

Develop LiDAR detection / extraction techniques: CIBAC Task

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LiDAR images contain various signatures from reflecting surfaces. Develop and/or refine algorithms for determining whether the signal is noise, an error, or a potential object, and identify the type of object. Extract significant features (i.e. obstacles, runway/taxiway edges), confirming their location, also distinguishing real obstacles from LiDAR "glitches."

One useful task would be to extract all data with an elevation 75 m above ground level. Determine error distributions. A non-real time system would be useful for creating airport databases. A real-time system could be an integrity monitor function for low vis surface ops. Several LiDAR sets that contain typical spikes are available. We currently use QT Viewer (to create images and visualize flight paths) and MATLAB (for statistical analysis and pattern detection) to process LiDAR data. (It is hard to visualize large data files with MATLAB.)

Statement of Work: Activities/Ideas/Approach

- Extract intensity images and range images from LiDAR instrument data from CD by using appropriate interpolation techniques (bilinear, bicubic, or spline).
- Using Matlab image processing tool kit, apply smoothing algorithm on intensity images for noise cleaning.
- Detect different features from the intensity images such as obstacles, runways, taxiways by using the feature description document.
- Detect obstacles on the runways by fusing the information from edges and objects. The idea is objects on runways is potential.
- From LiDAR range images detect all objects which are about 75 m above the ground level.
- Explore the real-time implementation of the above algorithms.
- Student integration into project
 - Expose the students to image processing algorithms
 - Noise cleaning, smoothing, contrast improvement
 - Image features, obstacle detection, line feature detection
 - Integrating the real world scene with database of the location