Automatic 3D Industrial Point Cloud Modeling and Recognition

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Goal
Automatic modeling and recognition of 3D industrial site point clouds

Algorithm – Individual Components
- Consider input to be a congregation of pipes, planes and objects
- Primitive Extraction
  - Pipes are modeled by projecting normal on Gaussian sphere and detect global similarity, creating pipes with detected parameters
  - Plane points are classified by FPFH descriptors trained by SVM
- Object Recognition
  - Object are recognized by converting point clouds into 3D image, then using scanning window to extract and evaluate 3D features

Algorithm – Cross-Component Improvements
- Recognized objects may not be aligned with each other because they are independently searched for and detected
- Align pre-defined object axis to pipe segment already modeled
- Establish missing pipe segment from gaps between detected objects
- Removing primitive shape points can speed-up object recognition

Results Labelling and Display
- Pipes, planes and objects are independently recognized and modeled
- Objects can be displayed in point clouds for accuracy, mesh model for efficiency or original point cloud cropped at detected locations
- Compare to original point cloud, professionally hand-made model (wrong number of pipelines) and automatic commercial software

Algorithm Flow-chart

More Results

Acknowledgement: This work is supported by Chevron U.S.A. Inc. under the joint project Center for Interactive Smart Oilfield Technologies (CiSoft), at the University of Southern California.