Welcome to the World of Fast Morphing!

We now Support ANSYS® Twin Builder!

(rbf-morph)™
Welcome to the World of Fast Morphing!

ANSYS® Fluent Add-On
ANSYS® ACT Extension
"RBF Morph's cutting edge tools allow time and computational resource saving in CFD research, Aero/Structure and much more. We've used it to optimise engineering design while using less resources than before."

Why mesh morphing?
• It allows to have parametric shape mesh that preserves the original topology. Remeshing noise is avoided.
• It allows to update the shape of a validated FEM model without rebuilding a new mesh.
• New shapes can be investigated even if the underlying CAD geometry is missing.
• The mesh can be updated to measured shapes (i.e. accounting for manufacturing tolerances).
• It’s usually faster than remeshing.

Why RBF morphing?
• RBF Morph is a best in class product crafted to deal with challenging CFD and CSM applications (huge meshes).
• 10 years of experience on industrial applications of Radial Basis Functions (RBF).
• RBF are recognized as one of the best mesh morphing tool available in the industrial and scientific community.

"RBF Morph is a powerful means in the hands of our analysts that helps them in fast reshaping models for a better design and optimization."

Alessandro Bozzolo
Industrial Design and CAE Technical Leader
RINA Consulting S.p.A.

Our RBF Morph technology
The aim of the RBF Morph technology is to perform fast mesh morphing using a mesh-independent approach based on state-of-the-art RBF (Radial Basis Functions) techniques. The use of such a Technology allows CFD and CSM users to perform shape modifications, compatible with the mesh topology, directly in the solving stage, saving up time needed to modify or rebuild geometry and to re-mesh the numerical model.

"State of the art morphing technology available with seamless integration to the ANSYS community"

Lewis Collins
Director, Program Management Corporate Marketing and Business Development
ANSYS, Inc.

RBF Morph software line
• ANSYS® Fluent Add-On
Integrated system for morphing and shape optimization tailored for the CFD solver ANSYS Fluent.
• ANSYS® ACT Extension
Developed with the Application Customization Toolkit (ACT) is the mesh morphing solution of choice for ANSYS Mechanical users. It supports ANSYS Workbench Meshing.
RBF Morph technology enables to apply the new shape directly in the solver, without the need to struggle with parametric CAD and to remesh the computational domain. In CFD and FEM calculations, once modified the design, the solver can continue from a previously obtained solution, shrinking even further the calculation time. Seamless integration with DOE and optimization tools can automate the process, reducing the required resources in terms of time and computational power.

Some successful examples

**AERONAUTICAL**
RBF Morph has proven to be a valuable tool in various aeronautical applications such as fluid structure interaction, in flight ice accretion and shape optimization of wings and nacelles. For the wings shape optimization the influence of 8 different parameters has been studied on the DLR-F6 geometry in order to maximize the lift-drag ratio.

**NAUTICAL**
Example of a nautical application of RBF Morph in which 16 different configurations have been reproduced to explore the effect of sails trim in a simplified boat configuration used during wind-tunnel testing. Twist and camber are taken into account in four different sections of each sail. CFD simulations allows to identify the best configuration to maximize thrust for given flow conditions.

**MOTORSPORT**
The engineering company Motocorse, has designed and optimized using ANSYS Mechanical and RBF Morph a CNC billet machined racing version of the rear suspension rocker for the motorbike Ducati 1199 Panigale. By steering five shape parameters, a 18% weight reduction has been achieved keeping an allowable stress level.

**MEDICAL**
RBF Morph has been used successfully to study a carotid bulb aneurysm. The carotid bifurcation has been parameterized to take into account the variations in the vascular anatomy and to explore its influence in the overall hemodynamic. Variations are noticeable comparing a wealthy carotid (top image) with the same in presence of an aneurysm (bottom image).
RBF Morph is proud to be a part of ANSYS Ecosystem since 2009 as a software Solution Partner.

RBF Morph was awarded for the “Best Use of HPC” during the closing ceremony of the ANSYS Automotive Simulation World Congress 2013 in Frankfurt.

Design Methods company won the 2016 Hall of Fame world competition thanks to a groundbreaking application concerning the optimization of A-class catamaran that was accomplished through the coupled use of ANSYS Fluent and RBF Morph.

FTGM won the Ansys Hall of Fame 2018 world competition in Academic Session. Using ANSYS CFD and RBF Morph, researchers created a virtual statistical patient to analyze the blood flow and blood pressure alterations during the transition of the aorta from a healthy to an aneurysmatic state.

### Products Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>ANSYS Fluent Add-On*</th>
<th>ANSYS ACT Extension**</th>
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<tbody>
<tr>
<td>Product Integration with ANSYS Software.</td>
<td>Fluent ANSYS WB</td>
<td>ANSYS WB</td>
</tr>
<tr>
<td>Process Integration allowing morphing phase directly inside the solving stage.</td>
<td>Yes (Fluent)</td>
<td>Yes (Mechanical)</td>
</tr>
<tr>
<td>Mesh Topology preservation.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Supported mesh GUI.</td>
<td>All 3D</td>
<td>Full</td>
</tr>
<tr>
<td>Supported mesh morphing.</td>
<td>All 3D</td>
<td>Full</td>
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<tr>
<td>Surface Morphing by free surface deformation, rigid movement or scaling.</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Surface Targeting by surface nodes projection on target surfaces.</td>
<td>STL targeting</td>
<td>CAD surface targeting</td>
</tr>
<tr>
<td>Volume Smoothing allowing relatively large movement possible in a single step deformation.</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Hierarchical morphing.</td>
<td>Two step via file</td>
<td>Nested in the tree</td>
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<tr>
<td>Parallel implementation for large models (many millions of cells/elements) calculations.</td>
<td>Full</td>
<td>OpenMP CUDA</td>
</tr>
<tr>
<td>Model Parameterization to efficiently manage multi-parameter and multi-step problems.</td>
<td>Fluent ANSYS WB</td>
<td>ANSYS CUDA</td>
</tr>
<tr>
<td>Back2CAD implementation to transfer shape modifications on model surfaces for re-design phases.</td>
<td>Yes</td>
<td>STEP file or ANSYS WB</td>
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<td>Precision of nodes movement to ensure exact nodes locations as well as exact feature preservation.</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Automatic shape sculpting of the model surfaces.</td>
<td>Adjoint based</td>
<td>BGM based</td>
</tr>
<tr>
<td>FSI integration to properly evaluate model response in Fluid-Structure Interaction.</td>
<td>Via GUI</td>
<td>N.A.</td>
</tr>
<tr>
<td>Via TUI</td>
<td></td>
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<tr>
<td>ROM integration to take advantage of ANSYS Reduced Order Models approach and get parametric shapes in ANSYS Twin Builder.</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>

*Offered by RBF Morph and by ANSYS
**Offered by RBF Morph and available on the ANSYS App Store