SYNOPSYS®

TECHNICAL DATASHEET

Simpleware CAD

Release Version T-2022.03

March 7, 2022

Import Formats

- STL
- PLY
- IGES/IGS
- STEP/STP

User Interface

- Fully integrated within Simpleware ScanIP
- Visualize surface and mask objects together

Working with Surface Data

- Surface to mask tool: Conversion of surface objects to image masks by voxelization. Three available methods:
  - Accurate for manifold objects: when converting watertight surface object
  - Accurate for non-manifold objects: when converting non-watertight surface object
  - Robust: Less accurate but failsafe option for poor quality surface objects
- Mask to surface tool: Use the current 3D visualization of a mask to create a surface object
- Create shape: generate surface object primitives:
  - Cuboid
  - Cylinder
  - Sphere
  - Cone
  - Tube
- Sweep scenterlines: create surface objects from centerlines or centerline networks
- Manipulate surface objects both interactively and by absolute position and orientation:
  - Transform
  - Rotate
  - Scale: aspect ratio preserving or along specified axis
  - Zero position: move surface object to the image space origin
- Use global, local or user-defined axis for object manipulation
- 2D nudge tool to fine tune position of surface object in 2D views
- Snap registration tool: Automatic registration of two surfaces with no additional inputs
- Register datasets tool: register surfaces to other surfaces or any other dataset types
  - Register to datasets in the current project or a foreign project (a separate ScanIP project file)
  - Best fit algorithm to align surface objects together with 3 methods: landmark, automatic, landmark and automatic
    - Landmark: uses picked landmark points on the moving and fixed surface objects
    - Automatic: uses all points on the moving and fixed surface objects
    - Landmark and automatic: uses landmark registration initially, then automatic registration for fine tuning
  - Root mean square error (RMSE) reported

Simpleware CAD allows for the import and interactive positioning of CAD models within image data, as well as lattice generation for export as multi-part STL files.

Working with Surface Data cont.

- Check and fix tool: check for surface errors and attempt to fix them
- Group surfaces: group surface objects into one single object
- Ungroup surfaces: create new surfaces by separating a surface object into its connected components
- Surface to surface Boolean operations: General and Venn diagram interface options:
  - Union
  - Intersect
  - Subtract
- Smooth: surface triangle smoothing:
  - Option to preserve volume
  - Option to preserve edges above a user-defined angle threshold
- Subdivide: increase triangle count, e.g. to better capture surface curvature, with the following methods:
  - Adaptive linear
  - Linear
  - Butterfly
  - Loop
- Flatten: project triangles to a plane
- Decimate: reduce triangle count by percentage reduction or maximum number of triangles
- Remesh: regenerate surface triangulation based on target edge length
- Remove triangles: delete unwanted triangles
- Fill holes: fill holes in a surface's triangulation:
  - Displays number of holes and smallest/largest hole diameter
  - Fill all holes or fill holes up to a user-defined maximum hole size
- Resurface: use voxelization and iso-surface extraction to re-triangulate surface objects
- Clip: cut a surface object using finite plane
- Extrude: extrude selected triangles in a specified direction
- Hollow: hollow a surface object, creating an inner and outer surface
- Sweep: dilate the triangles of a surface object inwards and outwards to create a tube (Specialist option only)
- Auto-pad: auto pad the image boundary to contain surface object
- Feature edge editor: Visualization and selection of feature edges that the meshing algorithms should try to preserve
- Interactive clipping box for section views of surface objects in 3D
- Surface deviation analysis tool: Comparison of a test surface:
  - Tool allows re-meshing of surfaces (user can set edge lengths required)
  - Options to set distance limits for deviation analysis
  - Surface deviation on regions of interest or the whole part can be calculated
  - 3D color map with customizable scale, and option to set out of range color
  - 3D color map also allows the user to set nominal and critical thresholds for positive and negative values
  - Annotate visualization with minimum and maximum surface deviation
  - Probe the visualized surface deviation to show point deviation values
  - Statistical values calculated for:
    - Upper and lower deviation
    - Mean (overall), mean positive and mean negative
    - Root Mean Square Error (RMSE)
    - Percentage area above critical and nominal positive deviation
    - Percentage area below critical and nominal negative deviation
  - Export statistics as text file

Internal Structures Wizard

- Allows shelling and adding a range of internal structures flexibly to any surface object
- Applications include reducing material usage and weight of 3D printed models
- Unit cell types available are:
  - Schwartz primitive
  - Schwartz primitive (pinched)
  - Schwartz diamond
  - Schwartz 'W'
  - Schoen gyroid
  - Neovius' surface
  - Cylinder grid
  - Schwartz primitive (2.5D)
  - Schwartz primitive (pinched) (2.5D)
  - Schwartz 'W' (2.5D)

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03/03/22.Simpleware-TDS-CAD-Letter.