

Model Parameterization in ANSA



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Types of Parameterization

- Shape modification
 - \rightarrow Morphing



Types of Parameterization

Shape modification

\rightarrow Morphing

- Modification of entity card values (e.g. property thickness, used material, connection properties)
 - \rightarrow ANSA Parameter





Types of Parameterization

• Shape modification

\rightarrow Morphing

 Modification of entity card values (e.g. property thickness, used material, connection properties)

ightarrow ANSA Parameter

- Anything else (e.g. Mesh Studies, Kinetics)
 - \rightarrow Scripting





Morphing

- Applicable on FE- and Geometry
- Two main methods:
 - Box Morphing





Morphing

- Applicable on FE- and Geometry
- Two main methods:
 - Box Morphing
 - Direct Morphing





Box Morphing Types of boxes



- 3D
 - Hexa
 - Penta
 - Tetra
 - Pyramid
 - Cylindrical



Box Morphing Types of boxes



- 3D
 - Hexa
 - Penta
 - Tetra
 - Pyramid
 - Cylindrical
- 2D (specific thickness)



Box Morphing Types of boxes



- 3D
 - Hexa
 - Penta
 - Tetra
 - Pyramid
 - Cylindrical
- 2D (specific thickness)
- 1D (specific diameter)



• Around geometry / mesh





- Around geometry / mesh
- Offset on existing boxes



- Around geometry / mesh
- Offset on existing boxes



- Around geometry / mesh
- Offset on existing boxes
- Split + Fit (edges or surfaces)





- Around geometry / mesh
- Offset on existing boxes
- Split + Fit (edges or surfaces)
- Sweep / Glide





- Around geometry / mesh
- Offset on existing boxes
- Split + Fit (edges or surfaces)
- Sweep / Glide
- Wrap



- Move (Translate, Rotate)
- Slide / Extend





- Move (Translate, Rotate)
- Slide / Extend
- Angle





- Move (Translate, Rotate)
- Slide / Extend
- Angle
- Fit (edges, surfaces)





- Move (Translate, Rotate)
- Slide / Extend
- Angle
- Fit (edges, surfaces)
- Radius





- Move (Translate, Rotate)
- Slide / Extend
- Angle
- Fit (edges, surfaces)
- Radius





Box Morphing Linked Morphing Boxes

- Utilize model symmetry
- Link according symmetry-/mirror plane, translation vector





Box Morphing Linked Morphing Boxes

- Utilize model symmetry
- Link according symmetry-/mirror plane, translation vector or rotation axis





- Separate groups of boxes handle different features
- Global and local modifications without excessive splits of boxes



- Separate groups of boxes handle different features
- Global and local modifications without excessive splits of boxes

• Global: B-pillar position

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- Color

- Separate groups of boxes handle different features
- Global and local modifications without excessive splits of boxes

- Global: B-pillar position
- Local: cross member width



- Separate groups of boxes handle different features
- Global and local modifications without excessive splits of boxes



- Separate groups of boxes handle different features
- Global and local modifications without excessive splits of boxes

• Global morphing

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- Separate groups of boxes handle different features
- Global and local modifications without excessive splits of boxes

- Global morphing
- Local morphing



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Box Morphing Coupled with Kinetics



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Box Morphing Coupled with Kinetics

- Morph Control Points added to Kinetic Rigid Bodies
- Morphing controlled by movement of Rigid Bodies

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Box Morphing Coupled with Kinetics

- Morph Control Points added to Kinetic Rigid Bodies
- Morphing controlled by movement of Rigid Bodies

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Box Morphing Recording History





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Box Morphing

Re-use of boxes and parameters for multiple similar models



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Direct Morphing DFM

Translate, rotate or scale FE-mesh or Geometry entities





Direct Morphing DFM

Translate, rotate or scale FE-mesh or Geometry entities



Direct N	lorphing►	
DFM	Holes-Tubes 🕨	Desig
Create 🕨	Constraints 🕨	Ha
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Translate, rotate or scale FE-mesh or Geometry entities



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• Control Entities

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Translate, rotate or scale FE-mesh or Geometry entities



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- Control Entities
- Morphed Entities
- Boundary



Translate, rotate or scale FE-mesh or Geometry entities



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DFM	Holes-Tubes 🕨	Desig
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- Control Entities
- Morphed Entities
- Boundary
- Morphing



Snap <u>**FE</u>** or geometry edges to <u>single</u> or multiple target curves</u>





Snap <u>**FE</u>** or geometry edges to <u>**single</u>** or multiple target curves</u></u>



• Origin



Snap <u>**FE</u>** or geometry edges to <u>**single</u>** or multiple target curves</u></u>



- Origin
- Target

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Snap <u>**FE</u>** or geometry edges to <u>**single</u>** or multiple target curves</u></u>



- Origin
- Target
- Morphed Entities
- Boundary



Snap <u>**FE</u>** or geometry edges to <u>**single</u>** or multiple target curves</u></u>



- Origin
- Target
- Morphed Entities
- Boundary
- Morphing



Snap <u>FE</u> or geometry edges to <u>single</u> or multiple target curves



- Origin
- Target
- Morphed Entities
- Boundary
- Morphing
- Reconstruct of morphed area



Snap FE or **geometry** edges to single or **multiple** target curves



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Snap FE or **geometry** edges to single or **multiple** target curves



- Origin
- Target
- Morphed Entities
- Boundary



Snap FE or **geometry** edges to single or **multiple** target curves



- Origin
- Target
- Morphed Entities
- Boundary
- Morphing



Sweep / Glide along pre-defined curves





Sweep / Glide along pre-defined curves





Surface Fit of *initial FE* or geometry onto *target* FE or *geometry*



 Initial FE-surface (with additional underlying parts)

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Surface Fit of *initial FE* or geometry onto *target* FE or *geometry*



- Initial FE-surface (with additional underlying parts)
- Target CAD-surface



Surface Fit of *initial FE* or geometry onto *target* FE or *geometry*



- Initial FE-surface (with additional underlying parts)
- Target CAD-surface
- Morphing



Surface Fit of *initial FE* or geometry onto *target FE* or geometry



• Initial FE-surface

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Surface Fit of *initial FE* or geometry onto *target FE* or geometry



• Initial FE-surface

• Target FE-surface



Surface Fit of *initial FE* or geometry onto *target FE* or geometry



[•] Initial FE-surface

- Target FE-surface
- Morphing



Direct Morphing Cross Sections

Fit cross sections (applicable on FE-mesh and geometry)



• Original cross section

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Direct Morphing Cross Sections

Fit cross sections (applicable on FE-mesh and geometry)



- Original cross section
- Target cross section

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Direct Morphing Cross Sections

Fit cross sections (applicable on FE-mesh and geometry)



- Original cross section
- Target cross section
- Morphing

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Direct Morphing Generation & modification of beads and embosses

- Curved & Rounded Beads
- Circular Flanged Openings

Parameters	Parameters				
	Feature type: Flanged opening		\$		
	Circular	Diameter (D)	60.		
		Height (H)	9.		
		Angle (A)	75		
		Radius (R1)	6.		
	Section view	Mesh			
		Length	3.		
	Invert direction	Distor. dist.	15%		
		Distor. angle	0.		
	[< Back Next >	Cancel		



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Direct Morphing Generation & modification of beads and embosses

- Curved & Rounded Beads
- Circular Flanged Openings
- Shell or Solid Ribs

Parameters	Parameters						
	Feature type: Rib						
	3D Rib 🗘) 🗌 Length (L)	10				
	1	Width (W)	1.				
		Angle (A)	0.				
		Top chamfer (🖨	0.				
		(m. n	2				
	Top view	Bottom cham 🗢	0.				
	Top view	Bottom cham Ç	0.9954				





Direct Morphing Design Change: Feature Slide/Copy

- Features of any shape (e.g. holes, beads, ribs) can be moved or copied on underlying surface
- Mesh of origin and target areas is reconstructed





Direct Morphing Design Change: Position

- Movement of members on their underlying surface
- Flanges and sidewalls are adapted on target position





Direct Morphing Design Change: Position

- Movement of members on their underlying surface
- Flanges and sidewalls are adapted on target position





Direct Morphing Design Change: Position

- Movement of members on their underlying surface
- Flanges and sidewalls are adapted on target position

Direct M	lorphing►	
М	Holes-Tubes 🕨	Design Change
te 🕨	Constraints 🕨	Position
nd	Modeling	Cross-Section





Direct Morphing Form (Bend)

Form parts by maintaining their cross-section

Direct Morphing		
DFM	Holes-Tubes	Design
Create 🕨	Constraints	Hat
Form	Modeling	Scu



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Direct Morphing

Spotweld Density

Adjust or preserve density of Spotweld Groups



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Direct Morphing Spotweld Density

Adjust or preserve density of Spotweld Groups

Controls ►					
Parameters	History	Nested			
Deform Map	Tubes Depenetrate	Spotweld Groups			





Direct Morphing Spotweld Density

Adjust or preserve density of Spotweld Groups

Controls ►					
Parameters	History	Nested			
Deform Map	Tubes Depenetrate	Spotweld Groups			





- Nested Elements for Box and Direct Morphing
- DFM Constraints (e.g. Planar, Rigid, Flange, Path Follower, ...)
- Freeze, rigidize, constrain feature-movement during morphing



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Optimization with ANSA, LS-OPT and META

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Morphing Parameters

• For Box and Direct Morphing PARAMETERS 🕻 🙆 🔍 🗄 🔍 - Ø. Id Name 1 cross_memeber_move 2 cross_member_height_1 3 cross_member_height_2 4 cross_member_taper_an... 5 side_member_width 7 roof_member_width 8 roof_member_height 9 roof_member_move 10 slide_b_pillar 11 side_member_height selected 0 total 10



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Morphing Parameters Video Recording

























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- Records any Box or Direct Morphing action
- Get any interpolation / extrapolation between undeformed and deformed shape with a single parameter



Initial shape – start recording



- Records any Box or Direct Morphing action
- Get any interpolation / extrapolation between undeformed and deformed shape with a single parameter



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- Records any Box or Direct Morphing action
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- Records any Box or Direct Morphing action
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Taylor Welded Blanks Parameter

Parameterization and Optimization of Taylor Blanks





Taylor Welded Blanks Parameter

Parameterization and Optimization of Taylor Blanks



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Mapping of Deformations

- Morph according existing deformation field from:
 - Deformation Parameter

 - History States
 DESVAR of Nastran SOL 200
 - Text file
- E.g. Modify geometry according optimized FE-model





Functionalities assisting Morphing 3D Points and Curves

- Act as initial or target positions for fittings
- Suitable for Box and Direct Morphing
- Obtained from FE mesh or CAD geometry





Functionalities assisting Morphing 3D Points and Curves

- Act as initial or target positions for fittings
- Suitable for Box and Direct Morphing
- Obtained from FE mesh or CAD geometry





Functionalities assisting Morphing Model Browser

- Useful for Box Morphing (esp. complex configurations)
- To organize morph contents





Functionalities assisting Morphing Reconstruct / Smooth morphed mesh

- Suitable for Box and Direct Morphing
- Improve mesh after morphing with large deformations



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Functionalities assisting Morphing Reconstruct / Smooth morphed mesh

- Suitable for Box and Direct Morphing
- Improve mesh after morphing with large deformations





Functionalities assisting Morphing Reconstruct / Smooth morphed mesh

- Suitable for Box and Direct Morphing
- Improve mesh after morphing with large deformations





Functionalities assisting Morphing Visualize Morphing Deviations

- Suitable for Box and Direct Morphing
- Measurement Tool
- Fringe Plot of deformed shape





Functionalities assisting Morphing Design Migrate

Re-application of Morph Parameters, Morph Constraints and Optimization Task items on different models



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Functionalities assisting Morphing Design Migrate

Re-application of Morph Parameters, Morph Constraints and Optimization Task items on different models



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Functionalities assisting Morphing Design Migrate

Re-application of Morph Parameters, Morph Constraints and Optimization Task items on different models



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• For parameterization of solver card entries, e.g. thicknesses

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- For parameterization of solver card entries, e.g. thicknesses
- Different types; Expressions

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- For parameterization of solver card entries, e.g. thicknesses
- Different types; Expressions

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- For parameterization of solver card entries, e.g. thicknesses
- Different types; Expressions
- Import from / Export to *PARAMETER

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• For parameterization of composite properties, e.g.:





- For parameterization of composite properties, e.g.:
 - fabric orientation





- For parameterization of composite properties, e.g.:
 - fabric orientation
 - layer thickness

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• For parameterization of connection properties, e.g.:

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- For parameterization of connection properties, e.g.:
 - distance between weld spots

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- For parameterization of connection properties, e.g.:
 - distance between weld spots
 - diameter of weld spots

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Ευχαριστώ πολύ



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