Comparison of LIDAR and RTK GPS elevations case study: Kisii municipality

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Abstract:

Surface terrain information is required to economically site new or relocate existing infrastructure facilities and make final design plans. Currently, ground surveying and photogrammetric mapping are the methods used to acquire this data. Both methods are time and resource intensive since they require significant data collection and reduction to provide the level of detail necessary for facility location. Additionally conventional surveying entails data collection entirely in the field and may require that collection personnel locate data on or near heavily traveled roadways. Light Detection and Ranging (LiDAR) may provide an alternative technology to obtain terrain information in a more expedient manner. Data can be collected under a variety of environmental conditions including low sun angle, forest cover, cloudy conditions, and even darkness, resulting in expanded windows for data collection. Despite the relatively up front high cost of airborne LiDAR-derived digital elevation models (DEMs), such products are usually presented without a satisfactory associated estimate of accuracy. The research presented here examines the elevation accuracy of LiDAR as it compares to a set of GPS control points on varying surfaces. This allowed for a determination of which surfaces LiDAR performed well on, as well as surfaces it did not. The results of comparison were achieved by recovering randomly selected LiDAR points for different land cover. surfaces on the ground and then picking their heights with R TK GPS for comparison purposes. At least twenty points were recovered for each land cover category. The RMSE was then computed by subtracting the RTK GPS (survey) elevations from the LiDAR elevations. The results showed that LiDAR was not as accurate as would have been expected on hard surfaces (Tarmac road), RMSE of0.38Sm as compared to grass surface which gave a RMSE of O.202m. The above results therefore show that before any data is used, it is important to know its accuracy and limitations. The results also show that LiDAR data cannot replace ground surveying methods for collecting data for final design of infrastructural facilities like roads.