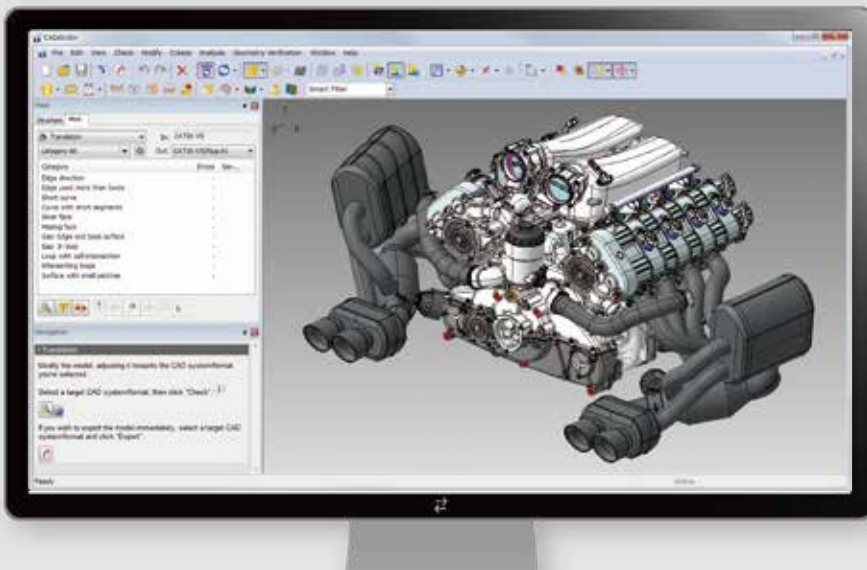# CADdoctor®

ELYSIUM

elysium-global.com

POWERFUL HEALING, OPTIMIZATION AND SIMPLIFICATION

CADdoctor is the ultimate tool to maximize and accelerate your 3D data. CADdoctor goes beyond CAD translation to provide geometry error detection, healing, simplification, and enhance your data for downstream processing.

THE LEADING EDGE OF 3D DATA UTILIZATION

CADdoctor was design to support your 3D data utilization. Going beyond CAD to CAD translation, CADdoctor has advanced capabilities to detect and heal errors and to optimize data for downstream processing, for instance prepping for FEA mesh generation. With CADdoctor, streamline and maximize the use of your 3D data.

Explore the possibilities of CADdoctor when you free yourself from complex integrations, time-costing errors, and project delays. Let CADdoctor take the uncertainty out of your 3D data.

HIGH-QUALITY TRANSLATION

Built on highly advanced 3D geometry handling technology and CAD system's API, CADdoctor can translate your CAD data with the highest fidelity toward your target system

EASY OPERATION

User-friendly interface combined with easy operation to assist novice and experienced designers alike

MORE THAN TRANSLATION

From Geometry Verification to Geometry Simplification, CADdoctor's optimization functions accelerate your downstream processes ensuring efficiency and effectiveness in the entire manufacturing lifecycle

Learn More...
elysium-global.com/en/product/caddoctor/

CADdoctor®

Highlighted Feature

# Translation & PDQ Verification / Geometry Validation

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

CAD Data Verification 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.
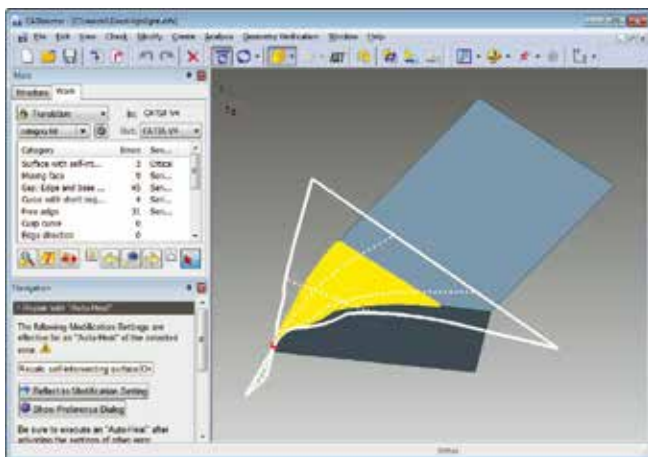
Repairing PDQ Errors Automatically

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.
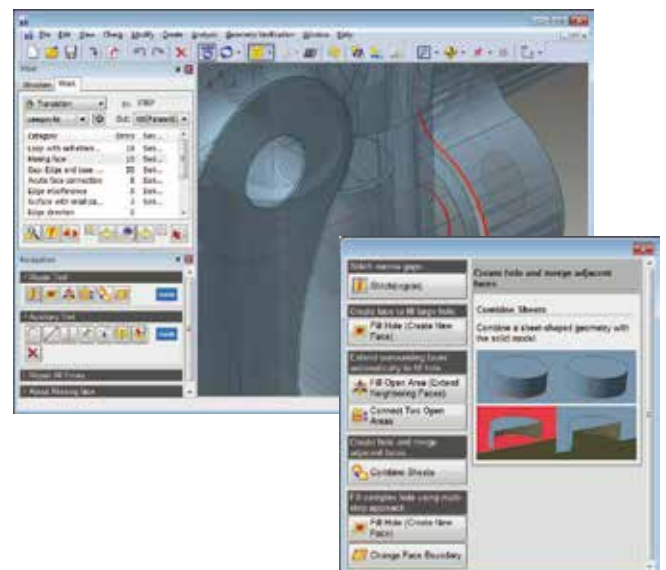
CADdoctor®

Geometry Validation

Geometry Validation 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.

Validation of Geometric Information and Assembly Structure

CADdoctor's Geometry Validation 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 validation 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 validation 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. Moreover, CADdoctor validates the differences of the assembly structure such as deletion/addition of components, orientation changes and hierarchy changes.
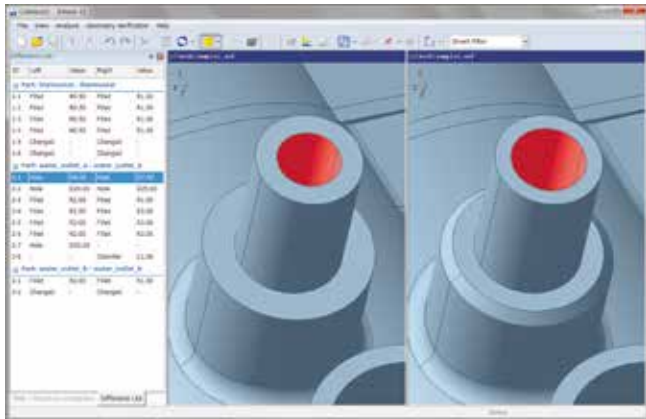

Quality Check for Mold Manufacturing

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.
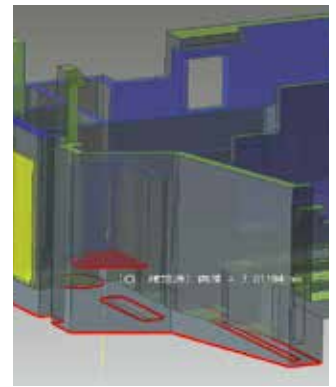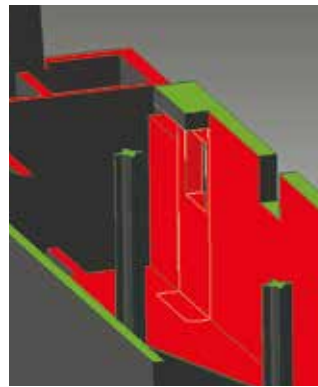
Polygon Extension / Reverse Engineering

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.
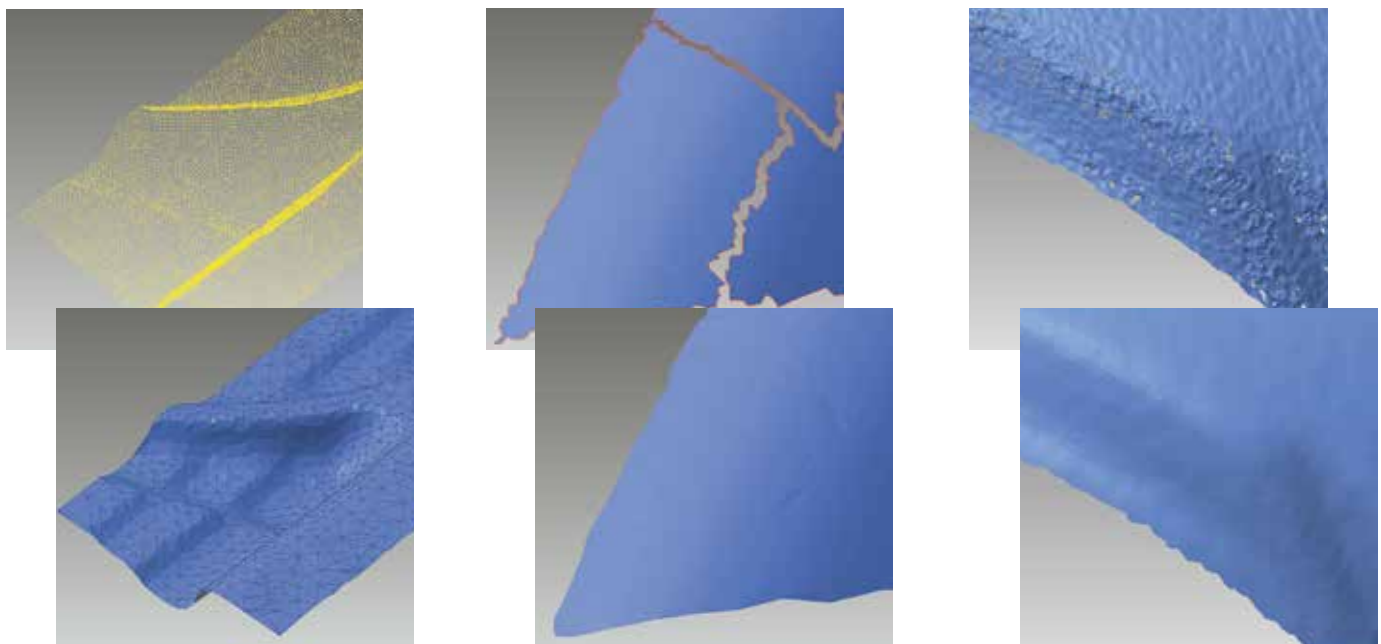
Reverse Engineering

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.
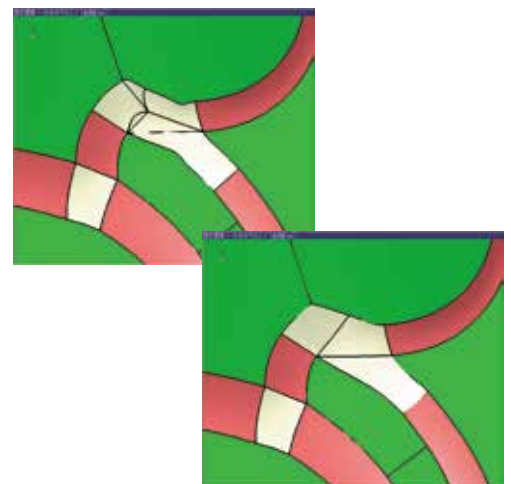
Geometry Simplification

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.

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.
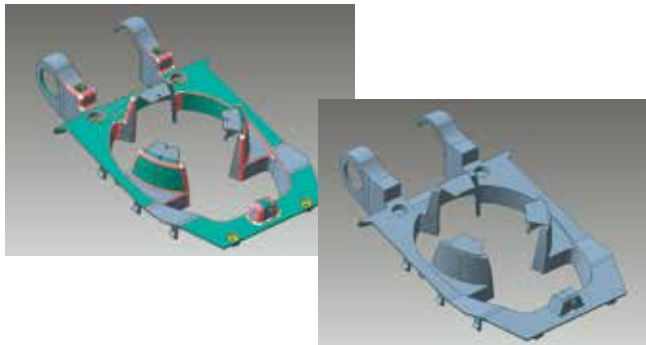
Feature Recognition

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.
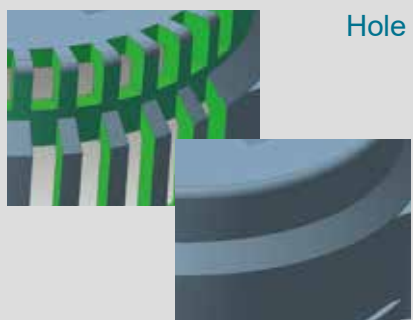
Feature Removal

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.
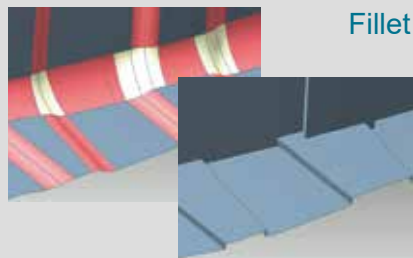
Fillet

Fillets are automatically detected by capturing radius as the threshold and an angle is developed by removing the fillet. Upper and lower limit of threshold can be set depending on purpose allowing to: detect all fillets with set radius, detect only the fillets with certain radius, or detect fillets that are under set radius. Series of fillets can be detected including fillets with radius that is non-constant, a gradually changed fillet that has varied radius, corner fillets that has multiple fillets colliding. Also, either concave fillet can be selectively detected. The detected fillets will be automatically removed collectively and an angle will be developed. In case of continuous fillet without auxiliary, face can be detected from the boundary line and removed.

Hole

Both round holes and generic holes can be detected and removed and three methods are available. The round hole auto-detect and removal feature refers to the diameter of the round hole as threshold. The generic hole auto-detect and removal feature refers to the width of the hole as threshold. By selecting a face to find holes, the manual hole detect and removal feature supports detection and removal of any opening as a hole. Round holes can be detected by setting upper and lower limit of thresholds, just like in the fillet feature. The hole doesn't have to be cylindrical. As long as the cross section is circular, complex holes that are winding can also be automatically detected. Openings that cross over multiple faces can also be detected. The holes can be filled by either extending the adjacent faces not leaving any form or by filling with another face and leaving the form. In developing flow path for fluid analysis, geometry of the inner void can be extracted. A cap will be automatically generated on the opening and can be extracted as a solid model.
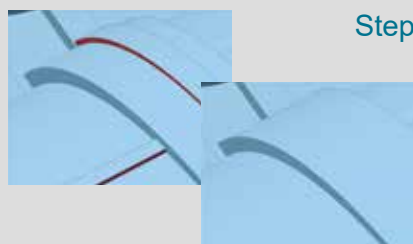
Step

Tiny step on two planar surfaces can be merged into one plane and step is removed. Distance between the steps are set as threshold, tiny step is determined when the threshold is within maximum distance between two planar surfaces parallel to the steps, the step will be removed and the planar surfaces merged. When merging the planar surface, the smaller plane moves towards the larger plane, gap is avoided by removal of the step after the adjacent faces are extended or contracted.

Solid Envelope Creation / Mid-surface Generation

CADdoctor contributes to the time reduction of data preparation for CAE analysis by its Solid Envelope and Mid-surface functions backed by Elysium's best-in-class geometry handling technology.

▍Solid Envelope Creation / Interior Space Extraction

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.
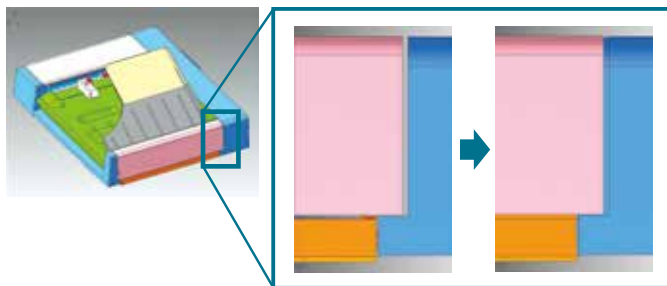

Filling Gaps between Parts

It is essential to fill gaps between parts to create a single solid model out of complex assembly models. CADdoctor automatically detects and fills gaps between parts—even tiny gaps which cannot be detected by the human eye—by either creating a new solid body or changing the shape of adjacent parts, while minimizing the geometric modification. It also provides an easy-to-use editing tool to fill complex gaps manually.

Enveloping and Extracting Outline of Interior Space

CADdoctor facilitates solid envelope creation with its Boolean operation, automatic recognition and removal of parts which are tiny or invisible from the outside, and gap filling between parts.

Typically, internal spaces will remain after enveloping when they are connected to exterior parts via gaps or openings. CADdoctor, however, detects and fills these openings to create a successful solid envelope extraction with no remaining interior spaces, while significantly reducing the data size. CADdoctor can also extract the interior space of the assembly model as a single solid model by covering openings automatically.
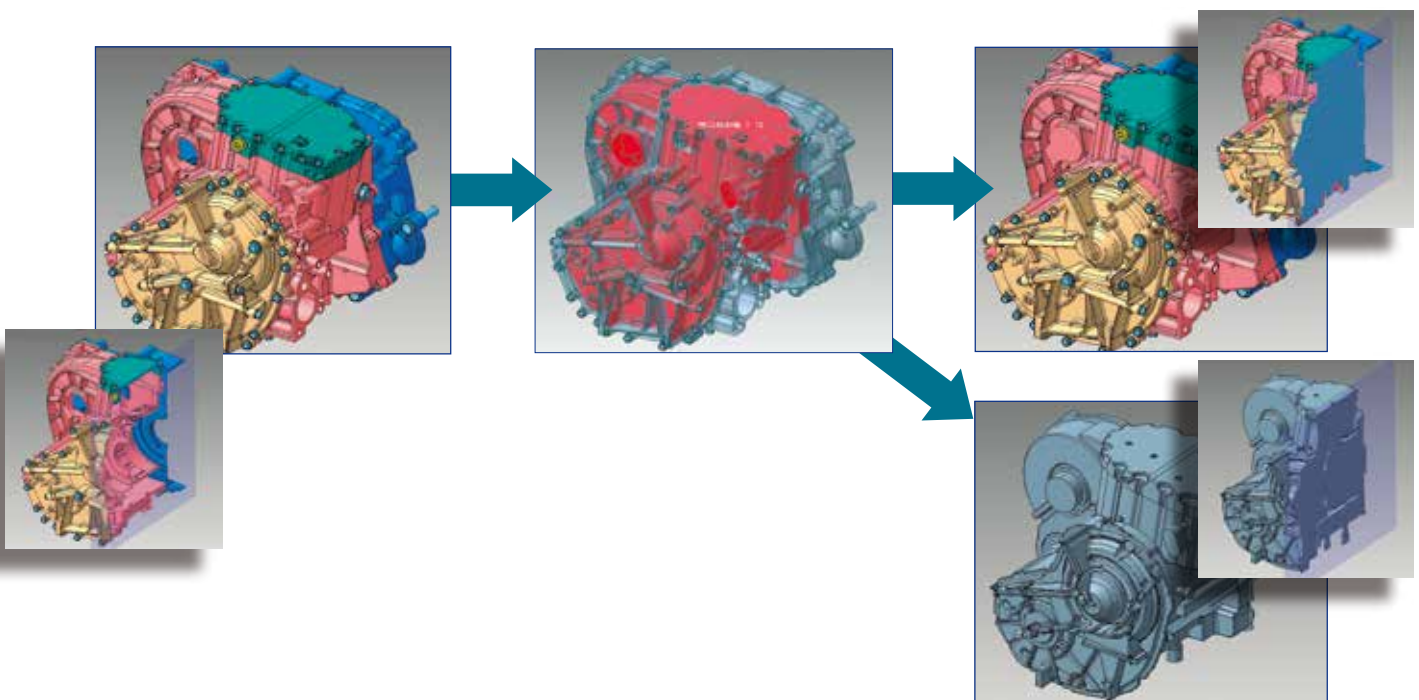
Mid-surface Generation

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-surface

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.