PD17920 Reverse Engineering Modeling Techniques

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Class summary

- What is Reverse Engineering and Why?
- 2D -> 3D
- Mesh -> 3D
- 3D -> 3D
- Tips and Tricks
- Q&A
At the end of this class, you will be able to:

- Understand basic techniques and tools to recreate 3D geometry from the following sources using Inventor
  - 2D Geometry
  - 3D Geometry
  - Raster data (mesh or image)
2D -> 3D
2D -> 3D

- DWG Underlay
- Import Points (xlsx, txt) to 2D or 3D sketch
- Import 2D or 3D Wires (STEP, IGES, SAT,...)
- 2D -> 3D Tool (Tech Preview)
- Paper 2D Drawings
DWG Underlay
Import 2D or 3D Points
Import 2D or 3D Wires

- From AutoCAD DWG
- From IGES or STEP
2D -> 3D Tool
2D -> 3D Tool

- Pros and Cons
  - + Importing geometry from DWG
  - + Creating features based on orthogonal views
  - - Unassociative to the source
  - - Performance issues on large drawing
  - - Limited to three orthogonal views
Tips and Tricks

- Identify the datum planes
- Understand scale, unit, and major dimensions
- Work on base view and projected views before section views or detail views
- *Verification: Create drawing views based on rebuilt part to compare
Raster/Mesh Data -> 3D
Raster (non-Vector) -> 3D

- Attach Image -> 3D
- Brep-Converted Mesh -> 3D
- Scanned Mesh -> 3D
Import Image
Mesh Import Units

OBJ Import Options

Save Options
- Save Components during Load
  - Save in Workspace

Component Destination Folder
- %Workspace%\Imported Components\FORTIS E-TYPE BODY

Translation Report
- Embed in Document
- Save to Disk

Units
- Import Units: millimeter
  - Bounding Box
    - X: 3977.63
    - Y: 1164.03
    - Z: 1809.93

OBJ Format
- Split Group

[OK] [Cancel]
Fit Mesh Face in 2017
Pre-Processing Mesh with Mesh Mixer

- Import mesh
- Separate shell
- Remove unwanted shells and combine
- Create face group
- Refine faces
- Reduce faces

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AUTODESK MESHMIXER®
Scanned Mesh data
Mesh Enabler
Tips and Tricks

- Estimate tolerance
- Ensure unit
- Simplify mesh (plane, cylinder, torus..)
- Identify features
- Work in zones
- Round trip validation (mesh -> Brep -> mesh)
3D B-rep -> 3D features
How many ways to create a cylinder in Inventor?

- Solid or Surface
- Cut or Join
  - Extrude
  - Revolve
- BP
- Sweep
3D -> 3D: How to start

- Simplify Geometry (fillets or chamfers)
- Divide
- Check if the geometry is analytical
- Recognize design intent (Feature Recog)
- Restore geometry
Tips and Tricks

- Find sweep path
- Delete Face and Offset Surface
- Ruled Surface is more than surface
- Keep it simple
- Curve on face
- Feature recognition
Sheet Metal and Thin-Walled Parts
Sheet Metal: How to start

- Find the thickness
- Remove unnecessary detail
- Thicken faces
- Rip corners
- Create bends
- Create relieves
Tips and Tricks

- Focus on main shape first
- Postpone creating relieves as much as possible
- Create bigger rips
- Use Thicken feature to ensure detail face angle
- Create multiple solids
Conclusion

- The fidelity of the reverse-engineered model depends largely on the source 2D/3D data
- Beware of precision loss due to continuous double-conversion
- Inventor offers capabilities to facilitate recreating models from partial data
- *These techniques help determine the level of detail to share
Q&A
Credits

- Inventor users around the world
- Inventor team, AutoCAD team, and Autodesk Shape Manager team