Post-processing of Laser Scanning point clouds for the as-built modeling of Petrochemical Installations

Dipl.-Ing. Dipl.-Inf Aymen TRIGUI
Société d'Etudes Topographiques et Foncières (SETOF)
1 rue Jean Jacques Rousseau
Tunis, TUNISIA

Contents

- Need for digitizing petrochemical plants

- Plant operator requirements

- « Intelligent » 3D Model vs. Geometrical 3D Model

- Test site and test data

- Scan data post-processing pipeline, state of the art

- Future Research Directions

The need for modeling petrochemical plants

- Petrochemical installations are extremely complex facilities

- The installation operator faces a lot of challenges

- Accurate description of the plant would be a great help for the operator.

- Often no reliable documents describing the exact site condition are available.

- The only suitable surveying technique for such complex plants is

Laser Scanning
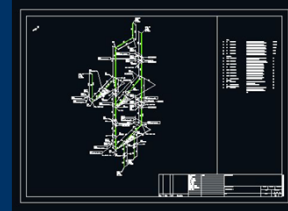

Plant operator requirements

- Besides the geometry, the plant operator is interested in:
  • a higher level representation like 3D models
  • the integration of the 3D model in the plant management system

- The end product shall be able to
  • provide Process control data
  • enable asset inventories, bill of materials
  • enable automatic generation of isometrics and orthometrics
  • provide a database for the maintenance work orders
  • assist construction and project management

- The end product should contain semantic and topological information on the base of field specific knowledge.

"intelligent" 3D model

Geometrical vs. Intelligent 3D model

Geometrical 3D model
- contains only the geometrical information.
- Could only be used for visualisation purposes or for clash detections.
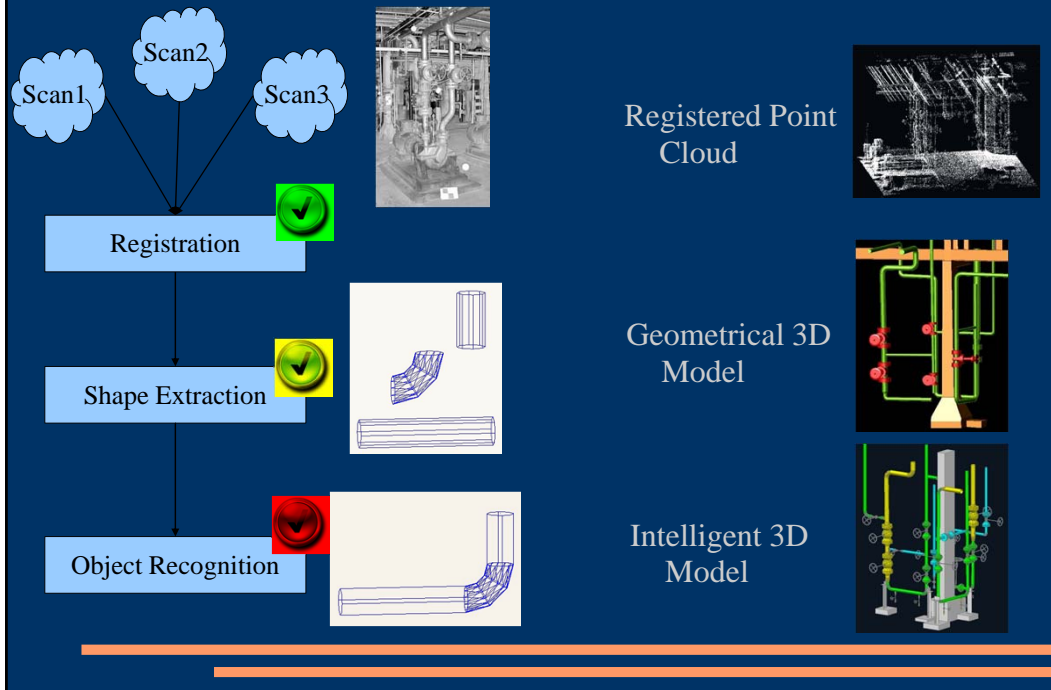

Intelligent 3D models contain
- Topology
- Part attributes
- semantic information
- automatically convertible in isometric drawings
- Easy integration in the plant management system

Test site and Test data

- The test data was captured in the Refinery of STIR in Bizerte, Tunisia

- A 25m2 demo area containing a high level of details

- FARO Photon120 scanner was used

- 3 scans with a 7mm resolution @ 25m

- Geometrical 3D model made using Leica cyclone

- Intelligent 3D model made using Autocad Plant 3D

Scan data Post-processing pipeline & State of the Art

Scan2
Scan1
Scan3

Registration

Shape Extraction

Object Recognition

Registered Point Cloud

Geometrical 3D Model

Intelligent 3D Model

Directions for future work

Need for more automation in the

- shape extraction
- Object recognition

The post-processing tools should make use of

- Norms
- Topological rules
- Sequence validation (grammar)
- Field specific knowledge
- Etc...

Thank you for your attention !!