








DMU Optimizer

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Preface

DMU OPTIMIZER 2 (DOP) is a product dedicated to improve user's productivity by computing an optimized representation of data for mockup verification in the context of the immersive and collaborative design review environment of the full digital mockup. DMU OPTIMIZER 2 (DOP) facilitates the full integration of Digital Mockup centric processes within the global engineering environment of the customer.

DMU OPTIMIZER 2 is a dedicated DMU Navigator workbench and is available on both UNIX and Windows NT environments.

This guide is organized as follows:

- **Getting Started**

Provides a scenario allowing you to get acquainted with the product.

- **Basic Tasks**

Provides a step-by-step guide for using DMU Optimizer. Useful tips are given for getting the most out of the product.

- **Workbench Description**

Describes menu commands and workbench toolbars that are useful for DMU Optimizer.



Using This Guide

This guide is intended for the user who needs to quickly become familiar with DMU Optimizer. The user should be familiar with basic DMU Navigator Version 5 concepts such as document windows, standard and view toolbars.

To get the most out of this guide, we suggest you start reading and performing the step-by-step tutorial "Getting Started".

>The next sections present main capabilities in the form of user's tasks. It may be a good idea to take a look at the section describing the menus and toolbars.



Where to Find More Information

Prior to reading this book, we recommend that you read the *DMU Navigator User's Guide*.

You may also like to read the following complementary DMU Navigator product guides, for which the appropriate license is required:

- *DMU Fitting Simulator User's Guide*
- *DMU Space Analysis User's Guide*.



Getting Started



Before getting into the detailed instructions for using DMU Optimizer, the following tutorial aims at giving you a feel of what you can do with the product. It provides a step-by-step scenario showing you how to use key functions. The main tasks described in this section are:

Tasks	
Starting a Session	
Generating a Silhouette	
Generating a Wrapping	
Generating a Thickness	
Generating an Offset	

Starting a DMU Optimizer Session



Before starting this scenario, you should be familiar with the basic commands common to all workbenches. These are described in the *DMU Navigator User's Guide*.

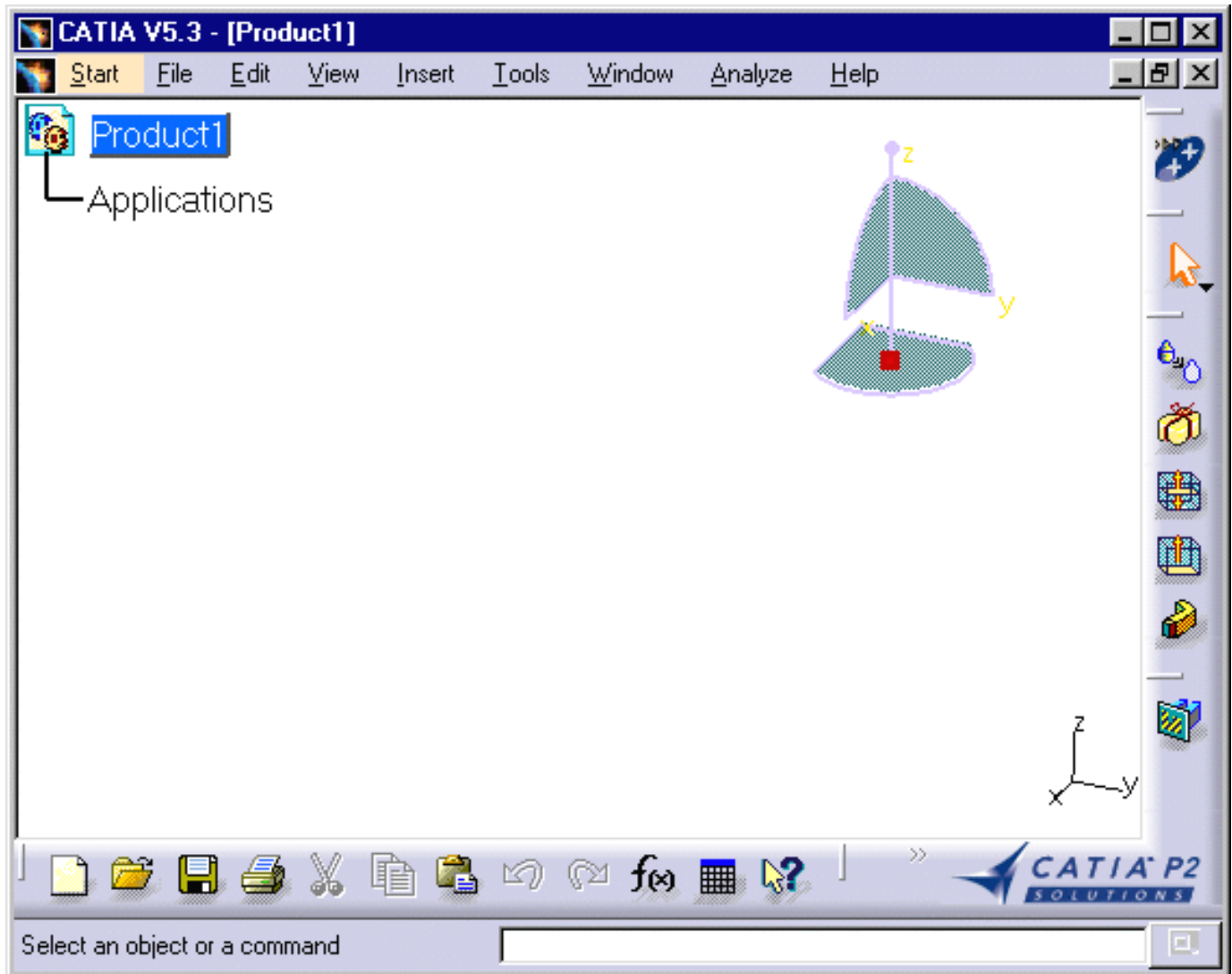


This first task will show you how to enter the DMU Optimizer workbench and select your models



1. Select Digital Mockup -> DMU Optimizer from the Start menu

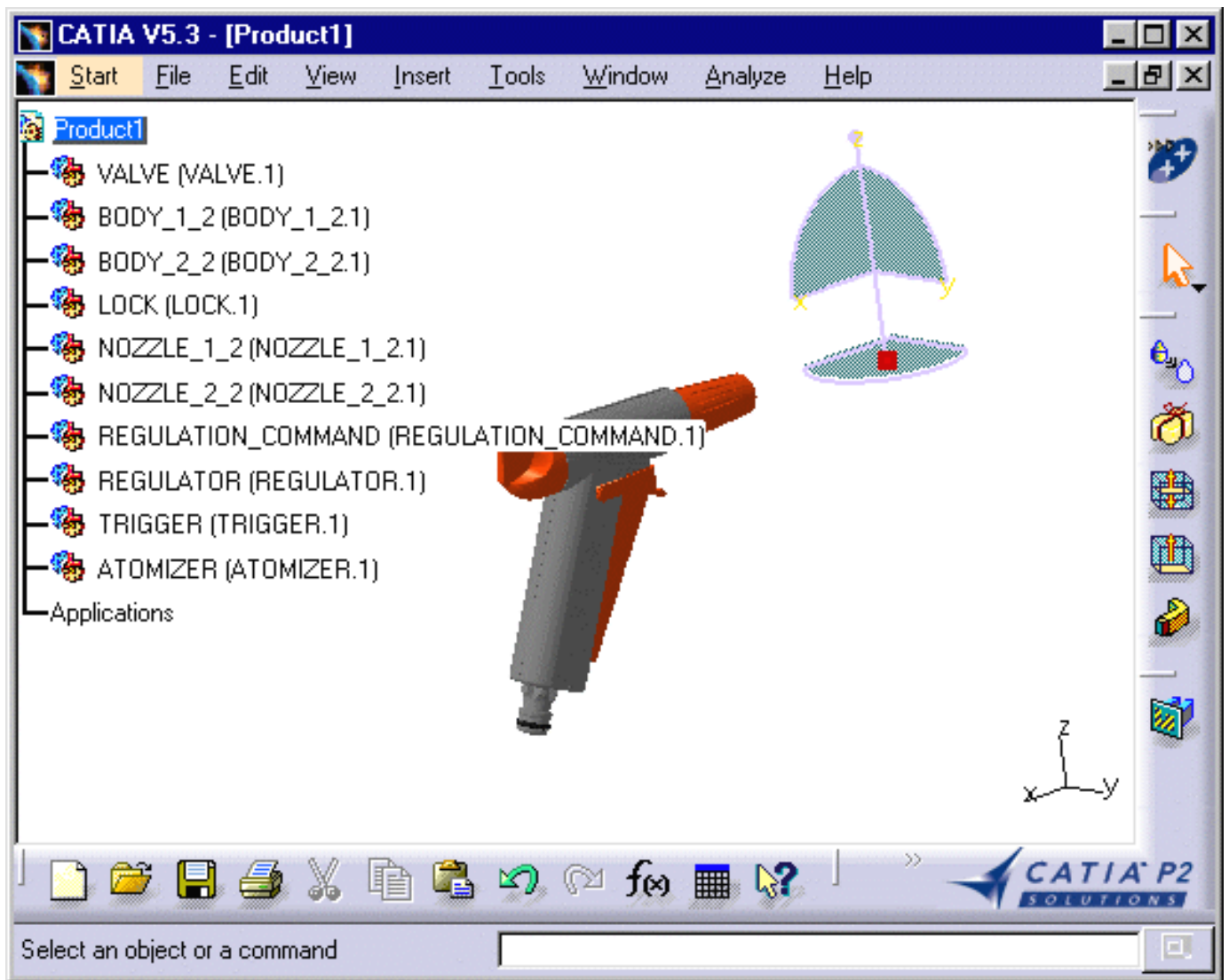
The DMU Optimizer workbench is loaded and an empty document opens:



2. Select Insert -> Existing Component... from the menu bar.
3. Select the desired model files by clicking the first one then shift-clicking the last one you want.

Click Open to open the selected files.

The specification tree is displayed showing all the selected products.



Use the Fit All In icon  to position the model geometry on the screen.



- Up
- Starting a Session
- Generating a Silhouette
- Generating a Wrapping
- Generating a Thickness
- Generating an Offset

Generating a Silhouette



This task will show you how to calculate new geometry and in this case generate a silhouette



The sample document used in this task can be accessed in the folder:
online\samples\dmuoptimizer\ GARDENA*.cgr.



(Optional)

You can manage the Silhouette result as alternate shape automatically.

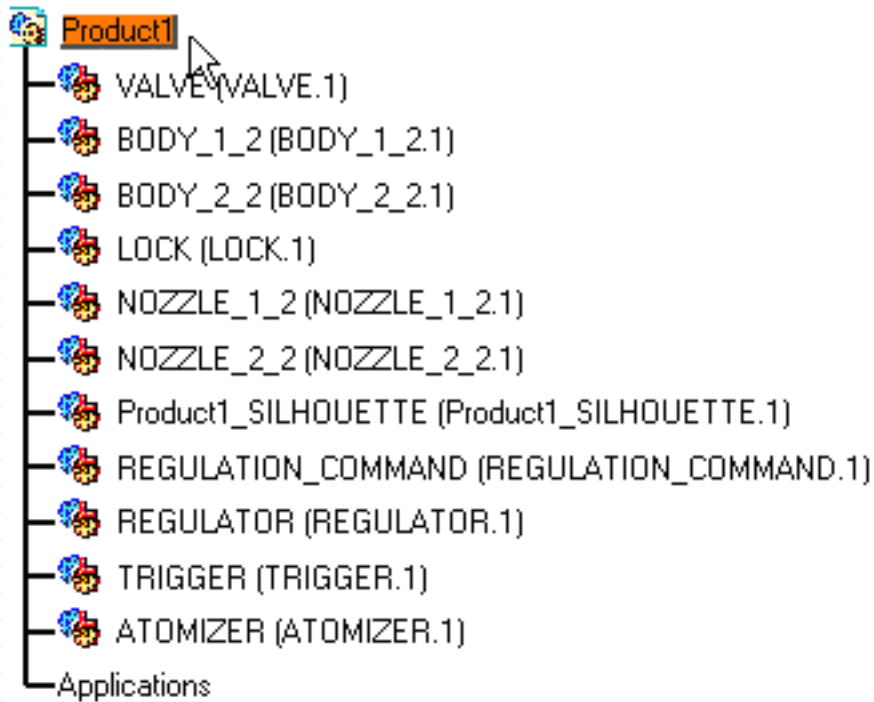



For more details, please refer to
[Managing an Alternate Shape](#).

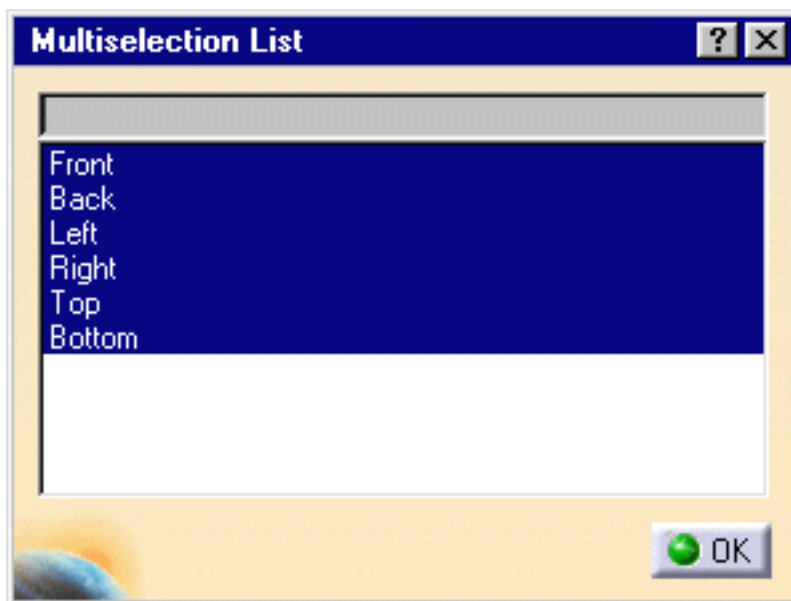
1. Click the Silhouette icon  from the DMU Optimizer toolbar.
The Silhouette dialog box appears:



2. Select Product1 in the specification tree.
3. Enter the desired value in the grain field for instance 2mm



4. Click the more button  to display the Multiselection list.
5. Select the desired views. The 6 views for instance
6. Click OK to confirm your operation.



7. Click the Apply button to obtain a silhouette preview
The progress bar displays:

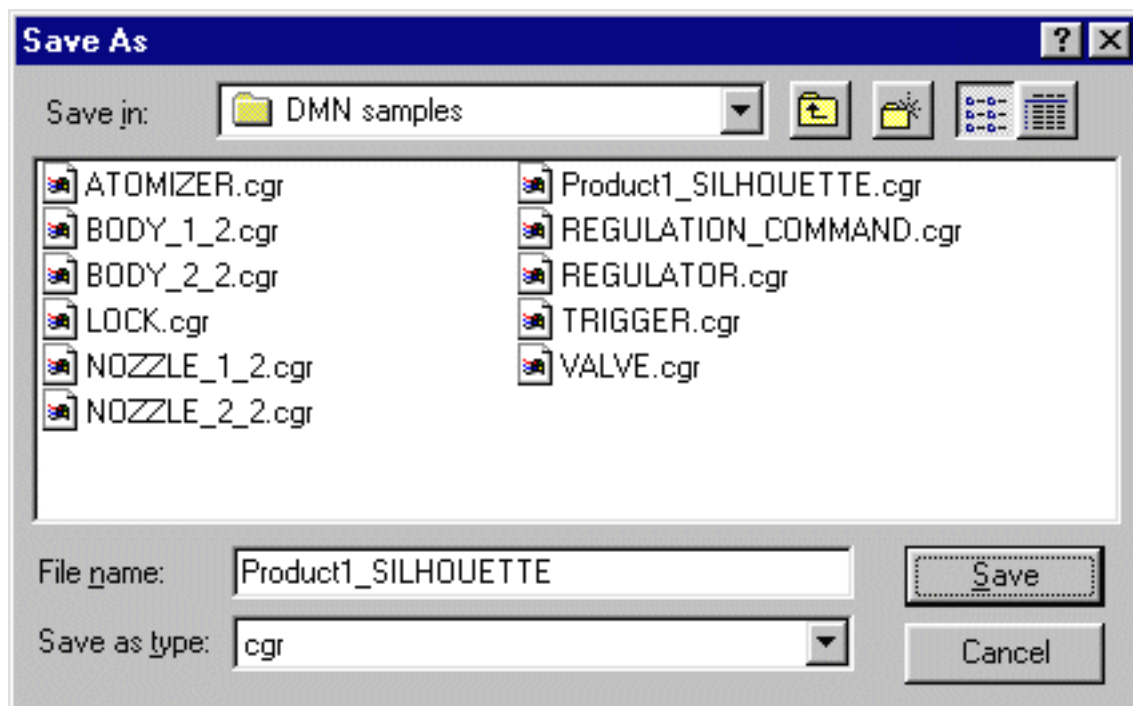
The Preview window display too.



DMN License:

If you have a DMU Navigator license, you can define cameras and they are proposed in the multiselection dialog box.

8. Click OK to save the silhouette representation.





Up



Starting a Session



Generating a Silhouette



Generating a Wrapping



Generating a Thickness



Generating an Offset

Generating a Wrapping



This first task will show you how to generate a Wrapping representation.



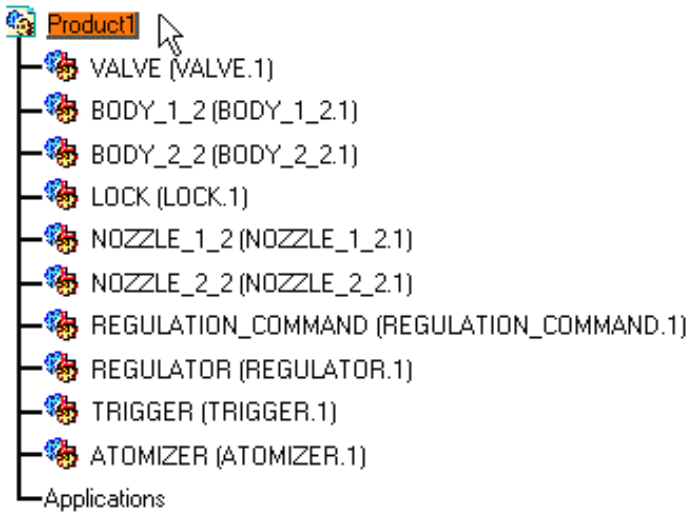
The sample document used in this task can be accessed in the folder: online\samples\dmuoptimizer*.cgr.
You activated



(Optional)

You can manage your Wrapping result as alternate shape automatically. Please refer to [Managing an Alternate Shape](#).

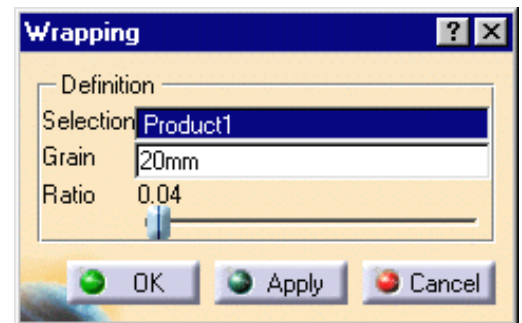
1. Select Product 1 in the specification tree.



2. Click the Wrapping icon  from the DMU Optimizer toolbar.

The Silhouette dialog box appears:

3. Set the grain accuracy by entering a value, 4mm for example.



Setting the Ratio

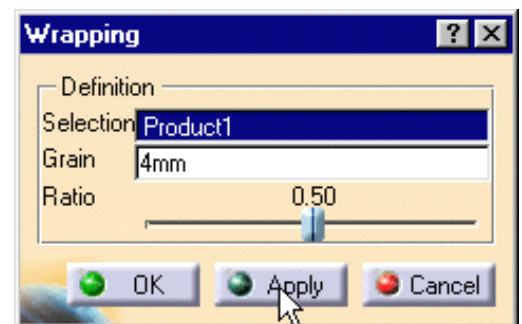
The Ratio determines the wrapping representation. A lower setting results in a thinner wrapping coverage

4. Move the slider to the right to set the ratio to 0.50 for example

5. Click Apply to obtain a preview

The progress bar shows the computation

The preview window lets you see the resulting wrapping

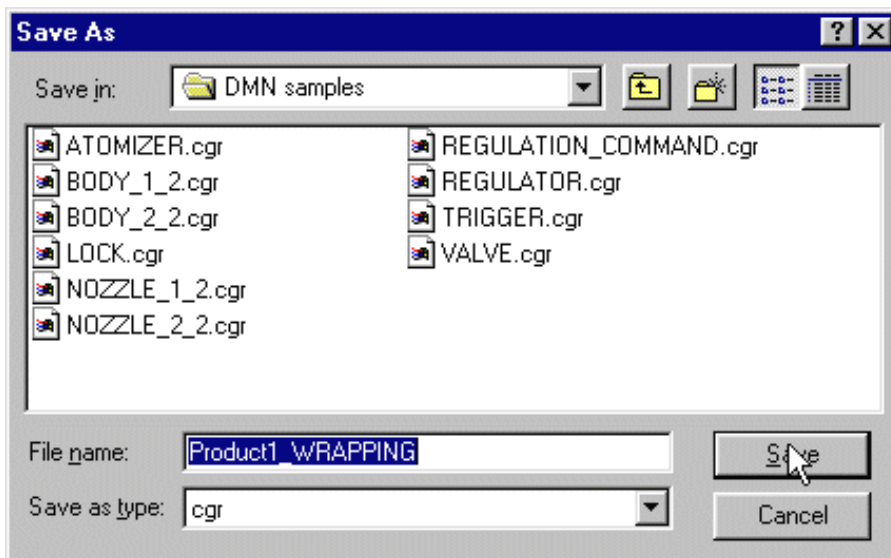




6. Click OK.

The Save As dialog box displays:

7. Click Save.



Up



Starting a Session



Generating a Silhouette



Generating a Wrapping




Generating a Thickness






Generating an Offset

Generating a Thickness

 This task will show you how to generate a thickness that is a solid from a surface.

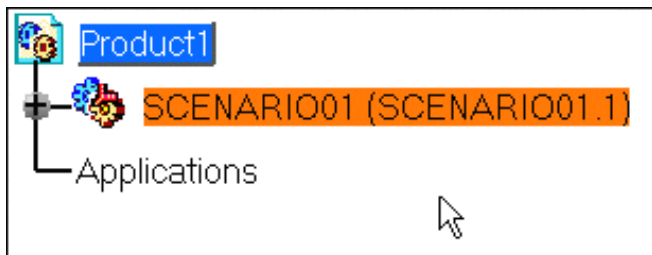
 Open SCENARIO01.model from online\samples\dmuoptimizer directory.

 Use the Fit All In icon  to position the model geometry on the screen.

 (Optional)
You can manage automatically the Thickness result as alternate shape.

1. Click the Thickness icon  from the DMU Optimizer toolbar.
The Thickness dialog box displays.

2. Select SCENARIO01.model in the specification tree

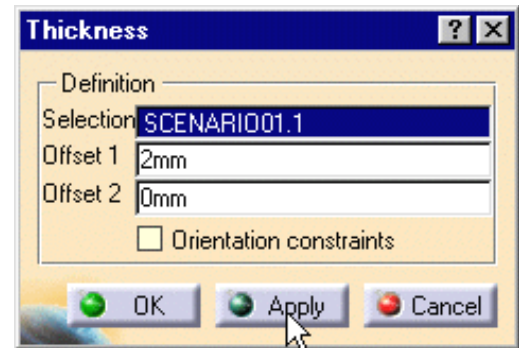



3. Enter the Offset values:

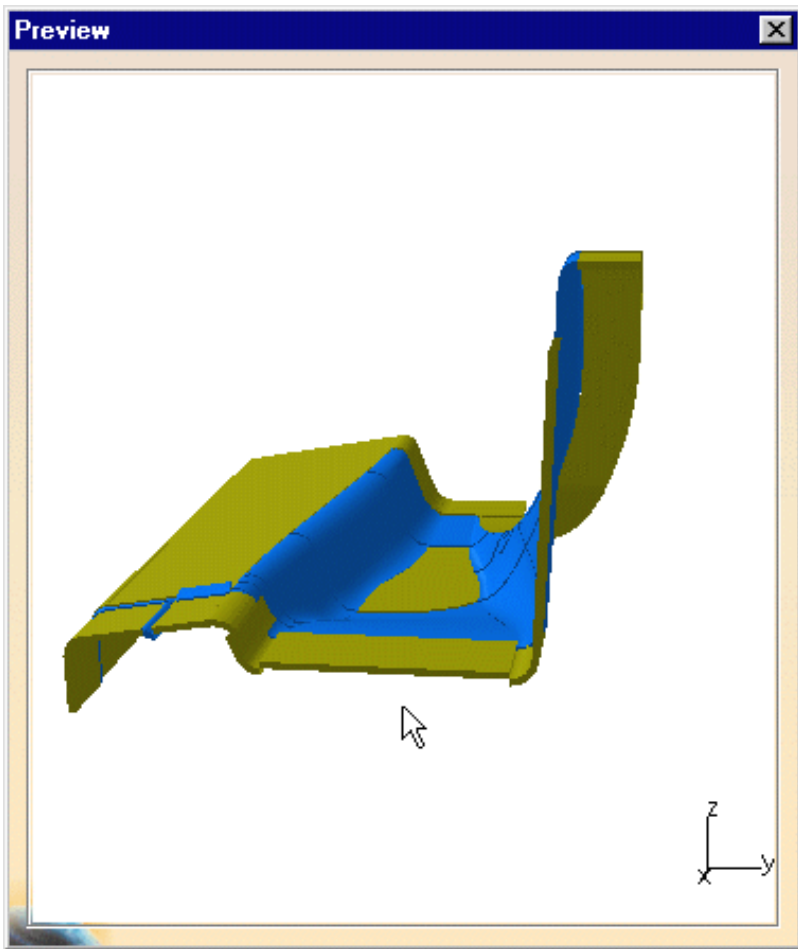
- Offset 1: 2mm
- Offset 2: 0mm

4. Click Apply to generate the thickness representation

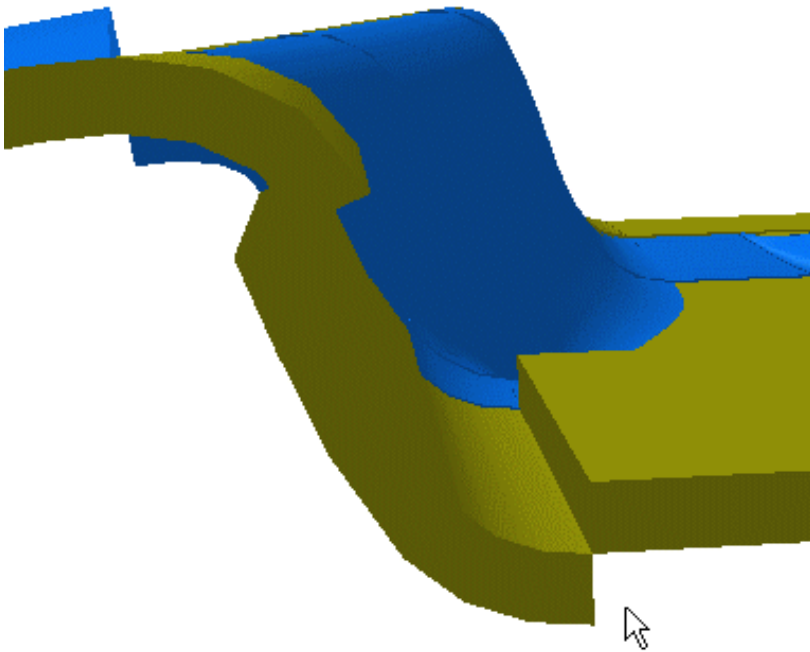
The preview window displays




 The Orientation constraints option is deactivated by default. The propagation of constraints is done automatically

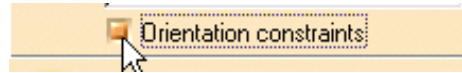


5. Zoom to visualize better the thickness result :
You are not satisfied with the result.

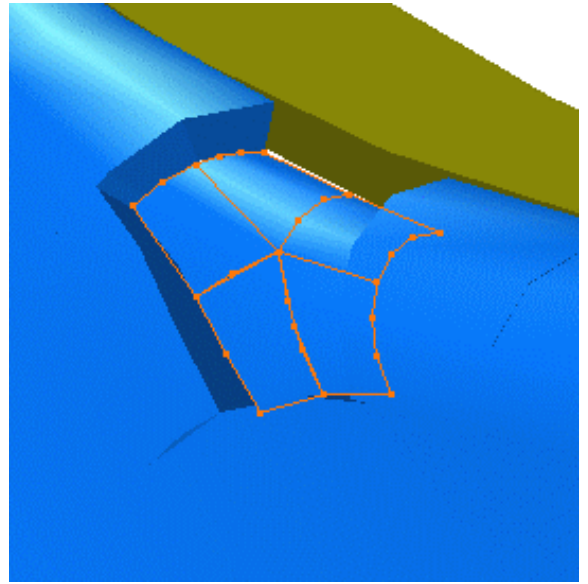
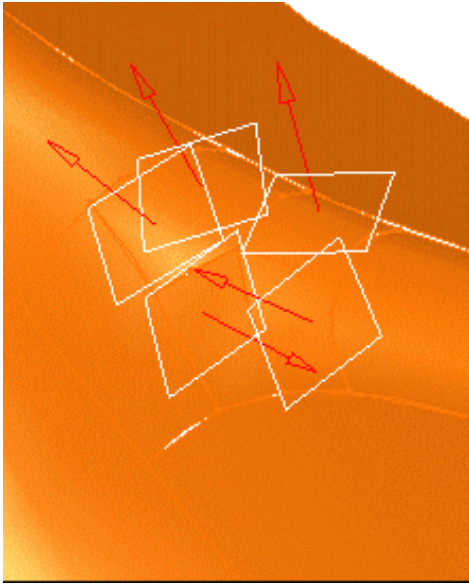



You are still in the Thickness command.

6. Click the undo icon  to go back to the initial representation.
 7. Activate the Orientation constraints option in the dialog box still displayed:
 8. Click Apply
- The Propagation of constraints is not complete.
The surfaces concerned are highlighted.

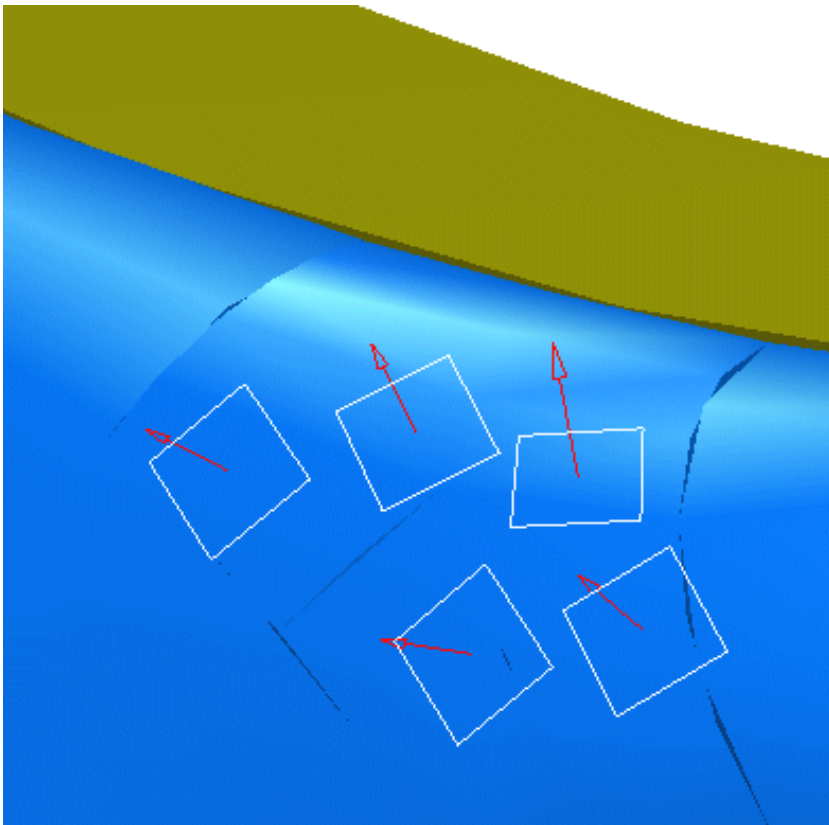


9. Define constraints on the corresponding surfaces:
 - Drag the cursor onto the surface
 - When you are satisfied, click the left-hand mouse button.The constraint is created



 At anytime, you can delete a constraint, what you need to do is to click on the white square
Note that if you click th arrow, you invert the constraint orientation.

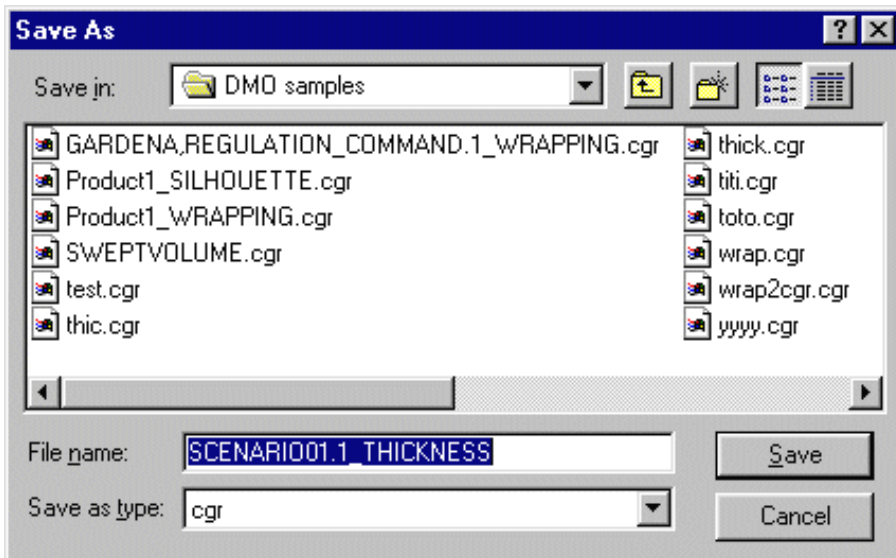
10. Click Apply when done. The surfaces are correctly positioned.



11. Click OK.

The Save As dialog box displays:

12. Enter a meaningful name and click Save.



Up



Generating a Wrapping



Starting a Session



Generating a Thickness



Generating a Silhouette



Generating an Offset



Generating an Offset




This task will show you how to generate a thickness that is a solid from a surface.



Open SCENARIO01.model from online\samples\dmuoptimizer directory.



Use the Fit All In icon  to position the model geometry on the screen.



1. Make sure the Thickness is managed as alternate shape and activated.

For this:

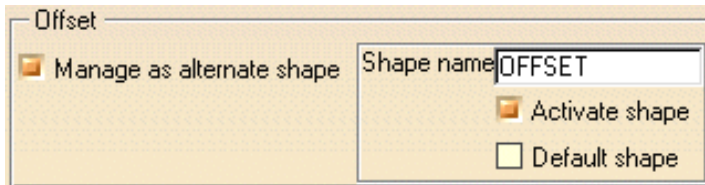
a. Select Tools->Options from the menu bar.
The Options dialog box displays.


b. Click Product in the left-hand box.

c. Click the DMU Optimizer tab.

d. In the Offset field, check the Manage as alternate shape button and activate the Activate shape option.

When activated the Offset representation is the one visualized in the session.



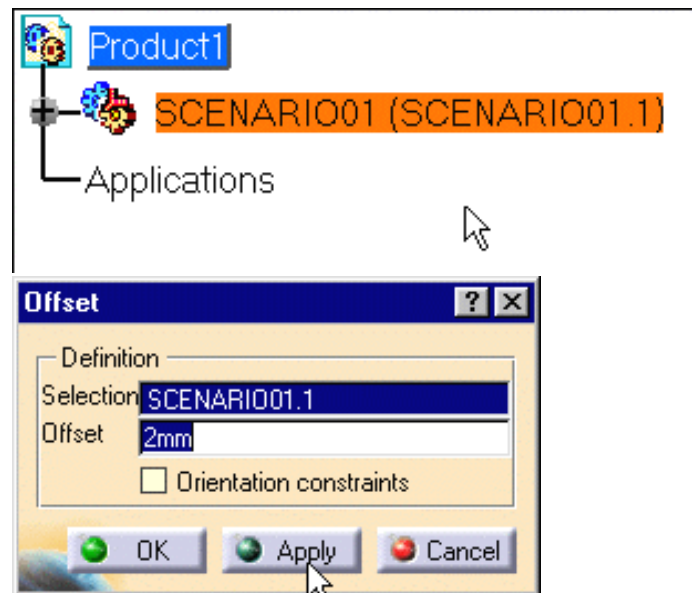
2. Click the Offset icon  from the DMU Optimizer toolbar.

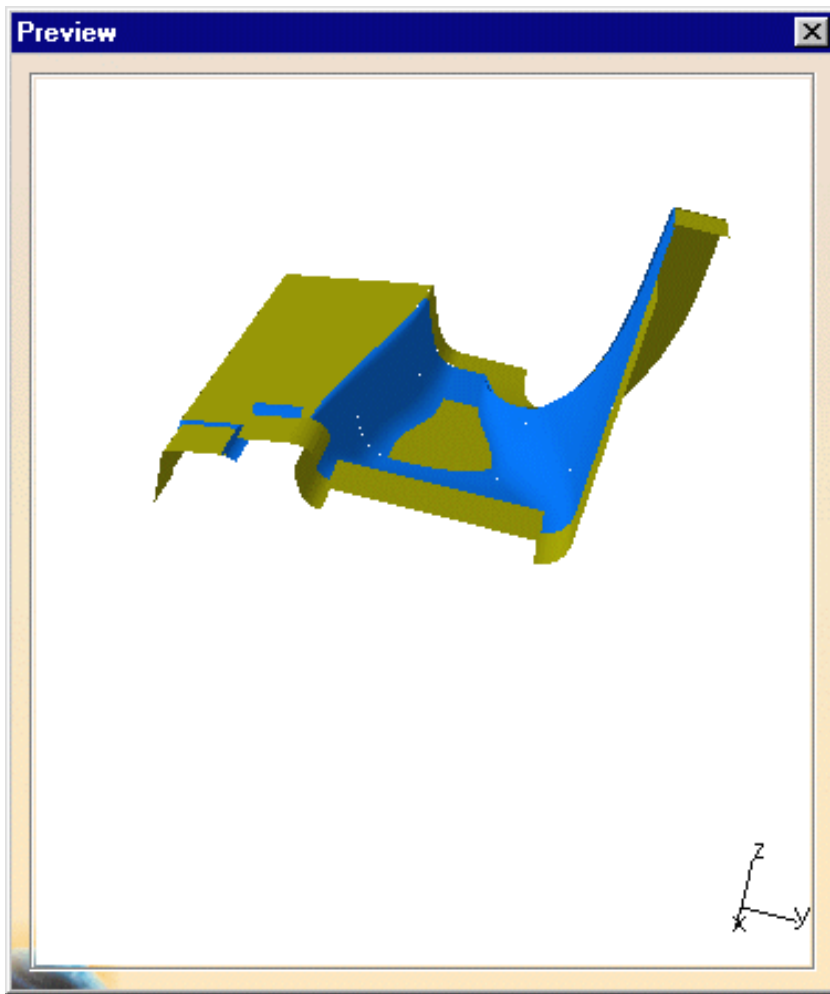
The Offset dialog box displays:


3. Select SCENARIO01 in the specification tree.

4. Enter the Offset value, 2mm for instance

5. Click Apply to obtain a preview.

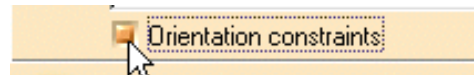




6. Click the undo icon  to go back to the initial representation.

7. Activate the Orientation constraints option in the dialog box still displayed:

8. Click Apply



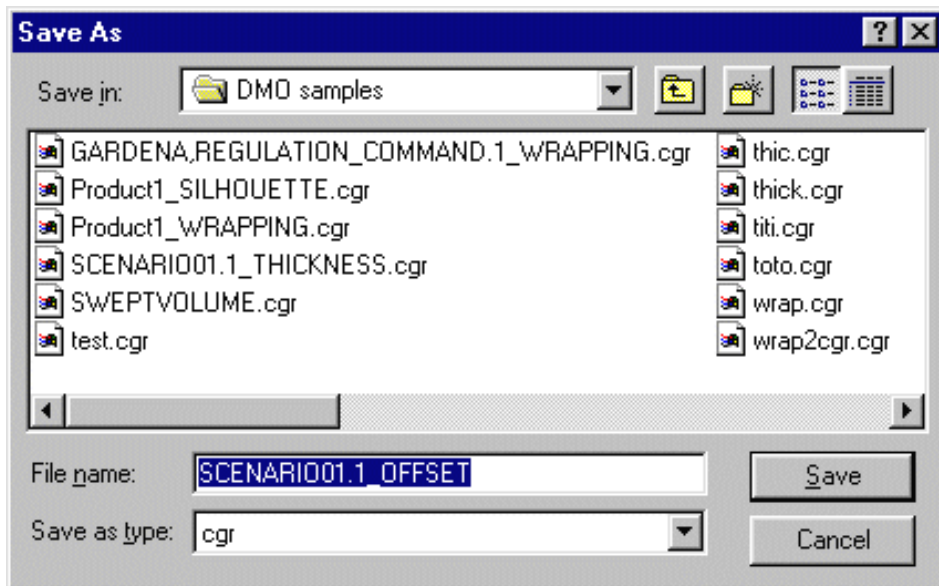
Orientation Constraints

- The Orientation constraints option is deactivated by default. (The propagation of default orientation constraints is done automatically).
- The constraints define the orientation of the offset (positive).

9. Click OK.

The Save As dialog box displays:

10. Enter a meaningful name and click Save.



Up



Starting a Session



Generating a Silhouette



Generating a Wrapping





Generating a Thickness



Generating an Offset





Basic Tasks

The table below lists the tasks you will find in this section.

Theme	
Simplifying a Representation	
Thickness and Offset	

Simplifying an Assembly

The table below lists the tasks you will find in this section.

Tasks	
Generating a Silhouette	 
Generating a Wrapping	 



Generating a Silhouette



This task will show you how to calculate a new geometry and in this case generate a silhouette



The sample document used in this task can be accessed in the folder: online\samples\dmuoptimizer\ GARDENA*.cgr.



(Optional)

1. You can manage automatically your Silhouette result as alternate shape.

For this:

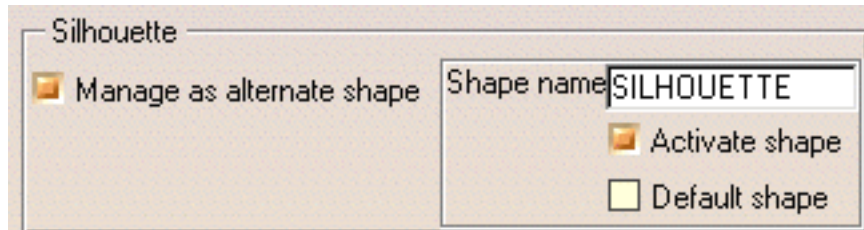
a. Select Tools->Options from the menu bar.
The Options dialog box displays.

b. Click Product in the left-hand box.

c. Click the DMU Optimizer tab.

d. In the Silhouette field, check the Manage as alternate shape button and activate the Activate shape option.

When activated the Silhouette representation is the one visualized in the session.



Remember you can customize silhouette settings at any time.

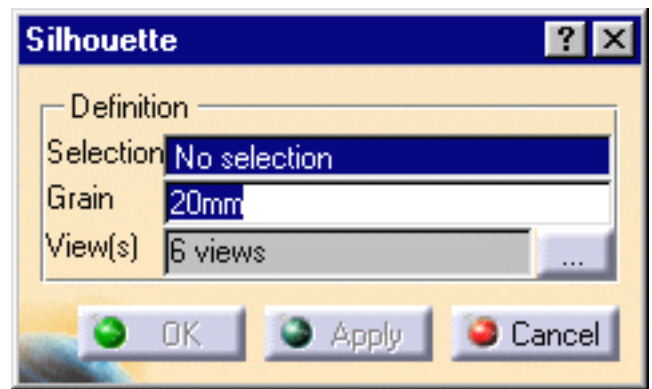
For more details, please refer to [Customizing DMU Optimizer Settings and Managing as an Alternate Shape](#)

2. Click the Silhouette icon



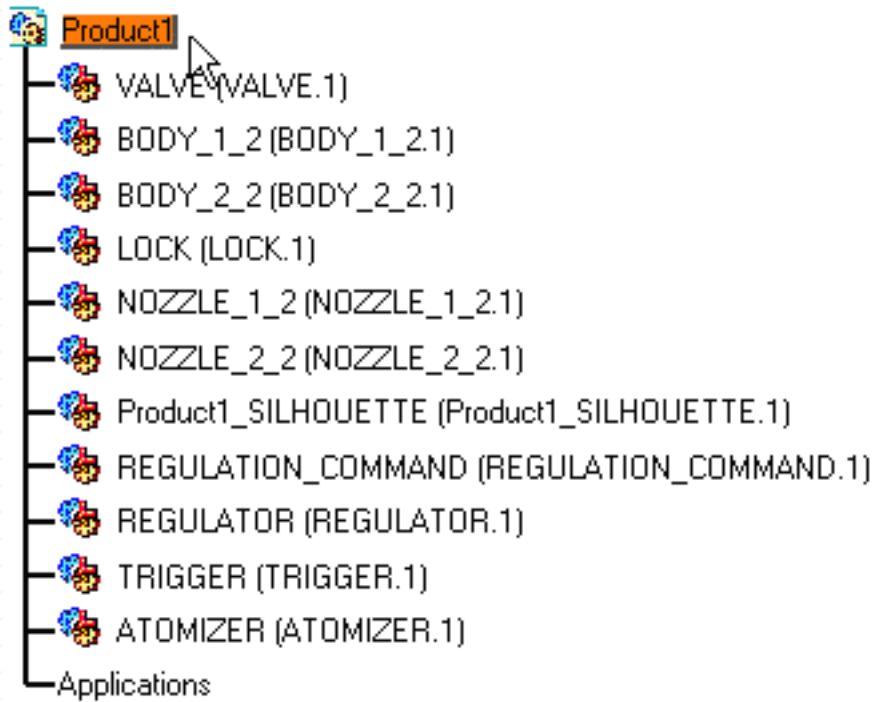
from the DMU Optimizer toolbar.


The Silhouette dialog box displays:

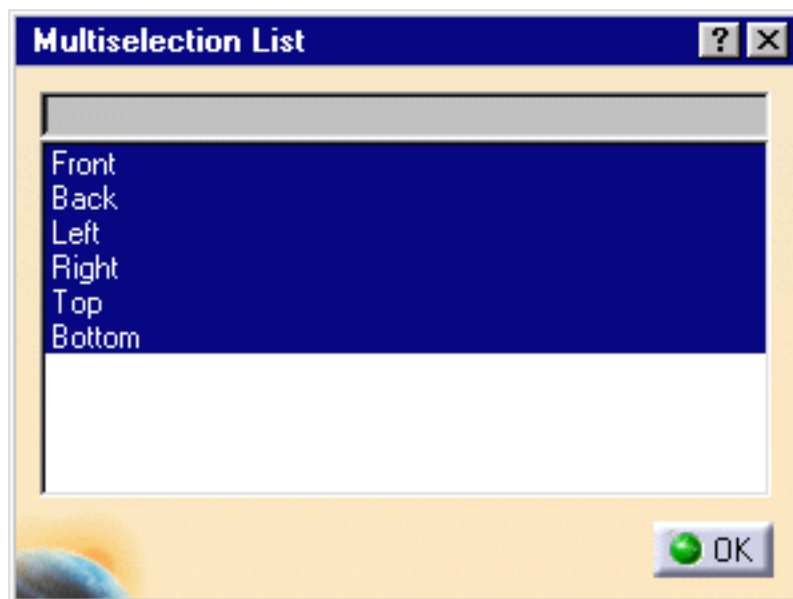


3. Select Product1 in the specification tree.

4. Enter the desired value in the grain field for instance 2mm.

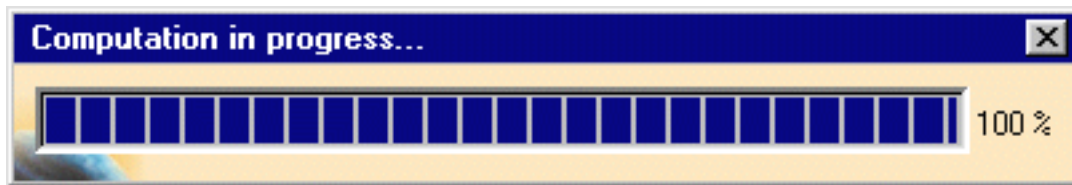
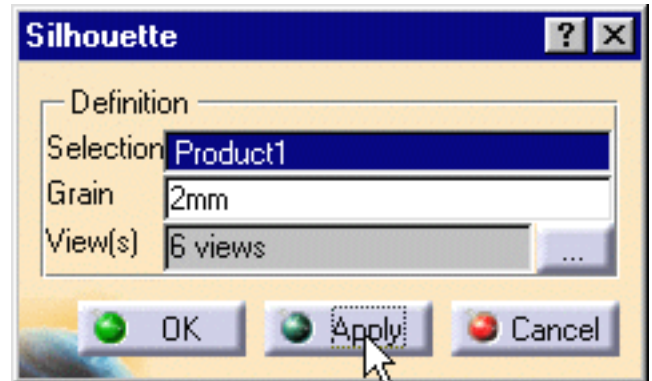


5. Click the more button  to display the Multiselection list.
6. Select the desired views. The 6 views for instance
7. Click OK to confirm your operation.



8. Click the Apply button to obtain a silhouette preview
The progress bar displays:

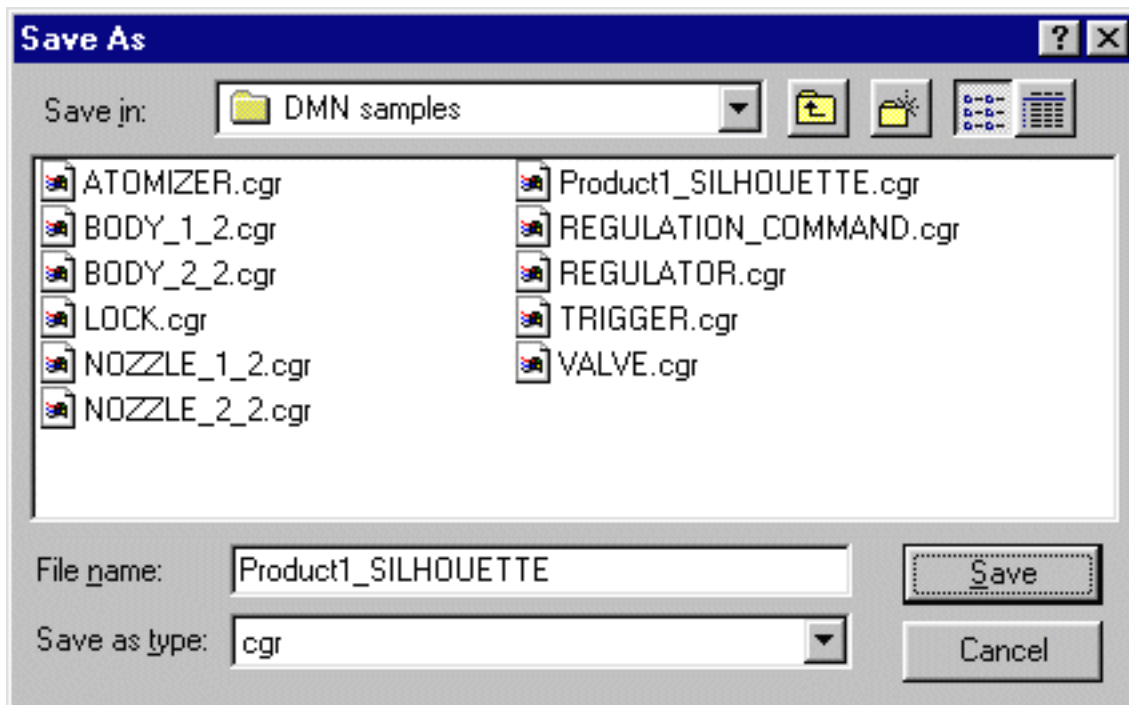
The Preview window display too.



DMN License:

If you have a DMU Navigator license, you can define cameras and they are proposed in the multiselection dialog box .

9. Click OK to save the silhouette representation.





Up



Generating a Silhouette



Generating a Wrapping

Generating a Wrapping



This task will show you how to generate a Wrapping representation.



The sample document used in this task can be accessed in the folder:
online\samples\dmuoptimizer*.cgr.



(Optional)

1. You can automatically manage your Thickness result as alternate shape.

For this:

a. Select Tools->Options from the menu bar.

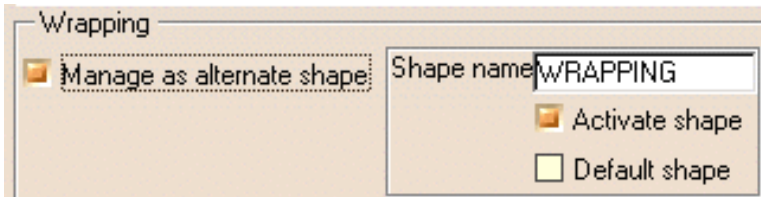
The Options dialog box displays.

b. Click Product in the left-hand box.

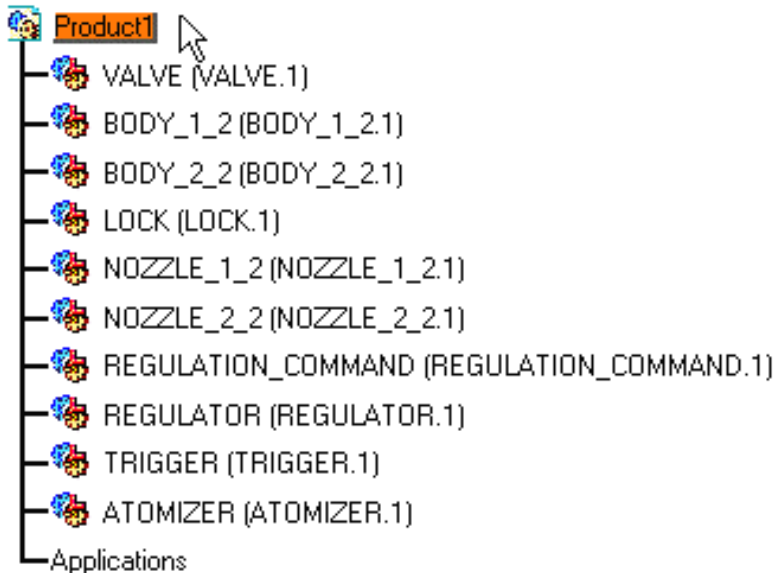
c. Click the DMU Optimizer tab.


d. In the Thickness field, check the Manage as alternate shape button and activate the Activate shape option.

When activated the Thickness representation is the one visualized in the session.

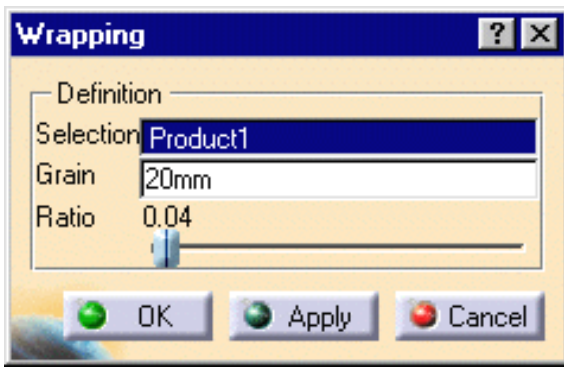


2. Select Product 1 in the specification tree



3. Click the Wrapping icon  from the DMU Optimizer toolbar. The Silhouette dialog box displays:

4. Set the grain accuracy by entering a value, 4mm for example.



Setting the Ratio

The Ratio determines the wrapping representation. A lower value results in a thinner but less enveloping representation.

5. Move the slider to the right to set the ratio to 0.50 for example

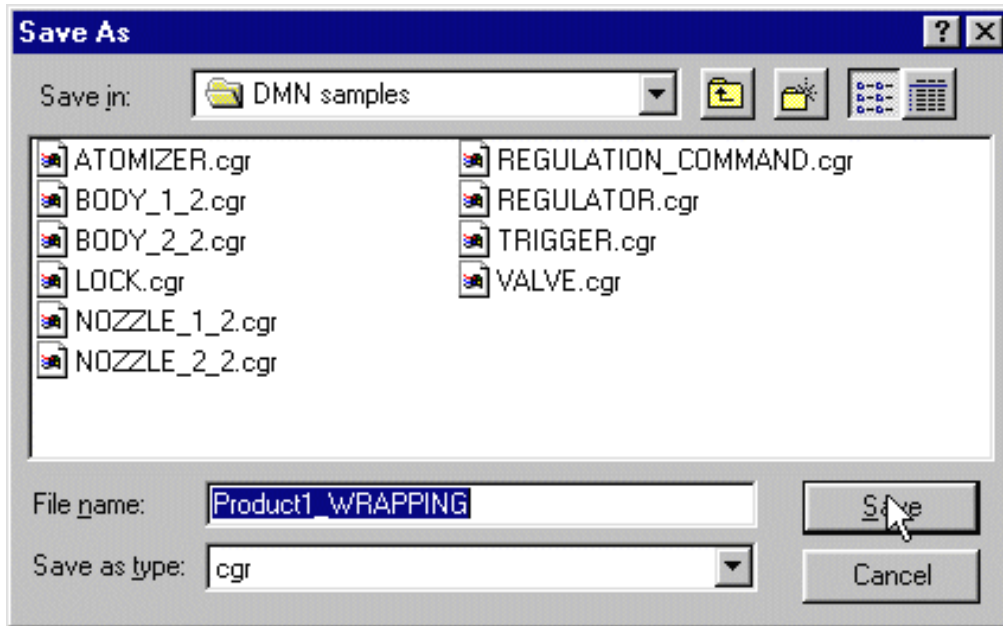
6. Click Apply to obtain a preview

The progress bar shows the computation

The preview window lets you see the resulting wrapping



7. Click OK.
- The Save As dialog box displays:
8. Click Save.



Thickness and Offset

Tasks

Generating a Thickness



Generating an Offset



Up





Simplifying a Representation






Thickness and Offset

Generating a Thickness

 This task will show you how to generate a thickness that is a solid from a surface.

 Open SCENARIO01.model from online\samples\dmuoptimizer directory.

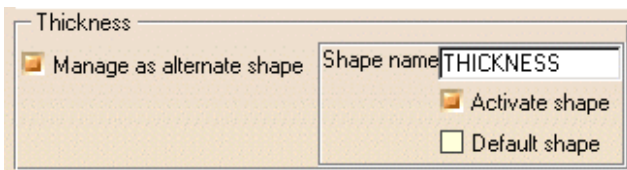
 Use the Fit All In icon  to position the model geometry on the screen.

 (Optional)
1. You can manage your Thickness result as alternate shape automatically.

For this:

- Select Tools->Options from the menu bar. The Options dialog box displays.
- Click Product in the left-hand box.
- Click the DMU Optimizer tab.
- In the Thickness field, check the Manage as alternate shape button and activate the Activate shape option.

When activated the Thickness representation is the one visualized in the session.



2. Click the Thickness icon  from the DMU Optimizer toolbar. The Thickness dialog box displays.

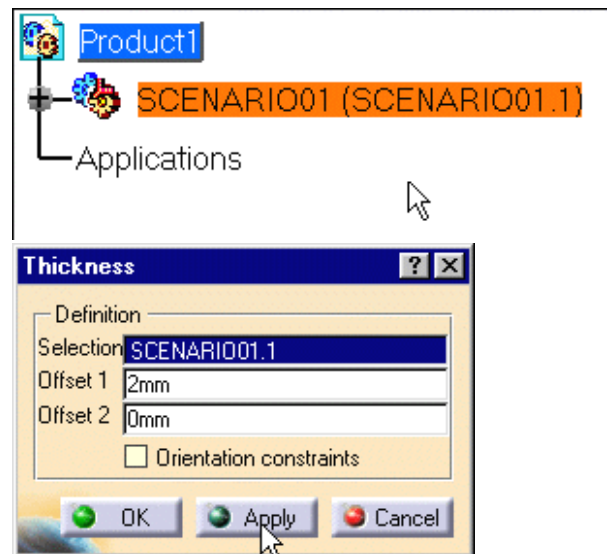
3. Select SCENARIO01.model in the specification tree

4. Enter the Offset values:

- Offset 1: 2mm
- Offset 2: 0mm

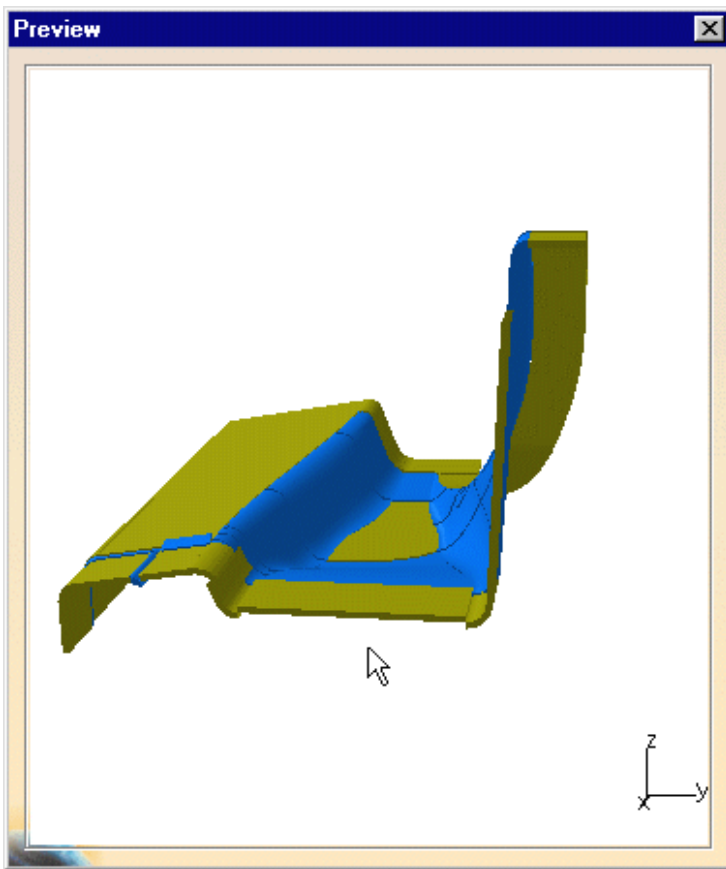
5. Click Apply to generate the thickness representation

The preview window displays

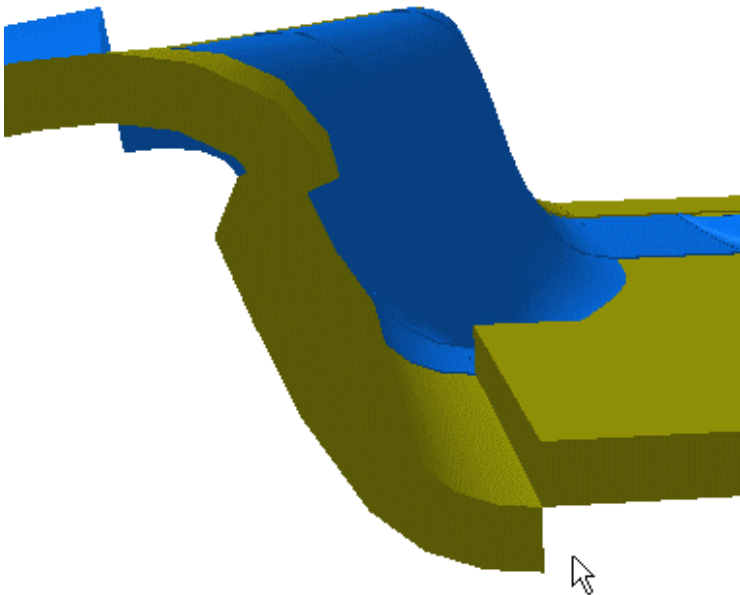


Orientation Constraints


- The Orientation constraints option is deactivated by default. (The propagation of constraints is done automatically).
- The constraints define the orientation of the offset (positive).

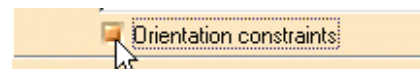


6. Zoom to visualize better the thickness result :
You are not satisfied with the result.



You are still in the Thickness command.

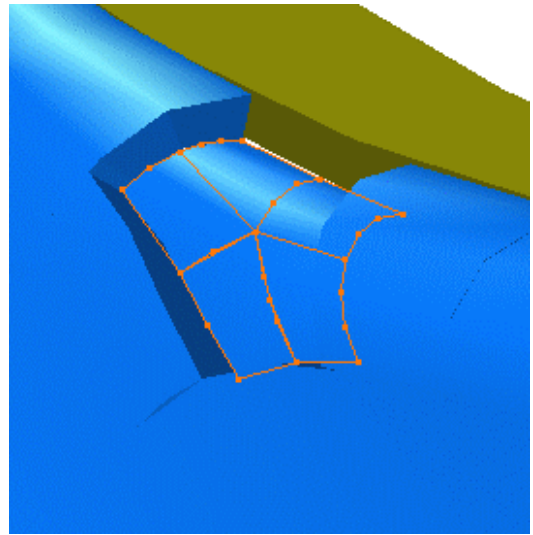
7. Click the Undo icon  to go back to the initial representation.
8. Activate the Orientation constraints option in the dialog box still displayed:
9. Click Apply



The Propagation of constraints is not complete. The surfaces concerned are highlighted.

10. Define constraints on the corresponding surfaces:

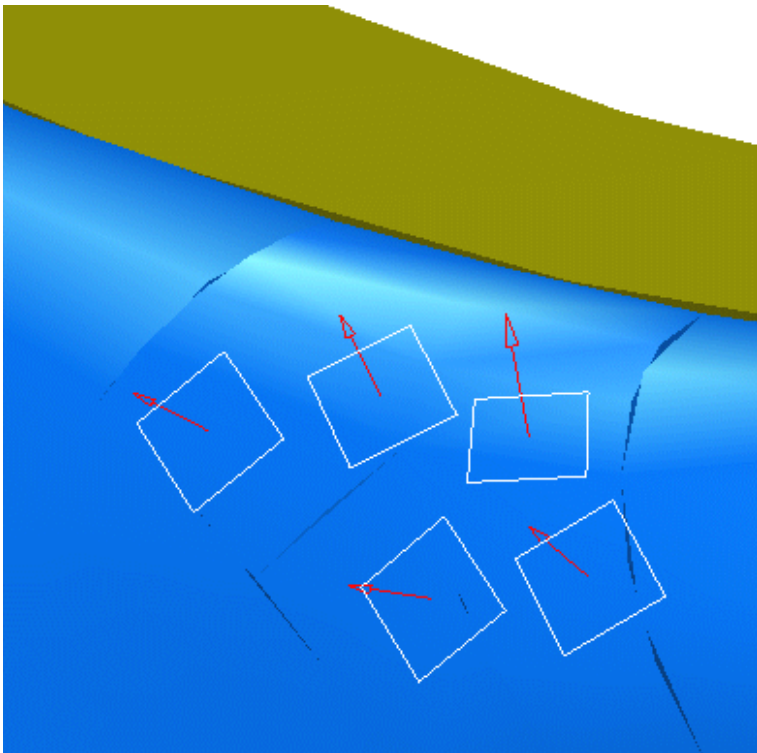
- Drag the cursor onto the surface
- When you are satisfied, click the left-hand mouse button.
The constraint is created



At anytime, you can delete a constraint, what you need to do is to click on the white square

Note that if you click the arrow, you invert the constraint orientation.

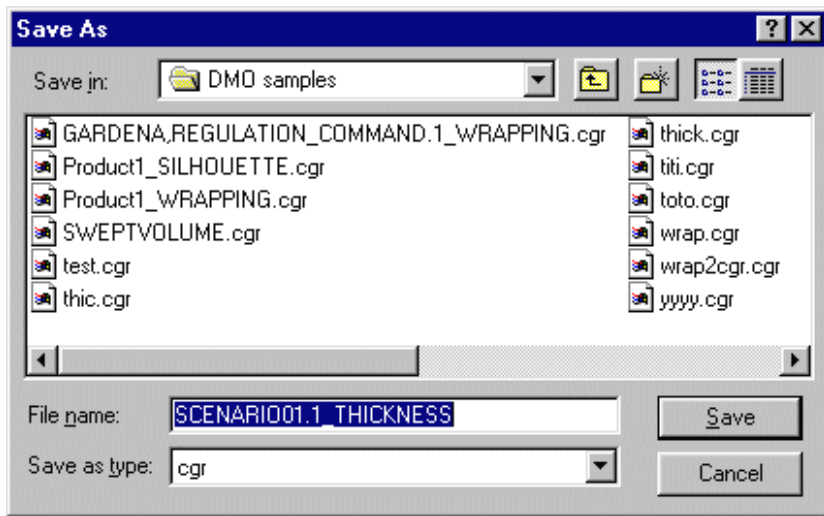
11. Click Apply when done. The result is correct : the calculation is based on the new orientation constraints



12. Click OK.

The Save As dialog box displays:

13. Enter a meaningful name and click Save.



Up





Generating a Thickness






Generating an Offset

Generating an Offset

 This task will show you how to generate an offset.

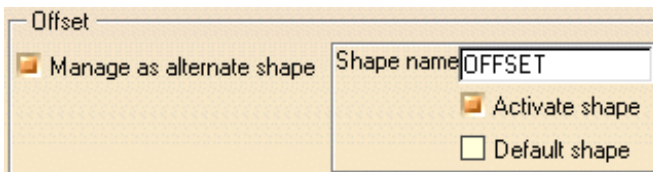
 Open SCENARIO01.model from online\samples\dmuoptimizer directory.


 Use the Fit All In icon  to position the model geometry on the screen.
(Optional)

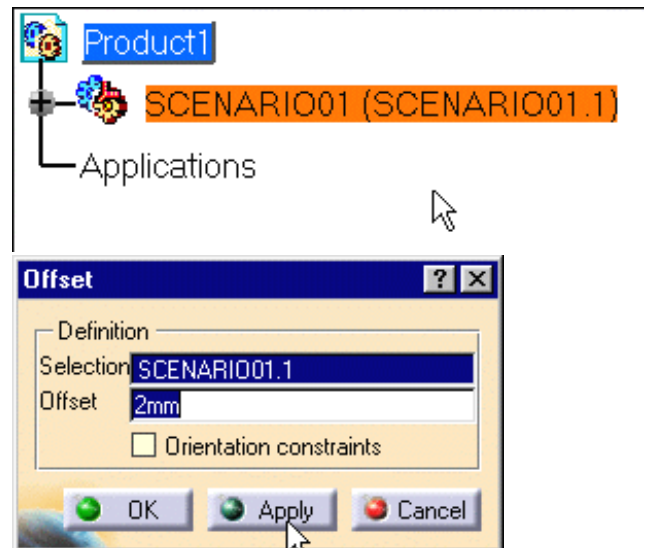
 1. You can manage automatically your Offset result as alternate shape.
For this:

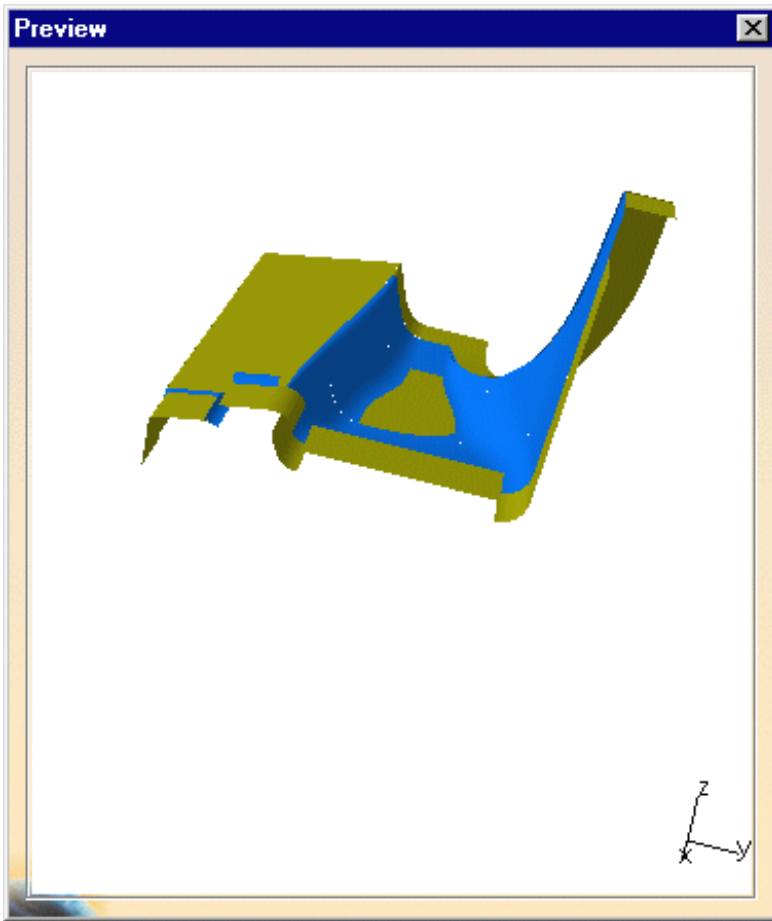
- a. Select Tools->Options from the menu bar.
The Options dialog box displays.
- b. Click Product in the left-hand box.
- c. Click the DMU Optimizer tab.
- d. In the Offset field, check the Manage as alternate shape button and activate the Activate shape option.

When activated the Offset representation is the one visualized in the session.




2. Click the Offset icon  from the DMU Optimizer toolbar
The Offset dialog box is displayed
3. Select SCENARIO01 in the specification tree.
4. Enter the Offset value, 2mm for instance
5. Click Apply to obtain a preview.



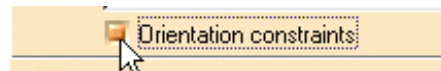


Orientation Constraints

- The Orientation constraints option is deactivated by default. (The propagation of constraints is done automatically).
- The constraints define the orientation of the offset (positive).

6. Click the Undo icon  to go back to the initial representation.

7. Activate the Orientation constraints option in the dialog box still displayed:




8. Click Apply

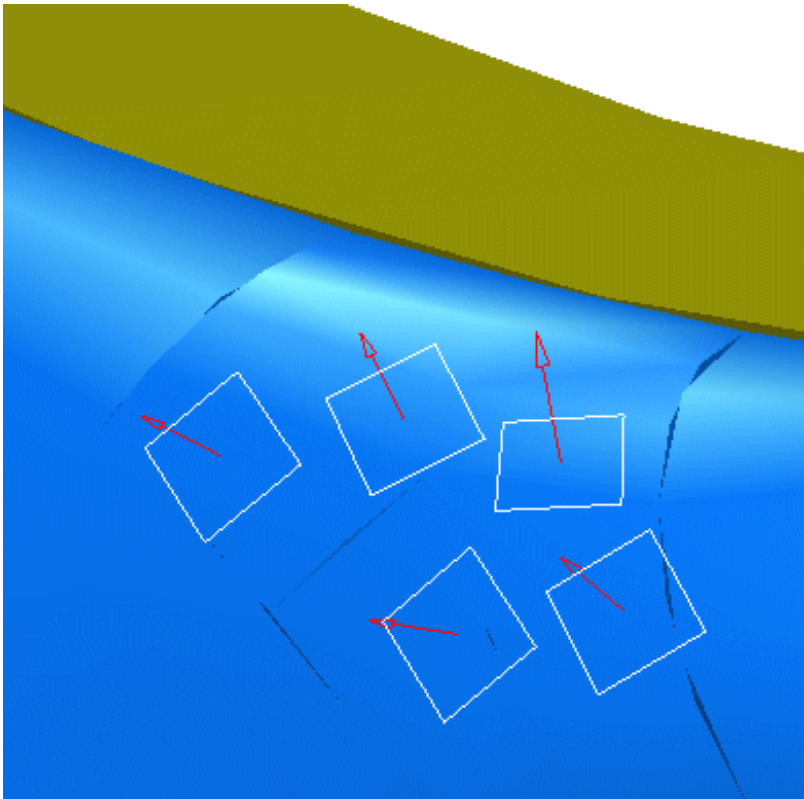
The Propagation of constraints is not complete. The surfaces concerned are highlighted.

9. Define constraints on the corresponding surfaces:

- Drag the cursor onto the surface
- When you are satisfied, click the left-hand mouse button.
The constraint is automatically created.

 At anytime, you can delete a constraint, what you need to do is click on the white square.
Note that if you click the arrow, you invert the constraint orientation.

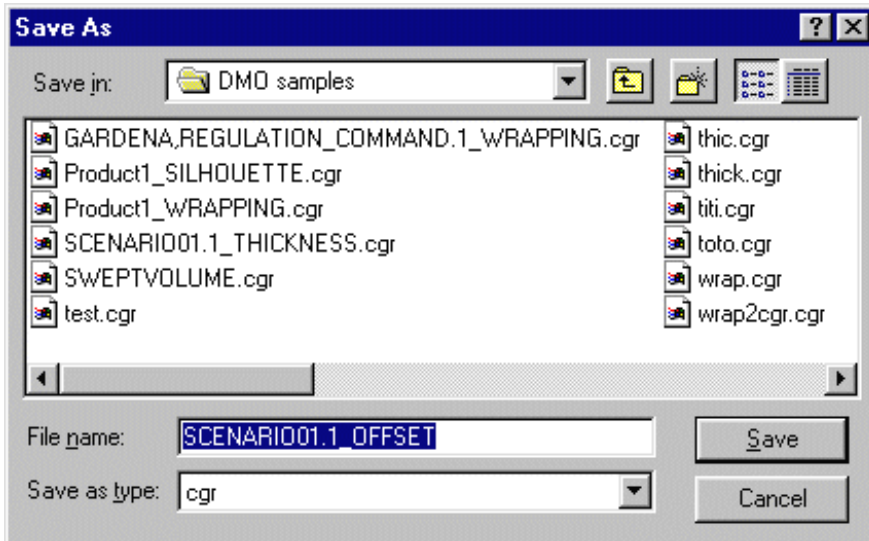
10. Click Apply when done. The result is correct : the calculation is based on the new orientation constraints



11. Click OK.

The Save As dialog box is displayed:

12. Enter a meaningful name and click Save.



Up





Generating a Thickness



Generating an Offset

Advanced Tasks

The table below lists the tasks you will find in this section.

Theme	
Managing an Alternate Shape	
Macros	

Managing an Alternate Shape



This task will show you how to manage representations as alternate shapes automatically.



1. Select the Tools->Options... command.

The Options dialog box appears

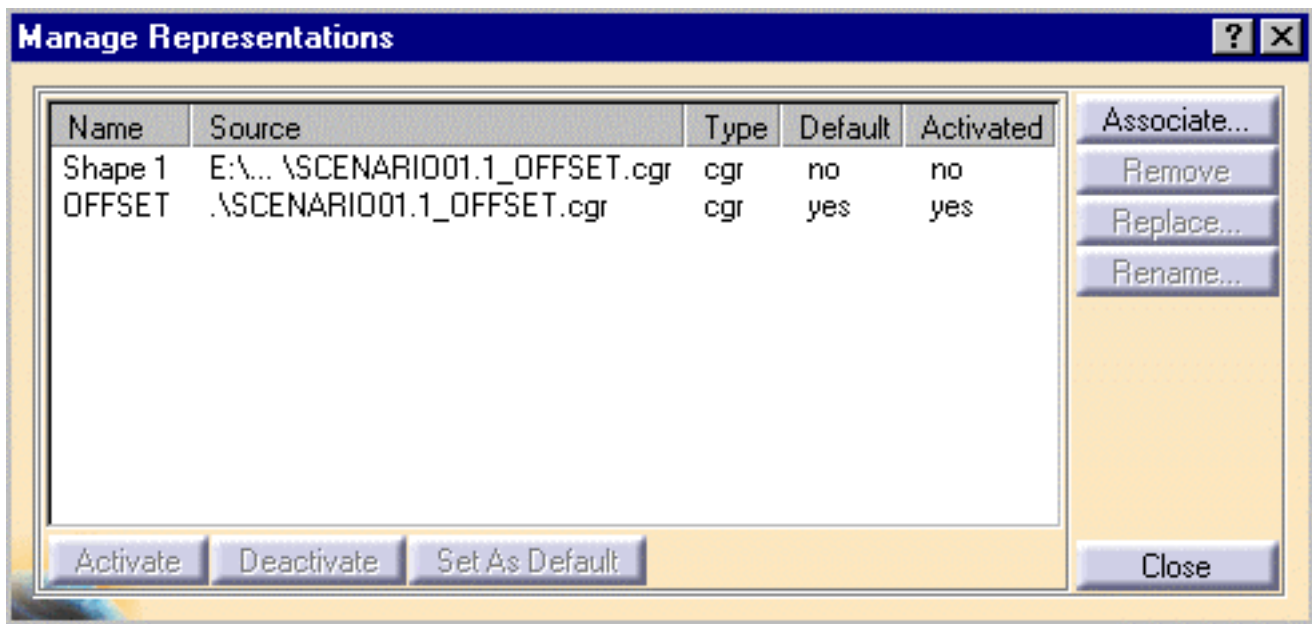
2. Click Product in the left-hand box
3. Click the DMU Optimizer tab

The screenshot shows the 'DMU Optimizer' tab of the 'Options' dialog box. It features five sections, each with a 'Manage as alternate shape' checkbox and a 'Shape name' field. The 'Activate shape' checkbox is checked for all sections, while 'Default shape' is unchecked. The sections are: Silhouette (Shape name: SILHOUETTE), Wrapping (Shape name: WRAPPING), Thickness (Shape name: THICKNESS), Offset (Shape name: OFFSET), and Swept Volume (Shape name: SWEPTVOLUME).


Section	Manage as alternate shape	Shape name	Activate shape	Default shape
Silhouette	<input type="checkbox"/>	SILHOUETTE	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Wrapping	<input type="checkbox"/>	WRAPPING	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Thickness	<input type="checkbox"/>	THICKNESS	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Offset	<input type="checkbox"/>	OFFSET	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Swept Volume	<input type="checkbox"/>	SWEPTVOLUME	<input checked="" type="checkbox"/>	<input type="checkbox"/>


3. Select the required representation, for example Offset.
4. Customize the representation settings as required:
 - **Manage as alternate shape** : if activated, you manage automatically your result as a new representation
 - **Activate Shape** : if activated the Offset representation is the one visualized in the session.
 - **Default Shape** : if activated the Default shape is the one loaded when opening the product
5. Click Ok to confirm your operation


After a new offset calculation, if you right-click the product and select Manage representations, the Manage representation dialog box is automatically updated with the offset representation.




Editing Macros

 If you perform a task repeatedly, you can take advantage of a macro to automate it. A macro is a series of functions, written in a scripting language, that you group in a single command to perform the requested task automatically

 This task will show you how to edit a macro created in the DMU Optimizer

 You stored your recorded macros in a text format file. For more details about recording, running macros please refer to the [Infrastructure User's Guide](#)

 1. You can easily modify the macro instructions specific to DMU Optimizer (strings of characters put in bold). Here is an example:

- Thickness Macro

THICKNESS MACRO

EXPLANATIONS

```
Language="VBSCRIPT"
```

```
Sub CATMain()
CATIA.ActiveWindow.ActiveViewer.Viewpoint3D.ProjectionMode = 0
CATIA.ActiveWindow.ActiveViewer.Reframe
```

```
Dim Product0 As AnyObject
Set Product0 = CATIA.ActiveDocument.GetItem ( "Product1" )
Dim Product1 As AnyObject
Set Product1 = Product0.Products.Item ( "SCENARIO01.1" )
```

Name of the product selected for the thickness.

```
var2 = Product1.HasAMasterShapeRepresentation
```

Enter a meaningful name if you wish to edit the name.

```
var3 = Product1.HasAMasterShapeRepresentation
Dim OptimizerWorkBench4 As Workbench
Set OptimizerWorkBench4 = CATIA.ActiveDocument.GetWorkbench ( "OptimizerWorkBench" )
```

Selection: SCENARIO01.1

```
Dim var5 ( 5 )
var5 ( 0 ) = 1686.914185
var5 ( 1 ) = -687.232605
var5 ( 2 ) = -30.685900
var5 ( 3 ) = -0.006788
var5 ( 4 ) = -0.173665
var5 ( 5 ) = 0.984781
Dim DMOThickness6 As DMOThickness
Set DMOThickness6 = OptimizerWorkBench4.Thicknesses.Add ( Product1, 2.000000, -2.000000, 1, var5, "THICKNESS", 0, 0 )
```

Product1 : corresponds to the selected product

2.000000, -2.000000, Gives the values of the offset 1 and offset 2, you defined.

Offset 1: 2mm
Offset 2: -2mm

```
Dim Document7 As AnyObject
Set Document7 = CATIA.Documents.Item ( "SCENARIO±013±±ZWISCHENSTUECK.1_THICKNESS.cgr" )
```

1 correspond to the number orientation constraints

var 5: defines the constraint coordinates:

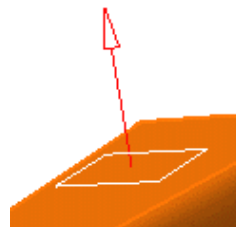
- Constraint location point

```
Document7.Activate
```

```
var5 ( 0 ) = 1686.914185
var5 ( 1 ) = -687.232605
var5 ( 2 ) = -30.685900
```

- Corresponding normal vector

```
var5 ( 3 ) = -0.006788
var5 ( 4 ) = -0.173665
var5 ( 5 ) = 0.984781
```



"THICKNESS": Name of the Alternate Shape

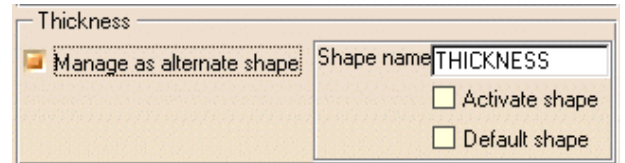


"" means the alternate shape option is deactivated.

0,0 : refer to the shape representation settings

0 -> "Activate shape" option is deactivated

0 -> "Default Shape" option is deactivated



Please refer to [Managing as an alternate shape](#) for more details

Document7.SaveAs

"E:\users\sbcb\ADELE\sbcbDPS3\SCENARIO01.1_THICKNESS.cgr"

CATIA.ActiveDocument.Activate

Gives the location of the cgr file you saved.

End Sub

Silhouette macro :



```
Dim var5 ( 17 )
var5 ( 0 ) = 1.000000
var5 ( 1 ) = 0.000000
var5 ( 2 ) = 0.000000
var5 ( 3 ) = -1.000000
var5 ( 4 ) = 0.000000
var5 ( 5 ) = 0.000000
var5 ( 6 ) = 0.000000
var5 ( 7 ) = 1.000000
var5 ( 8 ) = 0.000000
var5 ( 9 ) = 0.000000
var5 ( 10 ) = -1.000000
var5 ( 11 ) = 0.000000
var5 ( 12 ) = 0.000000
var5 ( 13 ) = 0.000000
var5 ( 14 ) = 1.000000
var5 ( 15 ) = 0.000000
var5 ( 16 ) = 0.000000
var5 ( 17 ) = -1.000000
```

Dim Silhouette6 As Silhouette

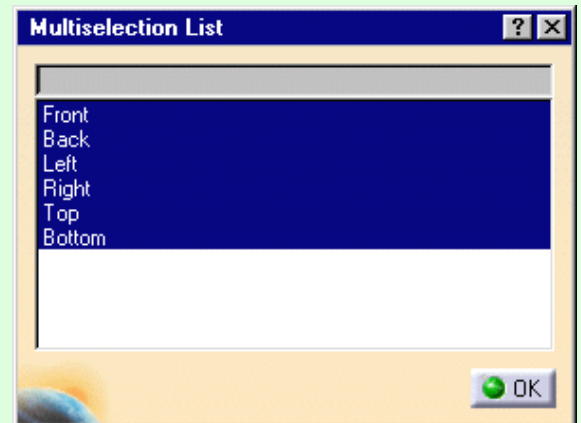
Set Silhouette6 = OptimizerWorkBench4.Silhouettes.Add (Product1, 20.000000, var5, "", 0, 0)

Var 5: defines the viewpoints vector coordinates

Coordinates of the first viewpoint vector :

```
var5 ( 0 ) = 1.000000
var5 ( 1 ) = 0.000000
var5 ( 2 ) = 0.000000
```

and so on...



Up



Managing an Alternate Shap

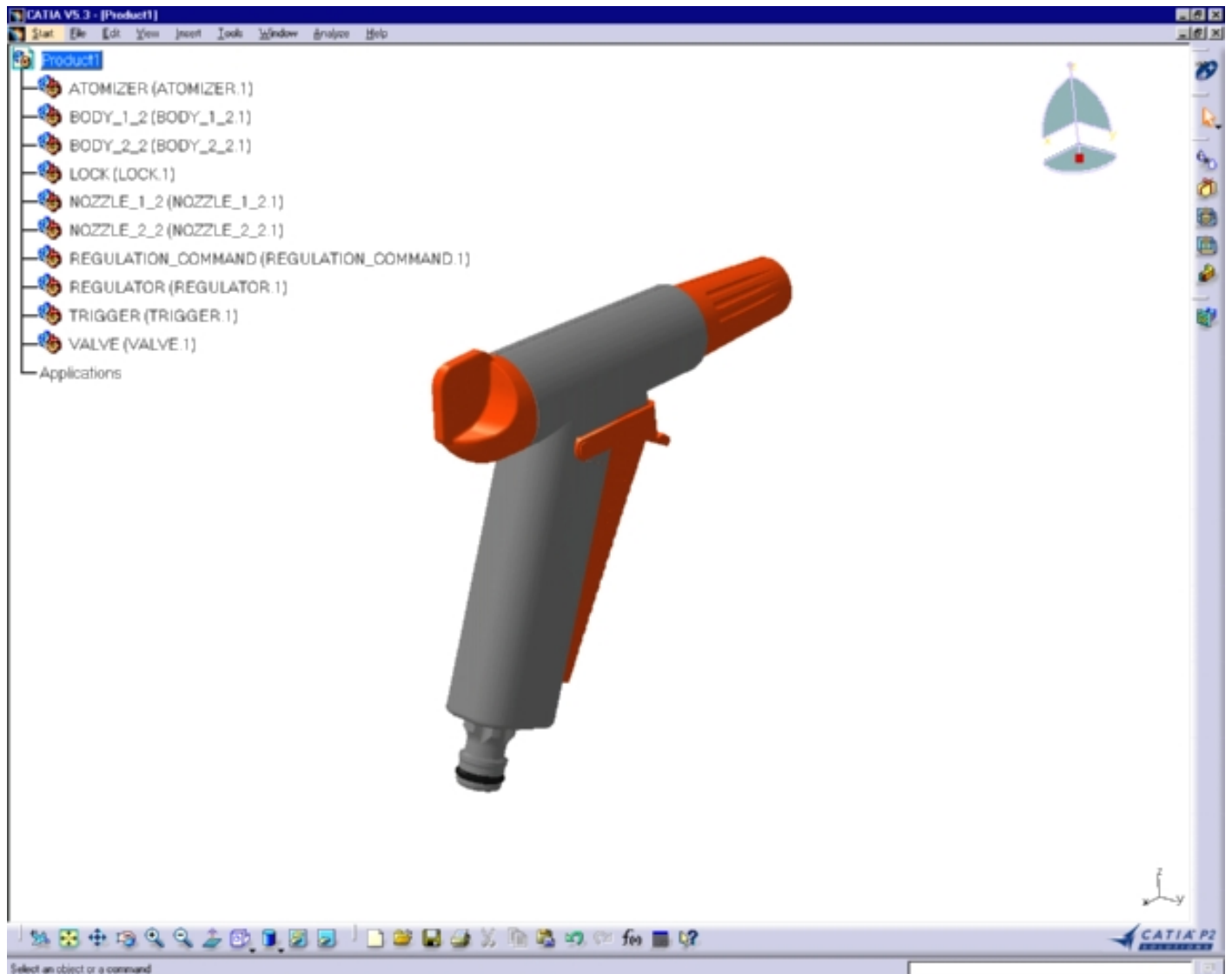


Macros

Workbench Description

This section contains the description of the icons and menus which are specific to the DMU Optimizer workbench.

The DMU Optimizer window looks like this: (click the sensitive areas to see the related documentation).



[DMU Optimizer Menu Bar](#)

[DMU Optimizer Toolbar](#)

[Sectioning Tools Toolbar](#)

DMU Optimizer Menu Bar

Here we will present the various menus and menu commands that are specific to DMU Kinematics Simulator Version 5.

Start File Edit View Insert Tools Analyze Windows Help

Tasks corresponding to General menu commands are described in the *DMU Version 5 Infrastructure User's Guide*.

Edit



For...	Description...
Undo	Cancels the last action.
Redo	Recovers the last action that was undone.
Cut Copy Paste Paste Special	Performs cut copy paste and special paste operations.
Delete	Deletes selected geometry.



Search

Allows searching and selecting objects.

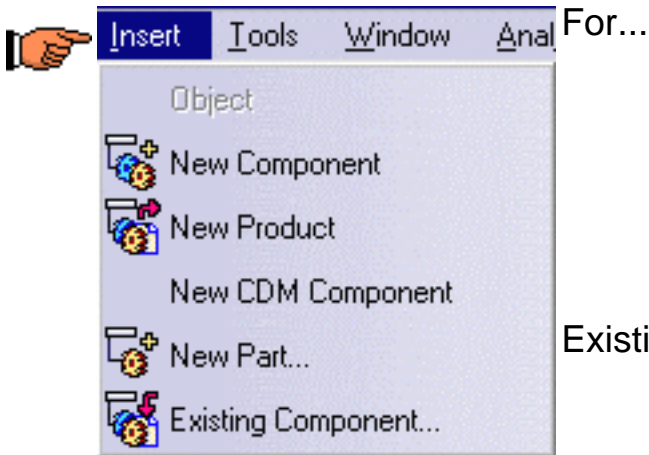
Links

Manages links to other documents.

Properties

Allows displaying and editing object properties.

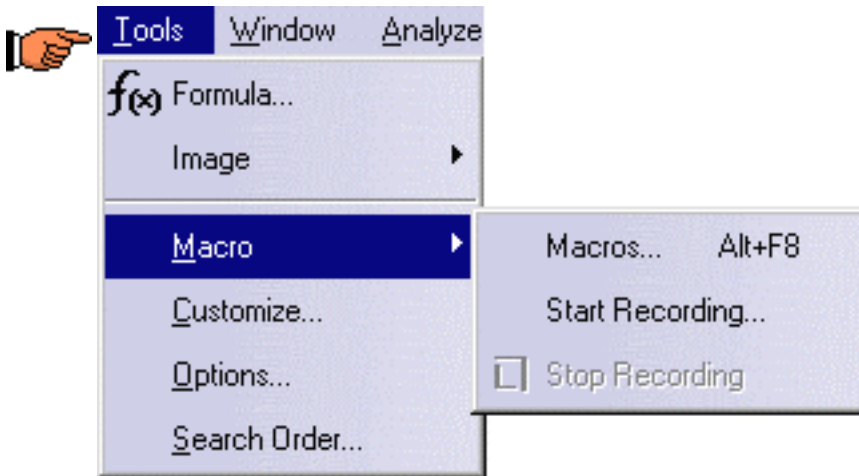
Insert



For... See...

Existing Component [Starting a Session](#)

Tools



For...	Description...
Formula...	Allows using Knowledgeware capabilities
Image	Allows capturing and managing images for the album
Macro	Editing a DMU Optimizer Macro
Customize...	Allows customizing toolbars
Options...	Allows customizing settings See Managing an Alternate Shape
Search Order...	Allows creating a document search order



Up



Menu Bar



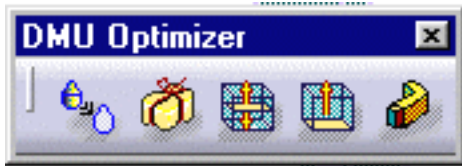
DMU Optimizer Toolbar



Sectioning Tools Toolbar

DMU Optimizer Toolbar

The DMU Optimizer toolbar contains a number of tools that are useful for DMU Optimizer.



See [Generating a Silhouette](#)



See [Generating a Wrapping](#)



See [Generating a Thickness](#)



See [Generating an Offset](#)



See the *Fitting Simulator User's Guide*



Sectioning Tools Toolbar

DMU Optimizer provides the sectioning tool. Please refer to [DMU Space Analysis User's Guide](#) for more information

Using cutting planes, you can create sections, section slices, section boxes as well as 3D section cuts of your products automatically.

