The Department of Electrical and Computer Engineering

Announces the

Final Defense of Dissertation

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Title: Automation of Bucket Wheel Reclaimer

Abstract: Stockpile reclaiming using a Bucket Wheel Reclaimer (BWR) is an important part of stockyard management. The growth in demand for material handling over the years has drawn attention to improve the automation of the process. However, studies have shown that stockpiled products are being reclaimed at approximately 50% of their potential. This study focuses on the challenges in the automation of stockyard management system using a BWR.

For high accuracy point cloud computation and surface reconstruction of the stockpiled materials, accurate calibration is of crucial importance. This dissertation presents a calibration technique to estimate the GNSS-LIDAR extrinsic parameters of BWR's. The approach presented works with one or more 2D LIDARs and does not require special markers (e.g., reflective tape) or surveyed locations (other than a DGNSS base station antenna). The method and its accuracy have been demonstrated using experimental data from a stockyard environment. Regarding real-time management and control, the dissertation presents a technique for real-time point cloud management, visualization, and feature extraction for large scale stockyards environments. The software solution described continuously manages the point cloud in real-time as the sensors stream data. It also displays the current stockpile on an interactive interface that allows the user to see the surface from different viewpoints, interrogate the coordinates of any surface location, and computes the BWR entry and exit point for automated operation. The software is tested using experimental data from a port located in Yantai, China.