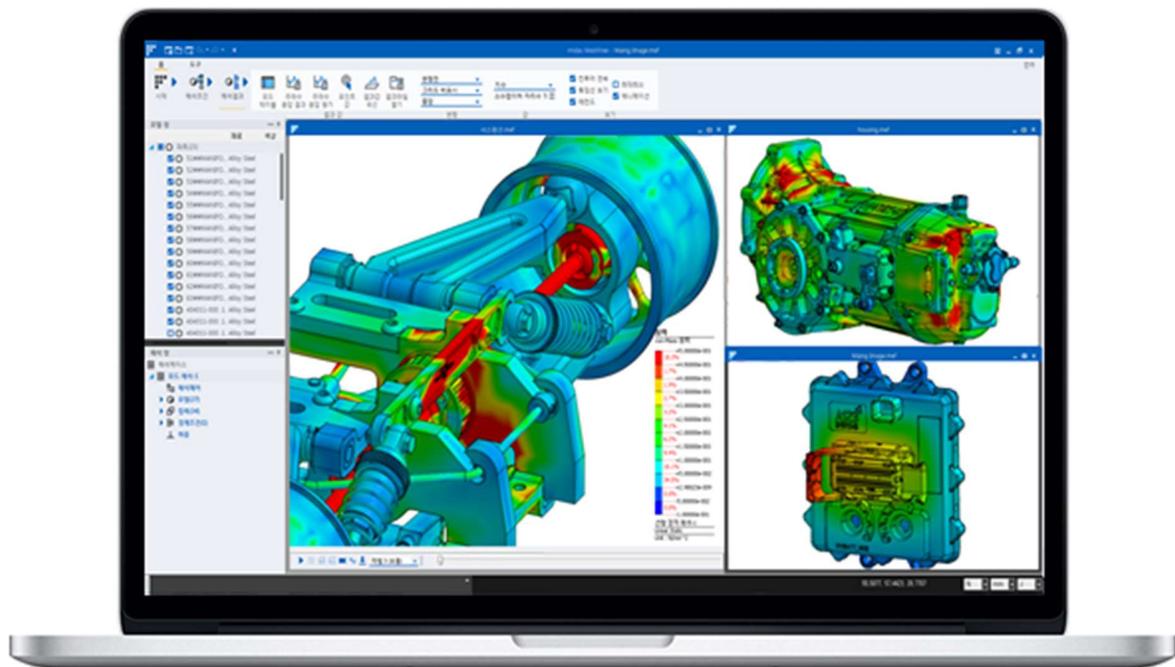


MIDASIT

MeshFree2021R1 Release Note

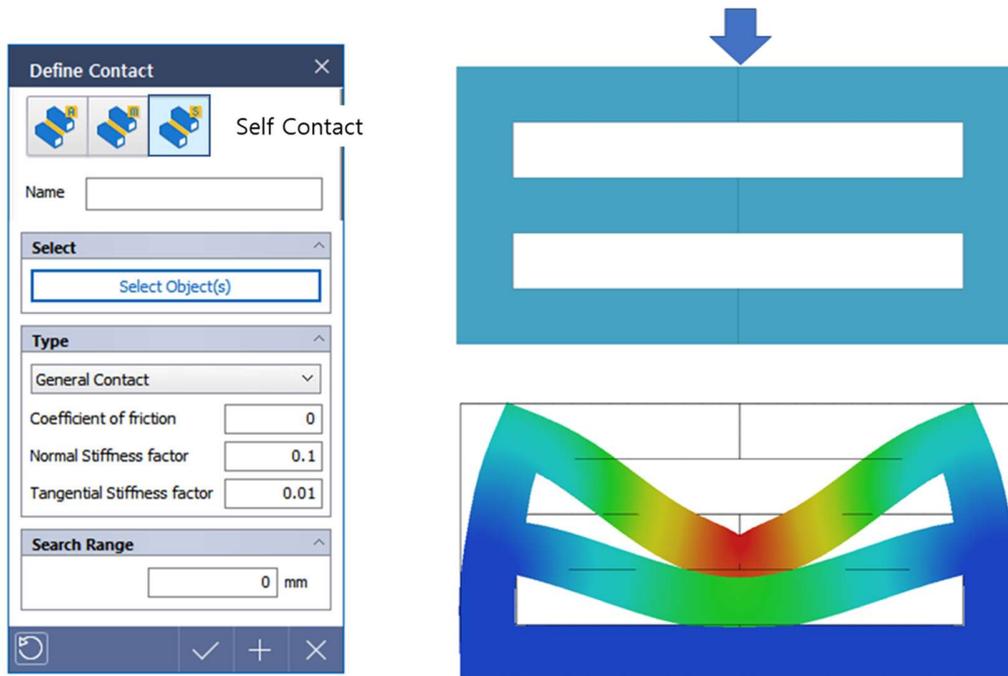
April 2021



Contact with the new world

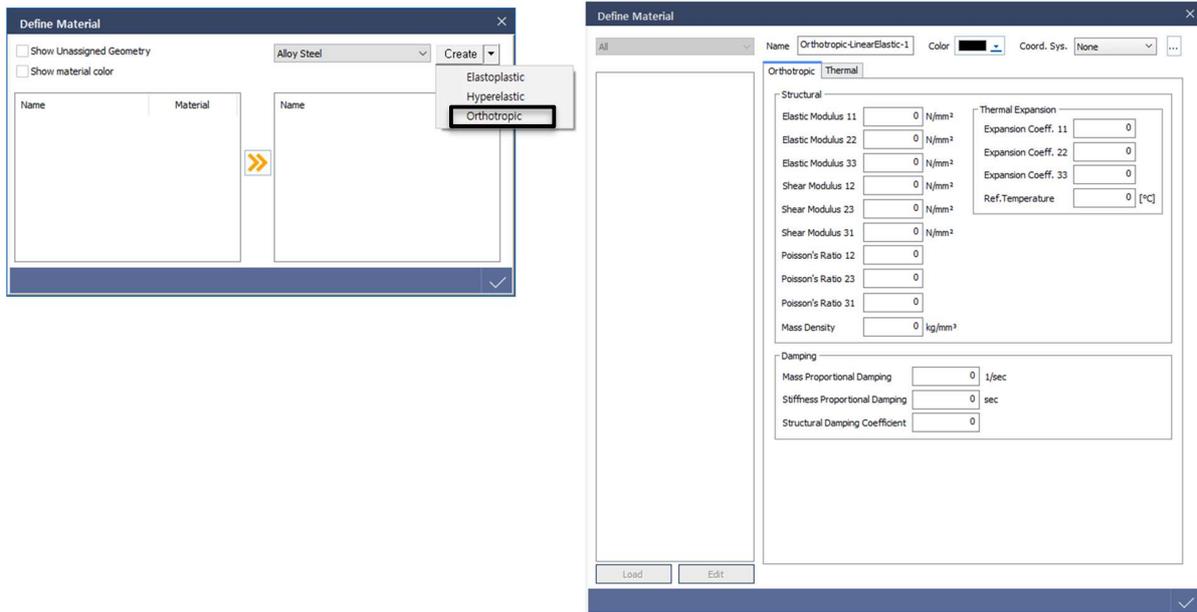
In August 2018, we released MeshFree 1.0 with slight changes to the existing CAE technology. Smaller technological changes that are freer to create meshes have innovatively overcome FEM-based technical limitations that have occupied the CAE market for more than half a century. MeshFree leads the change in the CAE process in the design stage, which allows design engineers to perform analysis by themselves using the beautiful model prototypes designed by design engineers to verify the performance of design products and perform optimal design. In MeshFree 2021 R1, to establish itself as a more reliable partner, the ease of use has been strengthened, and efforts have been made for continuous improvement to improve reliability.

Add self-contact function



In defining the general contact included in the nonlinear behavior, the user selects the master surface and the slave surface so that the two surfaces cannot penetrate each other. However, for a phenomenon in which contact occurs within a single part or a single surface due to large deformation of the structure, the user cannot define the contact by dividing the primary contact surface and the subordinate contact surface to track whether the faces pass through each other. The self-contact function makes it easy to define the contact surface, but the analysis time can be greatly increased.

The addition of orthotropic material



Orthotropic materials are materials whose material properties are symmetric about three perpendicular planes. In midas MeshFree, you can use orthotropic materials for 3D shape elements. Orthotropic materials express their properties for the major axis of the material, and the stress-strain relationship for a three-dimensional stress state is as follows.

$$\begin{Bmatrix} \sigma_{11} \\ \sigma_{22} \\ \sigma_{33} \\ \tau_{12} \\ \tau_{23} \\ \tau_{31} \end{Bmatrix} = \begin{bmatrix} \frac{1-\nu_{23}\nu_{32}}{E_2E_3\Delta} & \frac{\nu_{21}+\nu_{31}\nu_{23}}{E_2E_3\Delta} & \frac{\nu_{31}+\nu_{21}\nu_{32}}{E_2E_3\Delta} & 0 & 0 & 0 \\ & \frac{1-\nu_{13}\nu_{31}}{E_1E_3\Delta} & \frac{\nu_{32}+\nu_{12}\nu_{31}}{E_1E_3\Delta} & 0 & 0 & 0 \\ & & \frac{1-\nu_{12}\nu_{21}}{E_1E_2\Delta} & 0 & 0 & 0 \\ & \text{symmetric} & & G_{12} & 0 & 0 \\ & & & & G_{23} & 0 \\ & & & & & G_{31} \end{bmatrix} \begin{Bmatrix} \varepsilon_{11} - \alpha_{11}\Delta T \\ \varepsilon_{22} - \alpha_{22}\Delta T \\ \varepsilon_{33} - \alpha_{33}\Delta T \\ \gamma_{12} \\ \gamma_{23} \\ \gamma_{31} \end{Bmatrix}$$

$$\Delta = \frac{1 - \nu_{12}\nu_{21} - \nu_{23}\nu_{32} - \nu_{31}\nu_{13} - 2\nu_{21}\nu_{32}\nu_{13}}{E_1E_2E_3}$$

The stress-strain relationship for transverse shear is as follows.

$$\begin{Bmatrix} \tau_{31} \\ \tau_{23} \end{Bmatrix} = \begin{bmatrix} G_{31} & 0 \\ 0 & G_{23} \end{bmatrix} \begin{Bmatrix} \gamma_{31} \\ \gamma_{23} \end{Bmatrix}$$

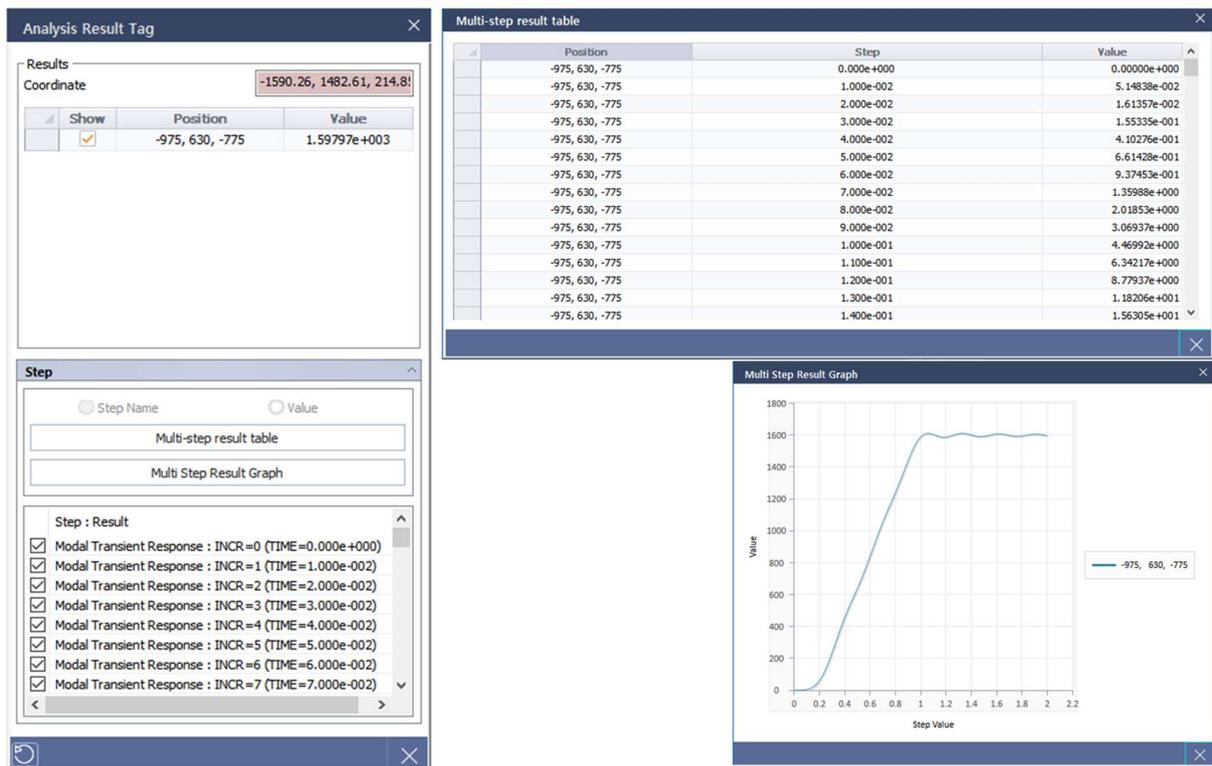
In general, in the case of orthotropic materials, the following properties must be satisfied.

$$\nu_{21}^2 < \frac{E_2}{E_1}, \quad \nu_{12}^2 < \frac{E_1}{E_2}, \quad \nu_{32}^2 < \frac{E_3}{E_2}, \quad \nu_{23}^2 < \frac{E_2}{E_3}, \quad \nu_{13}^2 < \frac{E_1}{E_3}, \quad \nu_{31}^2 < \frac{E_3}{E_1}$$

$$1 - \nu_{12}\nu_{21} - \nu_{23}\nu_{32} - \nu_{31}\nu_{13} - 2\nu_{21}\nu_{32}\nu_{13} > 0$$

Improved multi-step result function

For nonlinear static analysis, dynamic analysis (transient response, frequency response, random response), and transient heat transfer analysis, analysis results are output in multiple steps according to the magnitude of the load, time, or frequency change. The frequency response result, point value, and reaction force function output as a multi-step result (table or graph) have been improved to use it more intuitively and simply. Tables and graphs that were previously output based on step number are all output based on step values.



CAD interface Update

Type	Extension	version
Parasolid	x_t, xmt_txt, x_b, xmt_bin	9.0 ~ 33.0
ACIS	Sat, sab, asat, asab	R1 ~ 2021.1.0
STEP	stp, step	AP203, AP214, AP242
IGES	igs, iges	Up to 5.3
Pro-E / Creo	prt, prt.*, asm, asm.*	16 ~ Creo 7.0
SolidWorks	sldprt, sldasm, slddrw	98~2021
CATIA V4	CATPart, CATProduct, cgr, CATDrawing	4.1.9~4.2.4
CATIA V5	CATPart, CATProduct, cgr, CATDrawing	V5R8 ~ V5-6R2021
Unigraphics	prt	11 ~ NX 1926
Inventor part	ipt	V6 ~ V2021
Inventor Assembly	iam	V11 ~ V2021
SolidEdge	par, asm, psm	V18 ~ SE2021

Support for the latest version of the CAD interface may be delayed depending on the supplier's update environment. If the newest version is not supported, please convert it to a neutral file such as Parasolid or STEP file format. We will do our best to reflect on the latest version of CAD quickly.