

Surfgen™

Surface Grid Preprocessor

Need to produce high-quality surface grids for VSAERO, USAERO, and/or MGAERO?

Surfgen is an OEM product jointly developed by AMI and Pointwise® specifically for this purpose.

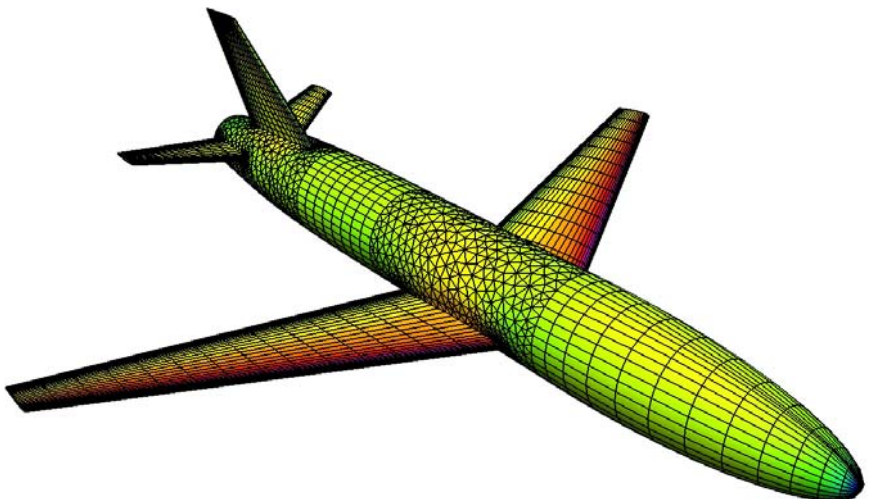
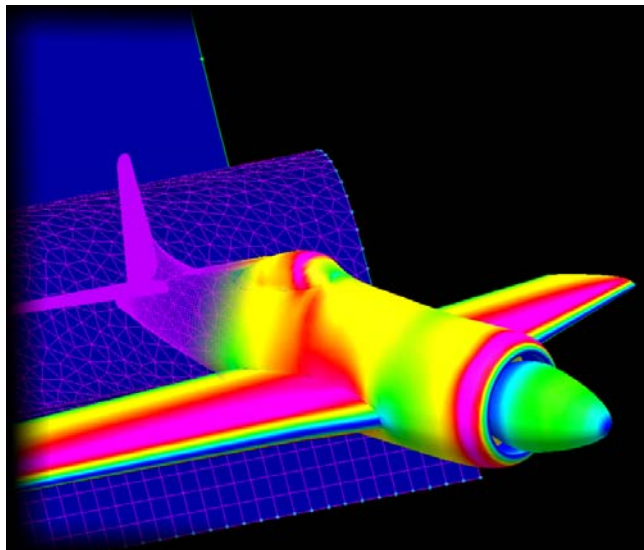
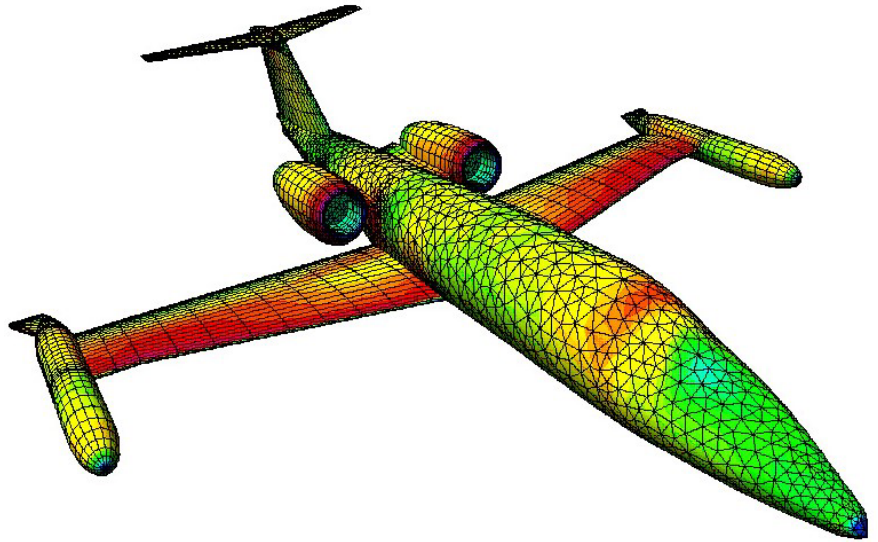
Notable features of Surfgen that users will find especially useful include the following:

- Surfgen can create meshes that are independent of the CAD topology. A mesh may span an entire CAD surface, only a portion of a surface, or multiple surfaces.
- Surfgen can automatically repair flaws in the grid that results from poor CAD data such as gaps, overlaps, and missing features.
- Surfgen can produce hybrid grids that are composed of unstructured, triangular-panel patches and structured quad-panel patches for VSAERO Version 7.
- Surfgen's Tcl-based scripting language, Glyph, can be used to create customized meshing applications for specific configurations. Combined with journaling, hands-off surface gridding is easily achieved.
- Surfgen includes a Glyph script to automatically close wing trailing edges if required.

Please contact AMI for a FREE evaluation of Surfgen!



Analytical Methods, Inc.
2133 152nd Avenue NE
Redmond, WA 98052



Surfgen is an OEM product jointly developed by AMI and Pointwise® to produce high-quality surface grids for VSAERO, USAERO, and MGAERO. In a highly automated manner Surfgen generates structured quad grids, unstructured triangle grids, and hybrid composite grids. While USAERO and MGAERO utilize structured quad grids exclusively, VSAERO Version 7 supports structured quads, unstructured triangles, and hybrid grids. Surfgen integrates nicely into a design environment with its open access to CAD geometry, fault tolerant geometry utilization, Unix/Linux/Windows portability, script ability, neutral IGES CAD import, and optional native interface to CATIA V4 models.

Data Import

As a standard, Surfgen imports CAD data by the IGES neutral format or optionally by a native interface to CATIA V4. Also, Surfgen's geometry kernel allows models to be imported in de facto standard formats such as PLOT3D wire frames and STL triangular faceted data.

Additionally, Surfgen does not require the use of CAD models for meshing – the mesh can be created directly without having to create the geometry first. This feature lessens the dependence on the CAD system, allowing the analyst to use CAD geometry only where necessary. Furthermore, Surfgen's geometry modeler may be used to supplement the CAD model and create new models from scratch: points, lines, Catmull-Rom and Akima splines, intersections, offsets, conics, circles, and ruled, revolution, linear sweep, polyconic, Coons, and fit surfaces.

CAD Fault-Tolerant and Topology Independent Meshing

An analyst must be able to mesh a less than perfect CAD model. Sloppy geometry such as gaps between adjacent surfaces, overlapping surfaces, and missing features are all too common in CAD models. Although CAD "healing" might be attempted, healing is an ill-defined problem since design intent is usually unknown. Instead, Surfgen uses a technique called merging to create a fully closed mesh upon a sloppy CAD model. Merging automatically identifies adjacent surface meshes, joins them across CAD model gaps, and uses the mesh solver to remove CAD artifacts such as topology and sliver surfaces from the mesh.

Surfgen can also create meshes that are independent of the CAD topology. Mesh patches may span an entire CAD surface, only a portion of a surface, or multiple surfaces.

Structured Quads, Unstructured Triangles and Hybrid Grids

Structured grids containing mapped quadrilaterals are initialized using transfinite interpolation (TFI) algebraic techniques and adhere automatically to the CAD model wherever possible using standard, linear, polar, and orthogonal TFI, and parametric fit TFI.

The quality of structured grids can be significantly improved by applying Surfgen's elliptic PDE methods. The methods iteratively solve Poisson's equation. While the defaults have been set to provide the nominal grid, the control functions can be fine tuned at any time for smoothness, clustering, and orthogonality by using LaPlace, Thomas-Middlecoff, fixed grid, von Lavante-Hilgenstock-White, and Steger-Sorenson techniques.

Unstructured triangles are generated by a modified Delaunay method. Like structured grids, unstructured surface grids can span multiple entities in the geometry model and adhere to the CAD model automatically. The unstructured solver may be re-applied at any time, giving you control over minimum and maximum panel size, maximum panel-to-panel turning angle, maximum surface deviation, and

boundary decay. These features may also be set in advance to result in a good grid automatically. Edge swapping and LaPlace smoothing may also further improve unstructured surface grids.

Surface hybrid grids that are composites of structured quads and unstructured triangles and easily be produced to take full advantage of VSAERO's (Version 7) capability.

Surfgen also provides the analyst with many diagnostic tools for ensuring that mesh quality criteria are met. Mesh examination may be performed during the generation process as these quality diagnostics are closely integrated with the mesh methods.

Customization via Scripting

Surfgen's Tcl-based scripting language, Glyph, can be used to create customized meshing applications for specific configurations. Surfgen's Glyph commands cover the entire range of functionality available in Surfgen's GUI, allowing tricks and special techniques to be captured and made part of the organization's intellectual property. Combined with journaling, hands-off surface gridding is easily achieved.

Surfgen also includes a Glyph script to automatically close wing trailing edges if required.

A Complete Toolkit

Surfgen is a complete surface meshing toolkit, allowing the analyst to go from CAD to VSAERO, USAERO, or MGAERO. In addition to the methods and techniques described above, its toolkit is rounded out with the following commands:

- *copy, delete,
- *translate, scale, stretch, mirror, rotate,
- *split, join, group,
- *intersect, project onto, and swap databases, and
- *edit and fit control points.

Data Export

Surfgen exports surface meshes for VSAERO as well as NASTRAN and CGNS data formats. Translators to USAERO and MGAERO are available from AMI. Additionally, AMI's SPIN(w) preprocessor translates VSAERO input to USAERO and MGAERO (enclosure models only) input formats.

Both standard VSAERO grids that include only quad panels and VSAEROhybrid grids, Version 7 release, that allow combinations of quad and triangle panels are supported by Surfgen.

Platforms

Surfgen is available on a variety of Unix (SGI, HP, Compaq, Sun, and IBM), Linux, and Windows (Intel) workstations.

Questions?

For more information about Surfgen, please contact:

Analytical Methods, Inc.
2133 152nd Avenue NE
Redmond, WA 98052 USA
Telephone: 425.643.9090
Facsimile: 425.746.1299
E-Mail: info@amiwest.com
Website: <http://www.am-inc.com>