World Academy of Science, Engineering and Technology
International Journal of Energy and Environmental Engineering
Vol:17, No:02, 2023

Clustering and Modelling Electricity Conductors from 3D Point Clouds in Complex Real-World Environments

Authors : Rahul Paul, Peter Mctaggart, Luke Skinner

Abstract : Maintaining public safety and network reliability are the core objectives of all electricity distributors globally. For many electricity distributors, managing vegetation clearances from their above ground assets (poles and conductors) is the most important and costly risk mitigation control employed to meet these objectives. Light Detection And Ranging (LiDAR) is widely used by utilities as a cost-effective method to inspect their spatially-distributed assets at scale, often captured using high powered LiDAR scanners attached to fixed wing or rotary aircraft. The resulting 3D point cloud model is used by these utilities to perform engineering grade measurements that guide the prioritisation of vegetation cutting programs. Advances in computer vision and machine-learning approaches are increasingly applied to increase automation and reduce inspection costs and time; however, real-world LiDAR capture variables (e.g., aircraft speed and height) create complexity, noise, and missing data, reducing the effectiveness of these approaches. This paper proposes a method for identifying each conductor from LiDAR data via clustering methods that can precisely reconstruct conductors in complex real-world configurations in the presence of high levels of noise. It proposes 3D catenary models for individual clusters fitted to the captured LiDAR data points using a least square method. An iterative learning process is used to identify potential conductor models between pole pairs. The proposed method identifies the optimum parameters of the catenary function and then fits the LiDAR points to reconstruct the conductors.

Keywords : point cloud, LİDAR data, machine learning, computer vision, catenary curve, vegetation management, utility industry
Conference Title : ICODEA 2023 : International Conference on Open Data and Energy Analytics
Conference Location : Sydney, Australia
Conference Dates : February 20-21, 2023

Open Science Index, Energy and Environmental Engineering Vol:17, No:02, 2023 publications.waset.org/abstracts/156067.pdf