Development of a System Aiding Designing and Planning on Airborne and Mobile LIDAR Data Acquisition Process

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Abstract: Point cloud data obtained from LIDAR (Light Detection and Ranging) technology and its derived value-added products have been used in various applications. Exhaustive listing of its applications is not plausible, however most of them exploit 3D object models created from LIDAR data through feature extraction and 3D object modeling or 3D reconstruction procedures. Such procedures to be successful and to yield satisfactory created products require good quality collected LIDAR point cloud data. One of the key properties of point cloud data is the point density which facilitate feature extraction from point cloud data to ensure successful 3D modeling process. To achieve high point density of point cloud data, data acquisition planning is necessary. In general, many aspects need to be considered in designing and planning of data acquisition process, however, when focusing on the point density property of the collected point cloud, specification and ability of the laser scanner and the operational manner are the key parameters. In this study a software module/system is developed to assist planning in data acquisition process. This software makes it possible for the users to simulate the pattern of point cloud data to be appeared on many variety types of the signalized reflective targets and plane ground surface. This system allowed users to select different customizable size and available patterns of reflective targets to be used in the simulation process, additionally users can also define their own reflective targets to be used in the simulation process The simulation approach is based on 1) the selection of the scene on which scanned point cloud is simulated; the scene can be selected either to be a customizable reflective targets or plane ground surface, 2) the specification of the laser scanner unit and 3) parameters considered in the operational manners of a LIDAR data collection. To specify the laser scanner unit to be used in the simulation process, this software allow users to select many commercially made units available as off-the-shelf product in the market or users can define their own unit to be used by customizing many basic properties of the laser scanner (such as scan rate, point repetition rate, fixture installed height and angles, etc.). Additionally, the simulation approach of this software also considers 2 parameters of the operational manners in a LIDAR data collection, those are the driving/flying speed of the platform and the range/height between the scanned scene and the laser unit. This developed software module/system make it possible for users to visual the

final pattern of to-be-scanned point cloud on the scene and to calculate the expected point cloud density to be achieved. Knowing expected point density is the key in ensuring successfulness of feature extraction and 3D object modeling procedures. Good quality created 3D models/objects from the point cloud can benefits many applications. This warrants the usefulness and the benefits of this software/system to the designing and planning of the LIDAR data acquisition process which has direct consequences on the quality of the scanned point cloud and the derived value-added products.

Keywords: LIDAR, Laser Scanning, Mobile Mapping System, Point Density, Simulation