

Utilization of Low Pass Filters for the Calculation of Termination Points for 3D fabrication control of Pipe Spools

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ABSTRACT

In the context of prefabrication and modularization, termination points are defined as local coordinate systems where assemblies are either connected or constrained. These points are typically points of connection between assemblies, sub-assemblies, or modules. As such, it is critical to ensure that termination points are measured accurately. In this study, the impact of point cloud filtering as a pre-processing step for improving the accuracy of detecting termination points in point clouds is investigated. An industrial-scale experiment was conducted where 3D scans of 40 piping components were collected and analysed while being fabricated. For data collection, each piping object was scanned using a laser scanner as well as a SLAM (Simultaneous Localization And Mapping) scanner (80 point clouds were collected in total). The components vary in their design geometry. Using a guided Hough Transform, a circle fitting method was developed to find the termination points in the scanned point clouds. It was then shown that applying noise removal as a pre-processing step for the termination point calculation can substantially improve the accuracy irrespective of the source of acquisition.