

CADdoctor® EX Product Configuration

CADdoctor EX series offers rich and powerful functionality for geometry optimization and verification as well as highly accurate 3D data translation, satisfying the requirements of professional users worldwide.

EX Basic Package

CADdoctor EX/Standard

Translating 3D data and checking SASIG PDQ criteria, including:

- 3D Data Translation (Geometry Check & Healing)
- SASIG PDQ Check
- IGES Import & Export
- STL Export

EX Solution Bundle Package

CADdoctor EX/Trans & Verification

Translating 3D data and verifying 2 models
CADdoctor EX/Standard bundled with:

- STEP (Import & Export) Add-on option
- Geometry Verification option

CADdoctor EX/Trans & Verification Plus2

Adding any 2 from CAD interface highlighted in blue.

CADdoctor EX/FEM & Verification

Simplifying models for FEM analysis.
CADdoctor EX/Standard bundled with:

- STEP (Import & Export) Add-on option
- Geometry Verification option
- Geometry Simplification option
- Mid-surface option
- Polygon Extension option

CADdoctor EX/FEM & Verification Plus2

Adding any 2 from CAD interface highlighted in blue.

CADdoctor EX/Reverse Engineering

Generating B-rep models from 3D scanned data for reverse engineering
CADdoctor EX/Standard bundled with:

- STEP (Import & Export) Add-on option
- Polygon Extension option
- Reverse Engineering option

CADdoctor EX/Reverse Engineering Plus2

Adding any 2 from CAD interface highlighted in blue.

EX CAD Interface Options

CATIA V5 Import Add-on

CATIA V5 Export Add-on

CATIA V4 Import Add-on

CATIA V4 Export Add-on

CADmeister (CFIO)(Import) Add-on

CADmeister (CFIO) Export Add-on

NX/UG Import Add-on

CATIA V5 (Import & Export) Plug-in

Creo (Pro/E) (Import) Add-on

NX (Import & Export) Plug-in

Parasolid (Import & Export) Add-on

Ideas (Import & Export) Plug-in

ACIS (SAT) (Import & Export) Add-on

Creo (Pro/E)(Import & Export) Plug-in

JT (Import & Export) Add-on

STEP (Import & Export) Add-on

EX Additional Function Options

Geometry Simplification

Quality Check for Mold Manufacturing

Mid-surface

Reverse Engineering

Geometry Verification

Polygon Extension

Geometry Deformation

Batch (for Multiple File Conversion)

CADdoctor® SX Product Configuration

A lighter version of CADdoctor utilizing the same geometry handling technology in CADdoctor EX.

SX Basic Package

CADdoctor SX/Trans

Translating 3D data, including:

- 3D Data Translation (Geometry Check & Healing)
- IGES Import & Export
- STEP Import & Export

CADdoctor SX/Trans Plus2

Adding any 2 from CAD interface highlighted in orange.

CADdoctor SX/FEM

Translating 3D data and simplifying models for FEM analysis, including:

- 3D Data Translation (Geometry Check & Healing)
- IGES Import & Export
- STEP Import & Export
- Polygon Import & Export
- Geometry Simplification
- Polygon Extension

CADdoctor SX/FEM Plus2

Adding any 2 from CAD interface highlighted in orange.

CADdoctor SX/Mold

Translating 3D data and checking conditions for plastic molding, including:

- 3D Data Translation (Geometry Check & Healing)
- IGES Import & Export
- STEP Import & Export
- Quality Check for Mold Mfg.
- Geo. Simplification (Geometry De-Featuring & Face Merging Only)

CADdoctor SX/Mold Plus2

Adding any 2 from CAD interface highlighted in orange.

SX CAD Interface Options

CATIA V5 Import Add-on

CATIA V4 Import Add-on

NX/UG Import Add-on

Creo (Pro/E) (Import) Add-on

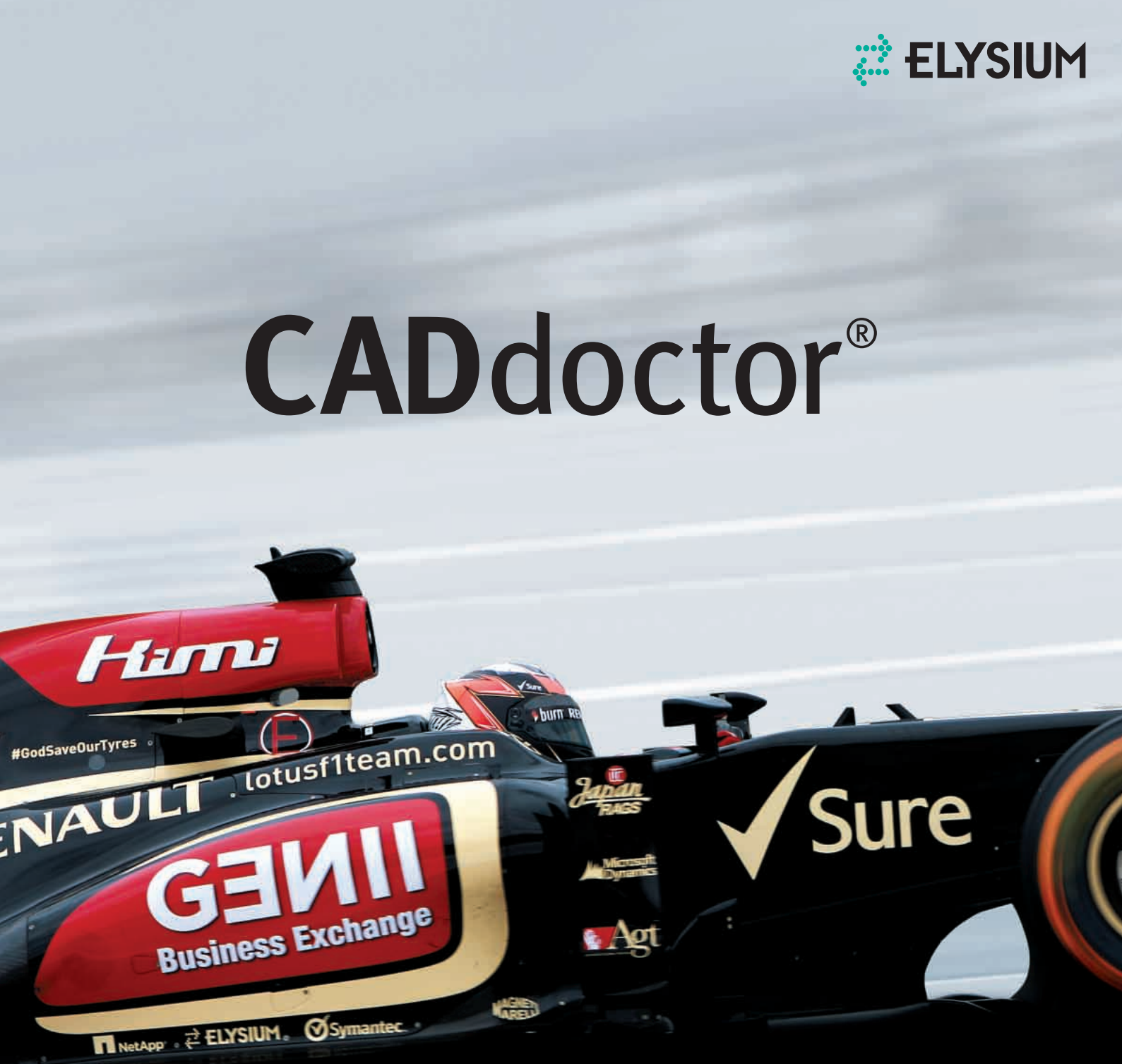
Parasolid (Import & Export) Add-on

ACIS (SAT) (Import & Export) Add-on

JT (Import & Export) Add-on

CATIA V5 Export Add-on

CATIA V4 Export Add-on



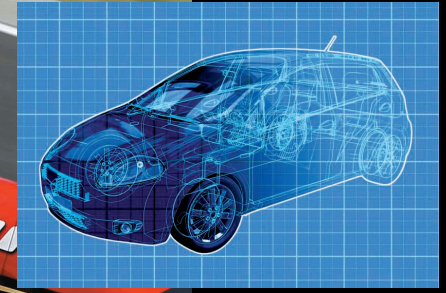
CADdoctor®

Translate and Harness the Power of 3D Data



Elysium's Cutting Edge Technology Realizing 3D Translation

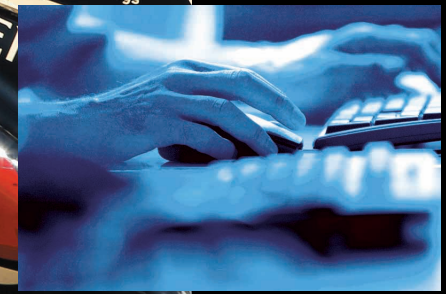
The smallest of an error hidden in 3D data is a major impediment in effectively using 3D data. The Elysium geometry interoperability technology condensed in CADdoctor provides highly reliable data translation and advanced 3D processing features. Adopted and highly praised by Lotus F1 Team, Elysium cutting edge technology brings unprecedented value to 3D data.



Heightened Technology with Incredible Accuracy

Automatic error healing is the key to maximizing 3D data. When an error is found through Product Data Quality (PDQ) validation, repairing in the original CAD system would be ideal. However, it is not very practical because the process can be very labor intensive, and the same errors can persist. Healing requires sophisticated geometry interoperability. As an example, for a high-precision CAD system, there is no problem with closing a gap using a tiny

element. But on the other hand, it is considered poor quality, even useless data in a lower-precision CAD system. Elysium Healing closes gaps by extending adjacent surfaces, at an accuracy of "0.001mm." Even for this level of advanced repair, the technology will never create an element that is troublesome for the target CAD system. Healing is applicable for various tools which leverage 3D data.



Adherence to Geometry Interoperability

When leveraging 3D data, editing, such as change to a FEM model or adding mold elements may be required. This type of editing requires work on the various CAD data using explicit operation. In these circumstances, the feature tree cannot be relied upon and operation must proceed strictly by using the geometry. Elysium geometry optimization provides advanced editing functionality utilizing geometry and topology in order to support 3D data editing for maximum utilization. As an example, for the most frequently used detection and

removal of fillets, free-form fillets are supported and full arc form is not required. Elysium's unique approximation operation, arc determination, and algorithms which determine continuity with periphery elements recognizes fillet areas very accurately including gradually changed fillets and corner fillets. Upon fillet removal, if a face is missing due to overlapping fillets, Elysium's advanced technology regenerates the missing face using information such as boundary lines.



Sustained through Tight Partnership with CAD Vendors

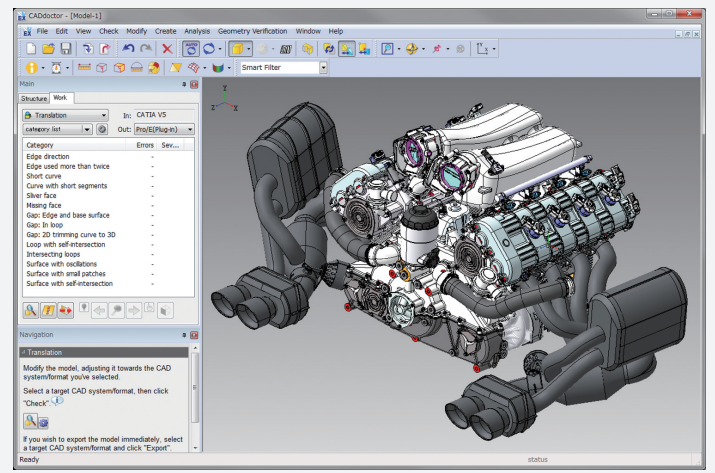
When translating CAD data, it is important to devise ways to accommodate the characteristics of each CAD system. An example would be mathematical representation of a ridgeline of a solid model which is different depending on the CAD system. Elysium examines the representation and makes a precise adjustment to the geometry based upon the intended target CAD system. Elysium has formed technical partnerships with all major CAD vendors in order to handle various CAD data in the most efficient and effective way. These relationships allow Elysium

to become fully versed on the CAD data structure and API (Application Programming Interface), provide high quality 3D data, and to quickly support the latest releases of CAD software. Elysium concentrates on maximizing 3D data by providing practical, highly reliable geometry healing and optimization so the user doesn't have to. In addition to strong technical partnerships with CAD vendors, Elysium's rich knowledge regarding CAD data gained through 3D data translation and data processing is what makes this possible.

CADdoctor®

CADdoctor's Data Leverage

CADdoctor supports not only manufacturing phases from design, analysis, prototyping, to fabrication, but also provides complete support for 3D data utilization in various areas such as medical, computer graphics, and plant engineering.



3D Data Translation · PDQ Check

3D data translation and PDQ validation intercede the product life cycle and are fundamental to maximizing 3D data.

Reverse Engineering

The Reverse Engineering option opens new avenues to maximizing 3D data.

Geometry Simplification

The Geometry Simplification option supports the development of FEM models, removes fillets prior to mold design, trims for DMU, and maximizes the usage of 3D data for a wide range of applications.

Mid-surface Generation

The Mid-surface option is a solution that utilizes the growing use of CAE tools.

Geometry Verification

Visual user interface enables the user to easily confirm differences of geometry and assembly structure between models before and after design change. The verification of models between different CAD systems is also supported.

Quality Check for Mold Manufacturing

The Manufacturing Check option to check plastic mold formability and construction reduces development rework and mold cost.

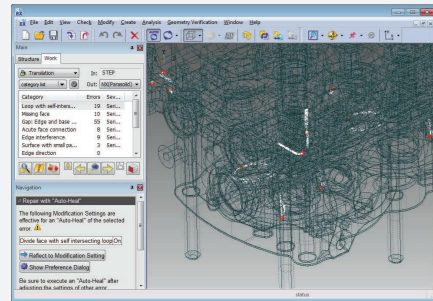
3D Data Translation & PDQ Validation

Interoperability is a fundamental requirement for the efficient re-use of multi-CAD throughout the product life cycle.

Geometry Simplification / Mid-surface Generation

CADdoctor users can optimize 3D data destined for consumption within downstream processes such as Toolpath Generation, Mesh Complexity, CAE Calculations, and 3D Printing. The benefits include reduction of analysis time, mesh size, and model size.

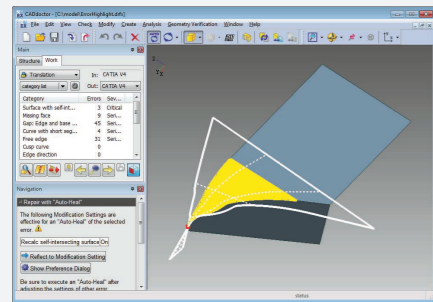
CAD Data Validation and Repair



3D data translation for efficient re-use of 3D data requires a robust error detection scheme and more importantly, the ability to heal while maintaining form, fit, and function in the destination use case or scenario. Perfect 3D data requires the detection and healing of errors such as tiny elements, tiny segments and large gaps, which directly result in increased efficiency and re-usability. CADdoctor provides these error detection and healing functions resulting in perfect CAD Data Integrity.

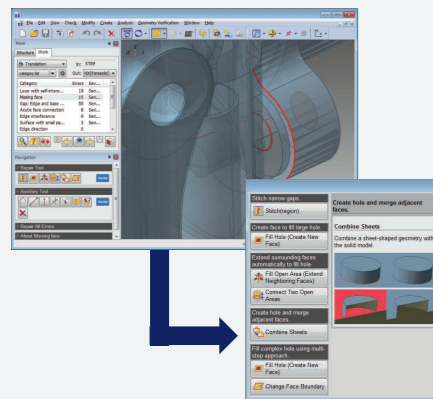
Detecting and Viewing PDQ Errors

CADdoctor is based on Elysium's legacy experience of more than 30 years in data translation which has produced validation criteria necessary to meet the stringent requirements of Automotive, Aerospace and National Standards. CADdoctor allows for the creation of perfect CAD formats in the native CAD system which meets the validation based upon the PDQ guideline per MILSTD/ISO/VDA/SASIG/JAMA/JAPIA. CADdoctor automatically detects and lists all errors in a textual dialogue box with automatic 3D model auto-location and auto-zoom to provide for instant visual representation of all errors.



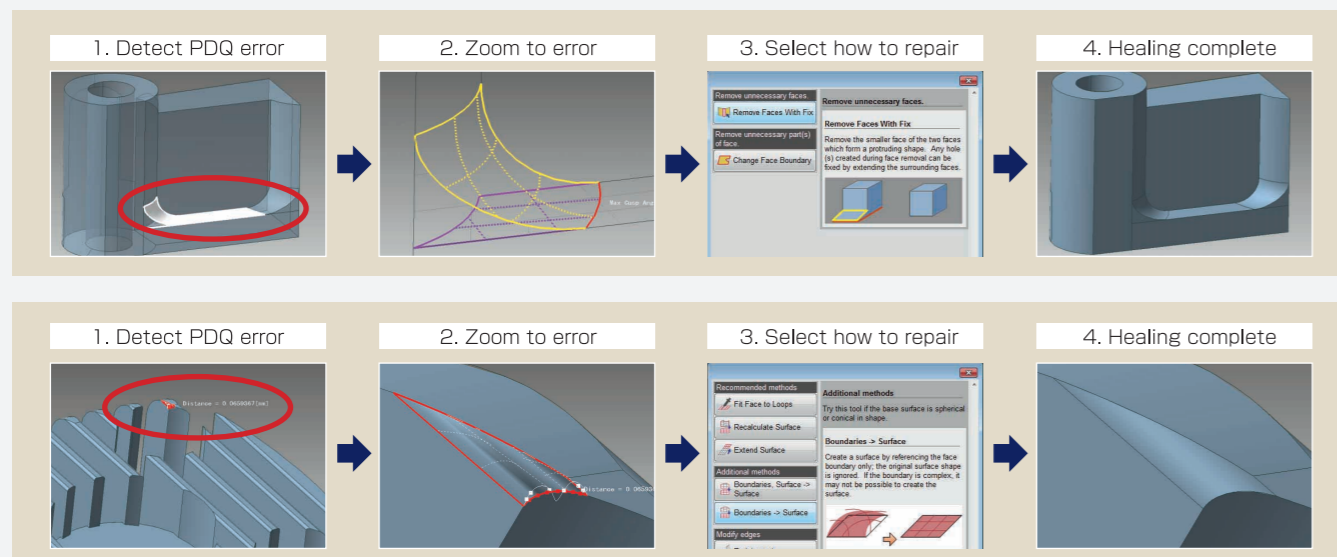
Repairing PDQ Errors Automatically

Most CAD files contain geometric errors which will be detected by PDQ Check. A single click on the "Auto Healing" icon will start the automatic heal process. Elysium's proprietary technology acquired through years of experience will systematically heal geometry/topology errors without any operator intervention. Elysium takes pride in its high fidelity technology which can auto-adjust the geometry and/or position of faces and edges within the tolerance of the source CAD system. All repairs are conducted while maintaining consistency with the original data.

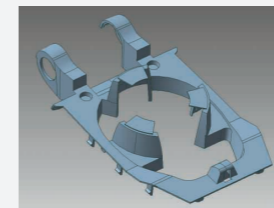
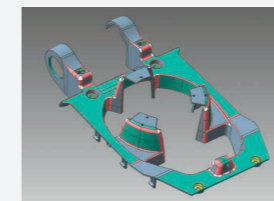


Repairing PDQ Errors Interactively

The Interactive Healing function is designed to repair extremely severe errors which remain after the Auto Healing process. The appropriate repair command icon(s) will be displayed once an error is selected in the list. Users can check each error visually, and repair with a displayed icon. A CADdoctor "Guide" will assist users to select the appropriate heal command in case there are several possible healing scenarios. The Guide explains each command via easy to use icons. These functions allow for any CAD user to systematically heal extreme errors which are impossible to heal without the utilization of CADdoctor.



Feature Recognition and Removal



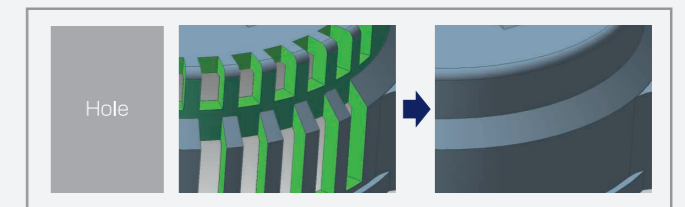
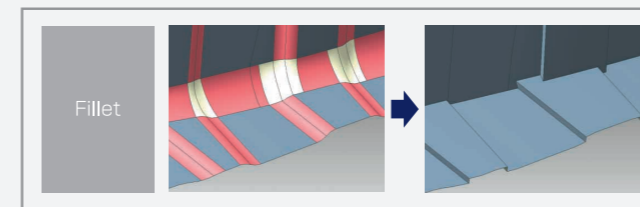
The Geometry Simplification Option reduces model complexity and size by removing unneeded design features which are unnecessary for a given process.

Feature Recognition

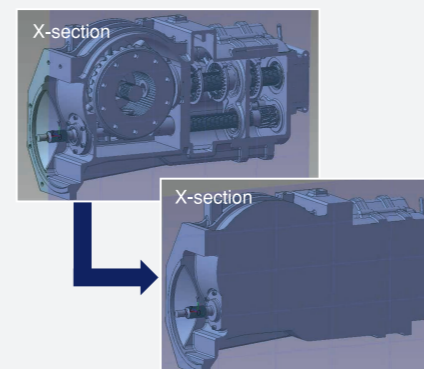
Feature Recognition allows for automatic identification of features such as fillets, holes, boss and rib, and steps. Elysium technology can operate on any B-rep due to proprietary geometry interrogation techniques. CADdoctor provides for systematic Feature Recognition integrated user interface to allow for, display of features, categorization.

Feature Removal

CADdoctor utilizes a non-destructive technique to remove features without damaging the original geometry model quality. The Feature Removal process allows for the end-user to either select specific features via mouse pointer, a group of feature, or an entire category of features. Once a feature has been removed, adjacent faces are extended to repair the section of the model which has been eliminated.



Solid Envelope Creation

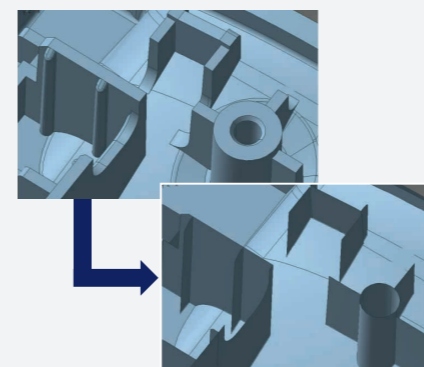


Enveloping function creates a super light single solid model by merging all the parts in an assembly and deleting the detailed interior geometry.

There are two major use cases for the Solid Envelope Creation: Protection of Intellectual Property and Reduction of data size. The requirements for the envelope are Geometric Accuracy to the original model and significant reduction of model size in terms of entity count and file size. CADdoctor can perform these requirements on very large assemblies with complex geometry with systematic automation and user guided operation for envelope creation.

The Solid Envelope Creation process involves the merging of a complex assembly by utilizing Boolean operations to create a single part. CADdoctor then automatically detects and fills small gaps which cannot be detected visually. Automatic gap detection and filling is controlled via user set parameters which allows for user defined shape preservation. Also by combining with feature recognition and removal function, users can better control whether to preserve a detailed exterior or to produce a more simplified envelop by filling large holes. CADdoctor allows for combined usage of Feature Recognition and Feature Removal functions in the case where specific details which are not required for the final Solid Envelope may be removed such as holes.

Mid-surface Generation



CADdoctor provides Mid-surface Generation tools to create high-quality mid-surfaces from a solid model for CAE analysis. Rich editing functions allow for the extraction of Mid-surfaces from very complex solid models.

Mid-surface Generation Automation

CADdoctor allows for automatic generation of Mid-surfaces with user defined parameters to support a mid-surface at the midpoint, upon a front-face, and the back-face. Advanced settings to support thickness variation include surface stepping or surface smoothing with slope interpolation. This control of mid-surface generation supports cases whereby a ribs or bosses vary in thickness and provides a gap free and a non-isolated mid-surface.

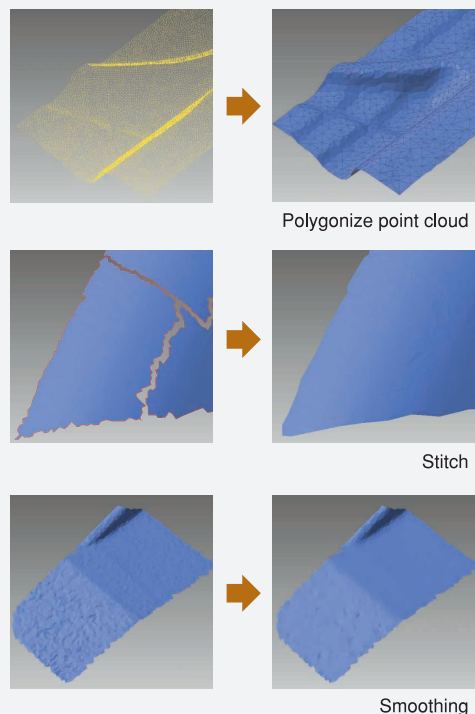
Modifying Mid-surfaces

CADdoctor includes a toolset to modify mid-surfaces so that the end-user has final editing capability to assure for complete intent for downstream consumption to allow for analysis results that meet the specific use-case intent.

Polygon Extension / Reverse Engineering

The Polygon option provides functions to create, validate, repair and edit the polygon data obtained from sources such as 3D measurement machines. It supports the import and export of STL and other polygon data formats.

Polygon Data Creation, Checking and Healing



Polygon data is used for applications such as visualization, computational fluid dynamics, digital mock-up, and rapid prototyping. CADdoctor allows for predicable build with parameters to control accuracy relative to the original 3D data set whether the data set originated from point clouds or from CAD.

Importing Point Cloud and Translating to Polygon

CADdoctor Polygon option provides for the import of point cloud data acquired from a 3D scanner and instantly creates a polygon representation. The fidelity of polygon import can be optimized via functions such as 'de-noising', 'smoothing', or 'false acquisition errors'.

Detecting Polygon PDQ Errors and Repairing

CADdoctor allows for legacy geometry/topology healing functions to allow for automated Polygon PDQ check function for automatic error detection and healing of erroneous data such as overlapping surfaces, slivers, gaps, holes and other errors which can cause downstream re-use impossible.

Optimizing Polygon Data

Final Polygon Fidelity is a term Elysium utilizes to address the usability of Polygon data in downstream applications such as finite element analysis mesh generation, visualization, or rapid prototyping. CADdoctor provides for rich Re-mesh functions which can automatically trim uneven or irregular polygons and polygon granularity. Other Polygon Fidelity functions include Polygon Optimization which provide for Smoothing, a function that smooth the contours for areas containing convex or concave profiles. Polygon Simplification reduces the complexity of the polygons while preserving the same physical shape. The Wrapping feature extracts the exterior form and creates a closed polygon representation.

Reverse Engineering



The Reverse Engineering function generates the B-reps from the data acquisition results of 3D scanning. CADdoctor allows for the creation of CAD models from 3D point cloud data or polygon data.

Automatic Fillet, Base Face and Analytic Face Recognition

CADdoctor's Reverse Engineering function automatically recognizes the areas for fillets and base faces by the curvature of polygons. It also recognizes the planar or cylindrical geometries of analytic faces to generate high-quality B-rep data containing the identical face structures and face types which equate to the same level of quality as if modeled directly in a CAD system.

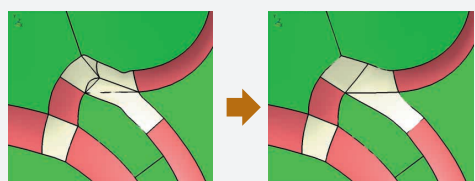
Users can easily adjust the areas for fillet recognition with a slide bar checking the areas graphically to ensure that the automatic recognition matches their intent. Users can also specify a known threshold for fillet radius in case where best modeling practices call for a specific fillet radius, hence allowing for rapid fillet recognition.

Automatic B-rep Generation

CADdoctor can automatically generate B-reps surfaces based on the recognition of fillets or base faces. High quality B-rep surfaces are created due to the automatic smoothing functions that assure that continuity between connected faces maintain tangency to link different face types such as fillet faces, base faces and blend faces. Analytic faces are generated upon detection of planes, cylinders and cones. Face types are clearly classified by the face color, which raises level of ease of use and work efficiency.

Modification of Edges and Faces

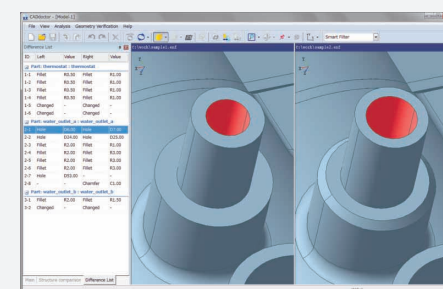
CADdoctor provides for rich editing tools which allow for the end user to edit or modification of low quality polygon data to create high fidelity B-reps. For example, the generated B-rep might not be smooth due to noise in the original polygon data, or the geometry might be vague due to the low density of the original polygon data. In these cases, users can improve the quality of those areas to satisfy their requirements by editing, deleting or adding edges and faces. Users can also control the continuity between adjacent edges by automatic edge re-creation. Additional edit functions extend the ability to include controls to maintain reference to the original polygon geometry so that the final B-rep maintains the shape with the original geometry. In the case of excessive noise, CADdoctor can be controlled to ignore erroneous polygons to provide for the generation of B-reps with smooth faces.



Geometry Verification / Quality Check for Mold Manufacturing

Automated Geometry Verification allows for instant detection and validation of design changes. Quality Check for Mold Manufacturing shortens production lead-time by reducing development rework.

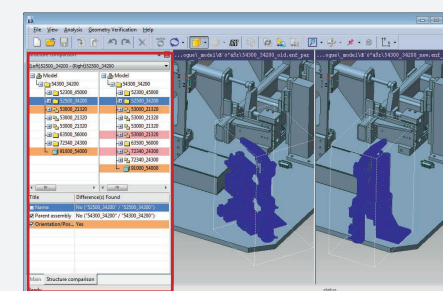
Geometry Verification



Geometry Verification detects differences in geometry and assembly structure between two CAD parts or assemblies. Differences or slight variations are easily identified using CADdoctor's comprehensive visual interface.

Verification of Geometric Information

CADdoctor's Geometry Verification function verifies the differences of the geometry and the position of faces and edges between two CAD files, for example, before and after engineering change operations. CADdoctor allows for ease of verification via numeric comparison as CADdoctor can recognize the values for fillet radius, hole diameter, and chamfer length. Job efficiency is greatly increased due to the reporting function to display numeric details extracted from a B-rep which could in some cases be invisible via visual analysis. CADdoctor's Detail Verification mode allows for the detection of topological information such as merged or divided faces or edges, or changes in the tangency between faces or edges. The result is displayed a color contour map allowing users to visually check and zoom in where need to each geometry difference via a single mouse click.



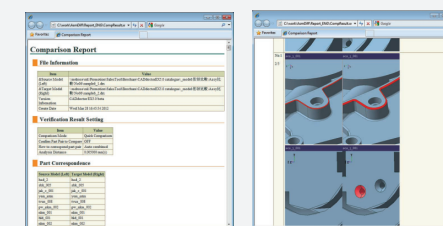
Structure Comparison Panel

Verification of Assembly Structure Information

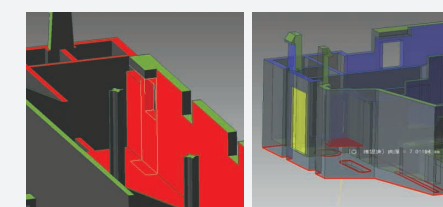
The Geometry Verification module in CADdoctor allows for detection of differences between two assembly structures such as addition/deletion of parts, part position/orientation, part hierarchy, and part name. Detected differences are highlighted in the assembly tree, as shown in the "Structure Comparison" panel [left] wherein each identified difference can be examined using a "zoom" function of CADdoctor. CADdoctor can analyze very large assembly models due to the methodology of display control – show/no-show of changed parts only in the "Structure Comparison" panel. CADdoctor detects corresponding parts in the two assemblies by referring to specific information such as internal ID, component alignment and number of elements. These functions allow for CADdoctor to provide the most accurate verification available in the marketplace.

Verification Report Export

The results from Geometry Verification can be exported in an XML format which is viewable in a Web browser. This XML report allows for results to be shared with other departments or partners who do not have access to CADdoctor. The XML report includes images of Verification results to allow for instant and ease of model variance checking which is normally very time intensive. This report is also useful for checking product data quality whereby unexpected differences in parts or faces are quickly and easily detected.



Quality Check for Mold Manufacturing



The Quality Check for Mold Manufacturing option has a built-in knowledge base of plastic injection molding expertise to allow for the checking of CAD data destined for a downstream plastic injection molding operation.

Automatic Error Detection for Manufacturing Requirements

The Mold Manufacturing Check is run on 11 items in 3 categories. The first category, Product Formability, is used to check for product quality issues during or after form, such as inadequate or excessive thickness. The second category is for Mold Construction, which contains checks for undercut or slide candidates, which can lead to complex mold construction, increasing the mold manufacturing cost. The third category is Mold Formability, for the checking of such issues as sharp edge, deep trench, and small bump. These types of detected characteristics cannot be formed by the mold. By setting tolerances and thresholds based on company standards, CADdoctor can ensure that every item which does not meet these standards will be detected.

Manufacturing Report Export

The results from the manufacturing check can be exported in an XML format which is viewable in a Web browser. This XML report allows for results to be shared with other departments or partners who do not have access to CADdoctor. The report also includes an overall image of the model and exploded images of each issue ensuring that readers of the report can easily consumed and issues interpreted.

