

Products | PolyWorks | PolyWorks/Modeler™

1- Short Description:

PolyWorks/Modeler™

Providing superior meshing capabilities to the manufacturing community since its first release, PolyWorks/Modeler™ expands the use of polygons for manufacturing applications by delivering unique polygon editing tools that prepare models for 3-axis & 5-axis milling, CFD & FEA analysis, and rapid prototyping. Using its optional NURBS Surfacing module, PolyWorks/Modeler also offers powerful NURBS surface generation tools to convert a polygonal surface into an accurate NURBS model that can be imported directly into all major CAD/CAM software

2- Detailed Description (Same as InnovMetric's website):

Total Reverse-Engineering Solution for Manufacturing Applications

PolyWorks' polygons are the ideal primitives for accurately representing the results of a 3D digitizing operation, as they provide an optimal surface description that is within user-defined tolerances from the measurements. Since 1994, manufacturers worldwide have selected PolyWorks/Modeler's high-quality polygonal models for their stringent manufacturing applications, such as 3- & 5-axis milling, CFD & FEA analysis, and rapid prototyping.

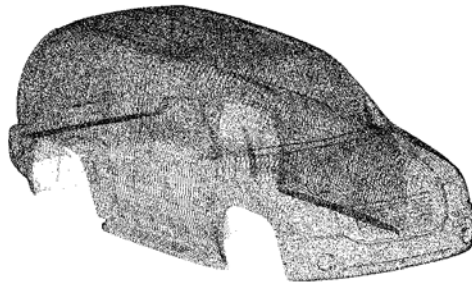
PolyWorks/Modeler also offers the possibility of quickly creating curve networks on polygonal models, and automatically fitting G1-Continuous NURBS surfaces over curve networks. The unrivaled accuracy of PolyWorks' polygonal meshes, results in superior NURBS surfaces that are directly exportable to all major CAD/CAM software.

The complete PolyWorks/Modeler solution allows you to:

- Handle huge datasets obtained from any 3D digitizer, up to 100 million digitized points;
- Align large numbers of digitized point clouds;
- Transform aligned point clouds into highly accurate polygonal models;
- Use powerful polygon editing tools to enhance polygonal models;
- Build CAD-ready curve networks and NURBS surfaces;
- Generate texture-mapped models.

Efficiently Handle Huge Datasets Obtained from Any 3D Digitizer

PolyWorks/Modeler is a flexible solution that adapts to any 3D digitizing equipment and that is optimized to efficiently handle any datasets of up to 100 million points. Our recipe to create the most accurate polygonal models begins at the early stage of the digitizing operation where PolyWorks processes all data obtained from the 3D digitizer, without sacrificing any points through uncontrolled subsampling.

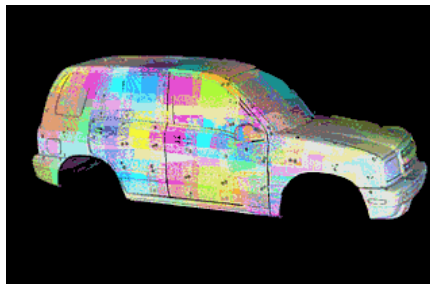


Dataset of 50 million points

Easily Align Multiple Point Clouds

Digitizing the surface of an object usually requires the acquisition of several 3D point clouds from different viewpoints. PolyWorks/Modeler uses a unique best fit alignment technology to unify multiple point clouds, expressed in different coordinate systems, into a single coordinate system.

Save a great amount of time in your digitizing operation. Digitize your object without using any targets, as PolyWorks uses the object's natural shape for alignment.

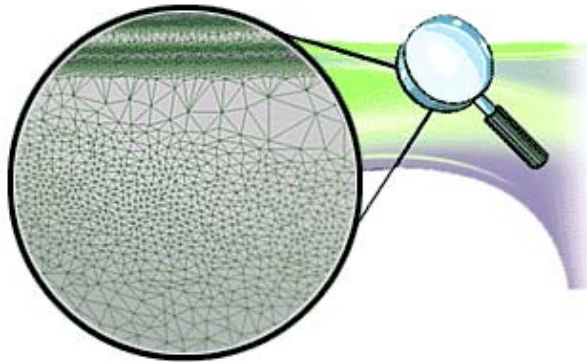


48,243,961 aligned points

Transform Aligned Point Clouds into Accurate Polygonal Models

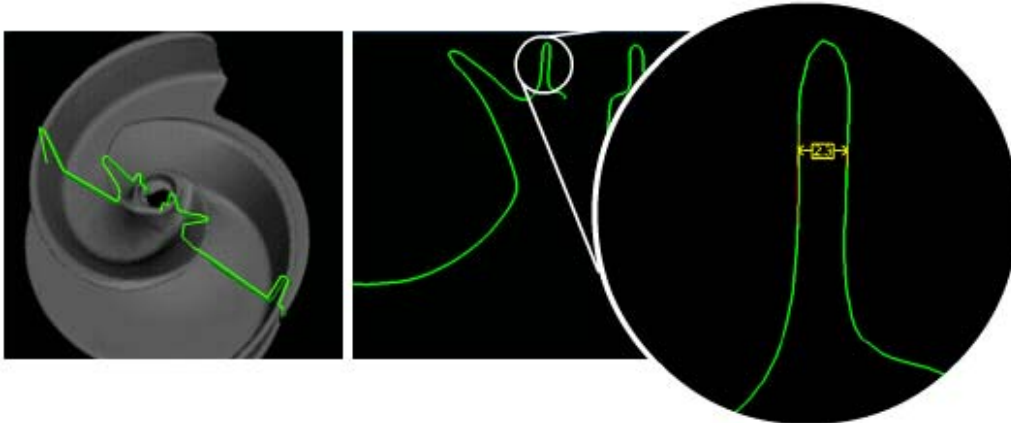
PolyWorks/Modeler merges aligned 3D point clouds into highly accurate polygonal meshes, eliminating overlapping areas by using intelligent averaging. Based on a user-defined surface tolerance, PolyWorks/Modeler adapts the polygonal mesh to the

curvature of the surface, automatically creating large triangles over flat areas and small triangles over edges and fillets.



Polygonal mesh with resolution intelligently adapted to the curvature of the object.

One key aspect of PolyWorks/Modeler's meshing process is its capability of automatically handling very intricate shapes containing thin parts. In this example, some sections are 2.3 mm thick.



Enhance Polygonal Models and Prepare them for Manufacturing Applications

PolyWorks/Modeler provides you with a wide array of polygon editing tools that optimizes the polygonal model and corrects problems caused by the limitations of a 3D digitizer including:

- Automatic curvature-based hole-filling
- Sharp edge extraction**
- Sharp edge reconstruction**
- Corner extraction & reconstruction**
- Smoothing
- And more.

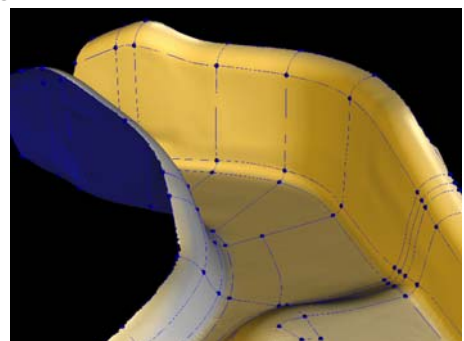
** PolyWorks makes polygon editing a user-friendly operation, as it offers "edge wizards" that automatically detects sharp edges and fillets within a given radius range, and extracts picture-perfect theoretical edge lines and tangent lines, for quick and easy reconstruction.

In addition, PolyWorks/Modeler offers you CAD operations for polygons, to prepare the models for manufacturing applications such as 3-axis & 5-axis milling, CFD & FEA analysis, and rapid prototyping.

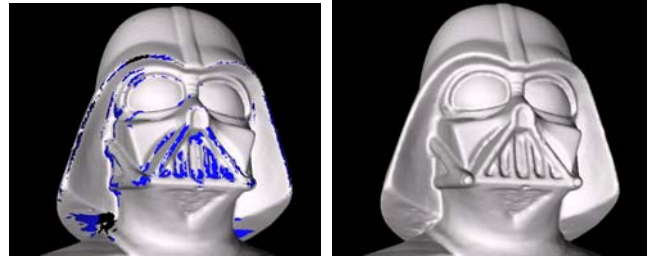
- Slicing and Dowel insertion
- Extruding along a boundary
- Filleting polygons
- Offsetting complex geometry
- And more.

Quickly Build Curve Networks and Fit NURBS Surfaces

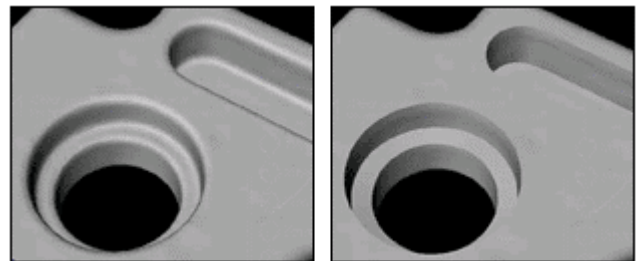
If you need to import your scanned objects into a CAD/CAM environment, PolyWorks/Modeler offers you powerful rapid-surfacing capabilities to create G1-continuous NURBS surfaces right from polygonal models.



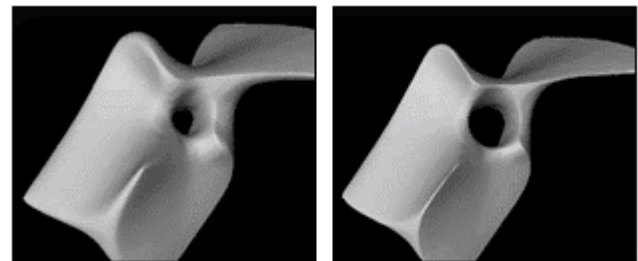
When a new curve is created, it is automatically snapped to existing curves. The curve network is thus built automatically.



Automatic hole filling performed in 48 seconds



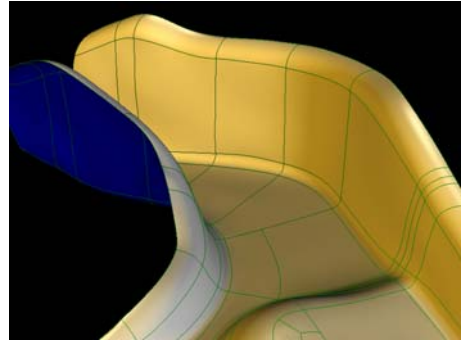
Sharp Edge Extraction and Reconstruction



Offsetting Complex Geometry

PolyWorks/Modeler offers a systematic A-to-Z approach to rapid-surfacing that lets you:

- 1- Automatically extract curves describing edges, fillets, corners, and boundaries from a polygonal model.
- 2- Interactively lay down additional tolerance-based curves on the mesh.
- 3- Create curve networks with T-junctions
- 4- Automatically fit NURBS surfaces directly over the curve network.
- 5- Directly export NURBS surfaces to CAD/CAM software.



If the quality of fitting needs to be improved locally, you can easily subdivide selected patches to get more accuracy in a given area.

Generating Texture-mapped Models

The PolyWorks/Modeler's software suite supports color 3D digitizers and can automatically generate texture maps for color models that were previously reduced. Mapping high-resolution texture maps onto reduced models produces dramatically realistic models.



6,454,772 triangles
High-resolution model



50,454 triangles
Model reduced using IMCompress/IMTexture

Applications

PolyWorks/Modeler is an indispensable tool for reducing time-to-market to a minimum, increasing the quality of your products, and optimizing your 3D digitizing process.

PolyWorks/Modeler allows you:

- To build accurate polygonal models of any part from 3D digitizer data for direct 3- or 5-axis milling and rapid prototyping using the resulting STL file;
- To create an accurate polygonal model of a clay model/sculpture, making it watertight, increasing or decreasing its size, then exporting it for direct machining;
- To obtain accurate polygonal models of clay models, making them watertight, optimizing the shape of triangles, reconstructing edges and fillets, and then sending the file to CFD/FEA software for simulation/analysis purposes;
- To create G1-Continuous NURBS surfaces over a polygonal mesh and to export them to a CAD/CAM software for additional enhancements using CAD operations such as trimming, offsetting, filleting, etc.;
- To build high-precision color 3D models of archeological and historical artifacts for cultural heritage preservation and to create virtual museums.

Technical Specifications

Computer Platforms Supported:

- All Intel-based workstations running Windows NT 4/Service Pack 6 and up, or Windows 2000/Service Pack 2 and up, or Windows XP.

3D Digitizers Supported:

- PolyWorks processes all 3D digitizer and CMM data organized as 3D meshes. Laser digitizers such as plane-of-light laser systems, optical systems such as Moiré and structured-light systems, in addition to some automated CMMs produce 3D meshes.
- PolyWorks also supports 3D digitizers producing high-density unorganized point clouds, such as laser scanners mounted on articulated arms.
- Supported 3D digitizers include systems manufactured by:
 - Breuckmann
 - Callidus
 - CogniTens
 - Cyberware
 - DataPixel
 - Dimensional Photonics
 - EOIS
 - Genex
 - Gom
 - HoloVision
 - Hymarc
 - Imetric
 - iQvolution
 - Inspeck
 - Kreon
 - Leica/Cyra
 - Metric Vision
 - Metron
 - Micromasure
 - Minolta

- Optech
- Opton
- Optonet
- Perceptron
- Renishaw
- Riegl
- Scantech
- ShapeGrabber
- Steinbichler
- Vitronic
- Voxelan
- Wicks and Wilson
- Zoller + Fröhlich
- 3D Digital Corp
- 3D Scanners
- 3rd Tech

- In-house digitizers that produce 3D meshes can be supported using the PIF format. PIF (Parametric Image Format) is a public format developed by InnovMetric. PIF includes a library for easily converting other 3D data formats to PIF. InnovMetric also provides user support for data format conversion to the PIF format.

Polygonal Format Translators Supported:

- Bidirectional translators
 - DXF (write-only)
 - OBJ
 - Inventor (write-only)
 - PLY
 - POL (InnovMetric's binary format)
 - STL (ASCII and binary)
 - VRML 2.0

Other Output Format Supported:

- Cross-Sections as polylines in ASCII, DXF, IGES and Inventor formats.
- Bézier Curves in ASCII and IGES formats.
- G1-Continuous NURBS surfaces in IGES format

On-Line Documentation Provided:

- All user's manuals are provided as PDF files that can be visualized within Adobe's Acrobat Reader 3.0., and up.

FAQs

What is PolyWorks/Modeler?

PolyWorks/Modeler is a comprehensive software package that quickly generates high-precision polygonal models and NURBS surfaces from 3D digitizer data. The PolyWorks/Modeler process typically consists of:

- Using any 3D digitizer to capture multiple 3D point clouds of an object;

- Automatically creating organized point clouds from unorganized data points captured by hand-held digitizers;
- Accurately aligning the multiple 3D point clouds into a unique coordinate system;
- Merging overlapping 3D point clouds into a high-precision intelligent polygonal mesh in which the triangle size is adapted to the curvature of the surface;
- Editing polygonal meshes, preparing them for a variety of applications such as machining, rapid prototyping, reverse engineering, simulation, and visualization.
- Building curve networks over polygonal meshes, automatically fit G1-continuous NURBS surfaces over curve networks, and export these NURBS surfaces to all major CAD/CAM software.

What 3D digitizers does PolyWorks/Modeler support?

PolyWorks/Modeler supports all 3D digitizers including:

- Optical digitizers based on structured light and Moiré;
- Hand-held digitizers such as laser sensors mounted on articulated arm;
- Whole-body scanners;
- 2-axis laser systems based on triangulation or time-of-flight measurement techniques;
- Automated CMMs capable of measuring grids of points.

PolyWorks/Modeler supports all of the following 3D digitizer systems:

- | | |
|-------------------------|---------------------|
| • Breuckmann | • Micromasure |
| • Callidus | • Minolta |
| • CogniTens | • Optech |
| • Cyberware | • Opton |
| • DataPixel | • Optonet |
| • Dimensional Photonics | • Perceptron |
| • EOIS | • Renishaw |
| • Genex | • Riegl |
| • Gom | • Scantech |
| • HoloVision | • ShapeGrabber |
| • Hymarc | • Steinbichler |
| • Imetric | • Vitronic |
| • iQvolution | • Voxelan |
| • Inspeck | • Wicks and Wilson |
| • Kreon | • Zoller + Fröhlich |
| • Leica/Cyra | • 3D Digital Corp |
| • Metric Vision | • 3D Scanners |
| • Metron | • 3rd Tech |

What are the key advantages of the PolyWorks/Modeler process?

- Processing organized 3D point clouds yields major advantages. Each incoming point cloud is automatically meshed. It therefore becomes possible to align (or register) two point clouds by using a unique automatic point-to-surface alignment algorithm, without needing tooling balls, CMMs, or optical targets;

- PolyWorks/Modeler supports all 3D digitizers, including hand-held digitizers;
- PolyWorks/Modeler can process up to 100 millions points and offers fully parallelized processing on dual-processor workstations;
- PolyWorks/Modeler's unique meshing algorithm intelligently adapts the resolution of the polygonal mesh to the curvature of the surface, automatically preserving a high degree of resolution over edges and fillets;
- PolyWorks/Modeler can also mesh very thin parts of complex and detailed objects;
- PolyWorks/Modeler provides a wide range of advanced editing tools that facilitate polygonal reverse engineering processes by preparing STL files that can be directly milled, sent to a rapid prototyping machine, or to a CFD/FEA software.
- PolyWorks' approach to rapid-surfacing is more straightforward and systematic, it fully supports T-junctions, and it produces high-quality surface models that are directly exportable to all major CAD/CAM software.

For which applications should I consider using PolyWorks/Modeler?

- To build accurate polygonal models from 3D digitizer data for direct milling and prototyping using the resulting STL file;
- To create an accurate polygonal model of a part design, making it watertight, increasing or decreasing its size, then building it using a rapid prototyping machine and a milling machine;
- To create highly-accurate G1-Continuous NURBS surfaces for reverse engineering into CAD software;
- To obtain accurate polygonal models of car clay models, making them watertight, optimizing the shape of triangles, reconstructing edges and fillets, and then sending the file to CFD/FEA software for aerodynamic simulation purposes;
- To construct high-precision polygonal models of parts, adding the models to a database;
- To build high-precision color 3D models of archeological and museum artifacts.

Why should I seriously consider implementing the PolyWorks/Modeler process?

- PolyWorks/Modeler offers the most accurate 3D point cloud alignment and polygonal meshing solution;
- PolyWorks/Modeler can mesh very large datasets containing tens of millions of points, such as those produced by digitizing a full-scale car or aircraft part; its unique meshing technique uses all the points to build a high-precision polygonal mesh;
- PolyWorks/Modeler features faster processing through several parallel operations on multi-processor Intel-based workstations;
- PolyWorks/Modeler is a proven and reliable solution that is currently used by major automotive and aerospace manufacturers and their suppliers in North America, Europe, and Asia.

What system configuration is recommended for running PolyWorks/Modeler?

- Workstation based on an Intel or Intel compatible processor (mandatory)
- Two processors (recommended)
- Windows NT4 SP6 and up or Windows 2000 SP2 and up, or Windows XP(mandatory)
- OpenGL Graphics card (recommended)
- 3-Button Mouse (mandatory)
- Minimum 256 MB of RAM, 1GB (recommended)
- 1GB free disk space and 1GB swap space