series of subsets by using random algorithm, representing the 75, 50, 25 and 5% of the original image based point cloud data set. Over the ANS campus of Afyon Kocatepe University as the test area, DTM constructed from the original image based point cloud data set is compared with DTMs interpolated from reduced data sets by Kriging interpolation method. The results show that the random data reduction method can be used to reduce the image based point cloud datasets to 50% density level while still maintaining the quality of DTM.

Keywords : DTM, Unmanned Aerial Vehicle (UAV), uniform, random, kriging
Conference Title : ICESTA 2018 : International Conference on Earth Sciences, Technologies and Applications
Conference Location : Amsterdam, Netherlands
Conference Dates : December 03-04, 2018