Evaluating the Efficiency of small Unmanned Aerial System (sUAS) against Conventional Field Surveying Techniques for Monitoring Earthen Levee System in South Louisiana

Brennon Dardar[1], Gary LaFleur, Jr[2,] and Balaji Ramachandran[1]
1 Undergraduate Research Assistant, Geomatics Program, Department of Applied Sciences, **bdardar1@its.nicholls.edu**
2 Center for Bayou Studies and Department of Biological Sciences, gary.lafleur@nicholls.edu
1 Geomatics Program, Department of Applied Sciences, balaji.ram@nicholls.edu
Nicholls State University

The main objective of this project is to evaluate the efficiency of small Unmanned Aerial System (sUAS) for monitoring earthen levee structures. The methodology involved comparing volumetric quantities derived from photogrammetry derived 3D Point Clouds, conventional differential leveling, Real Time Kinematic (RTK) Global Navigation Satellite System (GNSS) survey, Terrestrial Laser Scanning System (TLSS), and Light Detection and Ranging (LiDAR) of the same section along the levee alignment. The study area is the south 200 ft. of a 4.5 mile stretch of the Morganza to the Gulf levee system, Louisiana. A monument set near the levee was used as a control to perform conventional differential leveling and RTK-GNSS survey. Elevation data at critical points such as top, shoulders, and toes along the levee alignment at an established 6.1 m (20 ft.) reference grid was collected. A TLSS was used to generate a digital terrain model (DTM) to overlay the reference grid. An analysis of sUAS photo derived deliverables showed a ±2.5 cm horizontal and ±0.4 cm vertical precision at a 95% confidence level on the checkpoints used. A LiDAR equipped sUAS was flown over the alignment and a 3D point cloud was extracted for ground coordinates. A triangulated irregular network (TIN) surface was generated using the leveling, RTK-GNSS survey, photo derived, and LIDAR 3D point cloud data. The volumetric quantities derived from each TIN surfaces were compared. The difference in volumetric estimates between sUAS and differential leveling was 21.5 cu.m. (in other words two small truck loads over 200 ft.). The study show that sUAS method was most accurate compared to other topographic surveying techniques. It can be concluded that sUAS technique is a more accurate and cost effective topographic surveying method. Future work includes the development of filtering mechanism to eliminate noise and accurately model surfaces generated from point clouds.