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LIDAR DATA ANALYSIS FOR AUTOMATIC REGION SEGMENTATION AND OBJECT CLASSIFICATION

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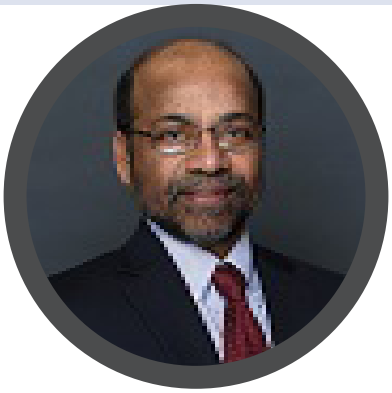
Light detection and ranging (LIDAR) presents a series of unique challenges, the foremost of these being object identification. Because of the ease of aerial collection and high range resolution, analysts are often faced with the challenge of sorting through large datasets and making informed decisions across multiple square miles of data. This problem has made automatic target detection in LIDAR a priority. We propose a novel algorithm with the overall goal of automatic identification of five object classes within aerially collected LIDAR data: ground, buildings, vehicles, vegetation and power lines. The main objective of this research is addressed as two specific tasks viz. region segmentation and object classification. The segmentation portion of the algorithm uses a progressive morphological filter to separate the ground points from the object points. The object points are then examined and a Normal Octree Region Merging (NORM) segmentation process is applied. This new segmentation technique, based on surface normal similarities, subdivides the object points into clusters. Next, for each cluster of object points, a Shape-based Eigen Local Feature (SELF) is computed. Finally, the features are used as the input to a cascade of classifiers, where four individual support vector machines (SVM) are trained to distinguish the object points into the remaining four classes. The ability of the algorithm to segment points into complete objects and also classify each point into its correct class is evaluated. Both the segmentation and classification results are compared to datasets which have been manually ground-truthed. The evaluation demonstrates the success of the proposed algorithm in segmenting and distinguishing between five classes of objects in a LIDAR point cloud. Future work in this direction includes developing a method to identify the volume changes in a scene over time in an effort to provide further contextual information about a given area.



Biography

Vijayan Asari is the University of Dayton Ohio Research Scholars Endowed Chair in Wide Area Surveillance and a Professor with the Department of Electrical and Computer Engineering. He is also the Director of the Center of Excellence for Computer Vision and Wide Area Surveillance Research (Vision Lab). He is the Senior Member of IEEE since 2001 and Senior Member of the SPIE. He co-organized several IEEE and SPIE conferences and workshops. He is also a Member of IEEE Computational Intelligence Society (CIS); IEEE Systems, Man and Cybernetics Society (SMC) Technical Committee of Human Perception in Vision, Graphics and Multimedia; IEEE Internet of Things (IoT) Community; Society for Imaging Science and Technology (IS&T); IS&T Data Analytics and Marketing Task Force; Institute for Systems and Technologies of Information, Control and Communication (INSTICC); and American Society for Engineering Education (ASEE).

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