THE EFFECTIVENESS OF TOPOGRAPHIC EARTH REPRESENTATIONS IN FOREST ENGINEERING

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Summary

Digital elevation data, commonly known as DTM, DEM, DTD, etc., consist of a group of elevation measurements recorded for regularly spaced positions distributed over any given land surface. These are the most widely used means to analyze the earth surface. They are the topographic representation of the earth surface excluding the objects which are on but not an intrinsic part of the actual surface. Digital elevation data can be used in a broad range of military, engineering and planning applications. They are extensively used utilized in the field of engineering to calculate earth works such as cut and fill requirements in road construction; in any given area that is likely to be flooded by the rising water levels behind a hydroelectric dam or to analyze areas that can be observed from any position within the modeled terrain (view shed). DEMs form one of the principal layers of information in a geographic information system (GIS). The analysis of terrain characteristics such as elevation, slope, aspect and cross sections can effectively be extracted from them. Furthermore, topographic functions can be used to calculate values that define the topography at any specific location. Slope maps derived from DEMs can especially be used in helping such activities as forest road and harvest planning, soil erosion assessments, etc. Today, there are different types of DEMs obtained through various means such as SRTM, Aster GDEM, HRS DEM, automatic and manual contour generation from hardcopy or quad maps, tacheometric measurements, LIDAR, etc. available for any given task. At this point, accuracy of the DEM is rather important for any planned project because the more realistic the calculations done over a DEM, the more accurate the expected results before undertaking the actual field work. In the scope of this study, all likely candidates of DEMs or DEM making means in a Turkish setting, in the province of Kastamonu, will be compared for a specific task, cross sectional accuracy, over the reference data set, either LIDAR or tacheometry/GPS generated model. The result will help the foresters to which type of data set will suit their operational planning needs best.

Keywords: DEM, forestry, harvest planning

3D models for a 2 km^2 area, which will house a irrigation/flood control dam in the near future, generated from different data sources: three different sets of hardcopy Turkish topographic maps (scaled 1/25000), 1960, 1993 and 2010 (manual digitizing), SRTM global DEM coverage (online source, ready to use elevation embedded raster), Aster GDEM coverage (online sources, ready to use elevation embedded raster) and automatically generated counters (elevation embedded vector from Turkish General Command of Mapping) were compared to a 3D model accuracy of which was guaranteed from the measurements of a high precision Real Time Kinematic (RTK) GPS device. Despite being very time consuming, a labor intensive GPS device was the choice for collection high precision ground data to compare to the alternatives because no other means i. e. LIDAR or satellite data were practical and cost efficient under Turkish conditions. Although LIDAR technology has long

been effectively used for collecting such data, neither it, nor satellite data is still practical and cost efficient for small to medium size projects in Turkey. In forestry, the standard topographic maps and any kind of information, including DEM, extracted from them is the way to go for foresters. Unfortunately, obtaining the maps is classified as “service only” so it requires a long procedure to order one. At this point, if the earth works related projects are at stake, Aster GDEM provides a very decent and easily obtainable alternative to any map related data.