

rbfTM

Unleash the power of mesh morphing

Ansys

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TECHNOLOGY PARTNER

Ansys RBF Morph Fluids
Ansys RBF Morph Structures



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What we do

RBF Morph is a pioneer in providing cutting-edge, reliable and high-performance mesh morphing technology for CAE multiphysics modeling and digital twin design. Since 2007 our dedicated team of engineers and experts in computer simulation has been key to creating innovative and unique solutions that can optimize any product's shape, increasing mechanical and aerodynamic performances, while significantly reducing development time and cost. Our mesh-morphing technology combines very accurate control of geometrical parameters with rapid mesh deformations fully integrated with the Ansys solvers family. We have been a technical partner of Ansys since 2009.

Advantages of our solutions

The main advantages of RBF mesh morphing available with these products are:

- it can handle any kind of mesh;
- it is fully integrated in the CAE solvers;
- it does not need re-meshing;
- it is highly parallelizable and very effective;
- it preserves the same mesh topology;
- it can reduce the turnaround time of the optimization by a factor of five and therefore allows to significantly cut costs;
- it allows for both parameter based and parameter free shape optimization.

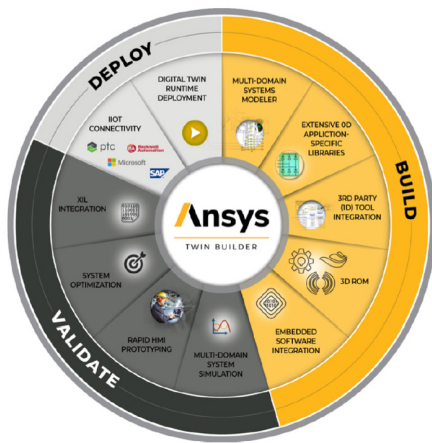
Ansys RBF Morph Fluids

Ansys RBF Morph Fluids is an add-on which allows for automated shape optimization studies entirely within Ansys Fluids family. It makes it possible to morph directly in the solving stage without modifying the underlying CAD geometry and regenerating the mesh. This new approach overcomes the limits of the mainstream methods by introducing these functionalities through the implementation of dedicated routines in Ansys Fluent CFD code. Parametric optimization can be accelerated because the observable sensitivities become available as derivatives of the input parameters, and parameterless optimization can be performed with full control allowing an accurate selection of areas to be sculpted.

Ansys RBF Morph Structures

Ansys RBF Morph Structures is an ACT extension which allows for automated shape optimization studies entirely within Ansys Mechanical and Ansys Workbench by morphing the existing mesh. This solution is fully embedded in Ansys Mechanical GUI, same "look and feel" and interaction logic, it leverages fast RBF library with CUDA and OpenMP parallel acceleration.

Many basic shape modifications (translation, rotation, scaling, surface offset, curve offset, surface target, curve target) are easily achieved, as well as complex shape modifications by using a hierarchical approach to create chains of multiple modifications. In this way, for example, an available mesh can be fully adapted and fitted to a new-built CAD, without rebuilding it from scratch.



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

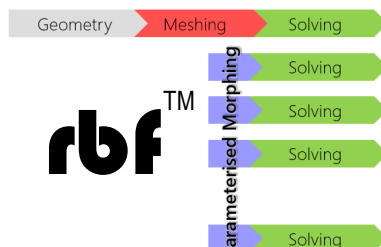
LEWIS COLLINS
Director, Strategy & Partnerships
Ansys, Inc.

Design iteration

Conventional approach

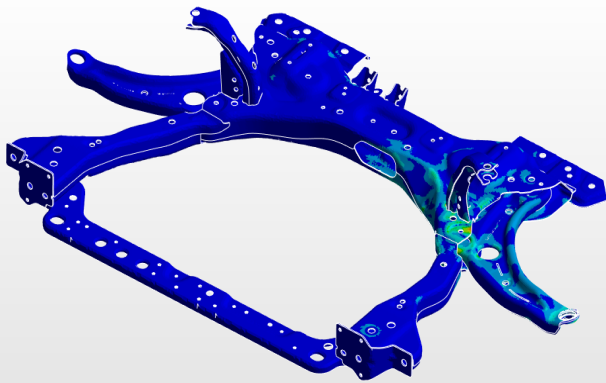
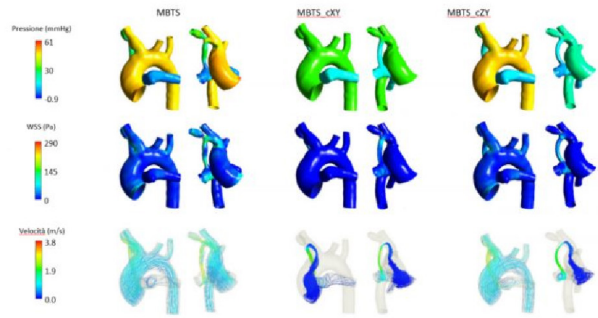


RBF's morphing approach



"We worked with RBF Morph and other partners on the Copernicus project, whose aim was to provide a medical digital twin of the patient to support the surgery planning of Modified Blalock Taussing Shunt under critical conditions. RBF Morph Fluids was key to complete the Copernicus workflow, and it helped increase the know-how on the application of radial basis function mesh morphing in the medical sector."

ALESSANDRO BOZZOLO
Industrial Design & CAE Manager
RINA

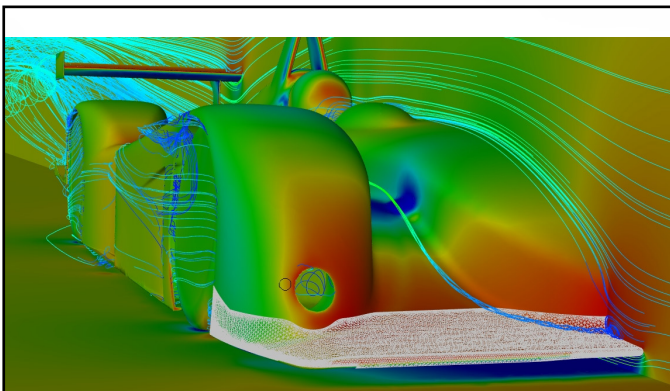
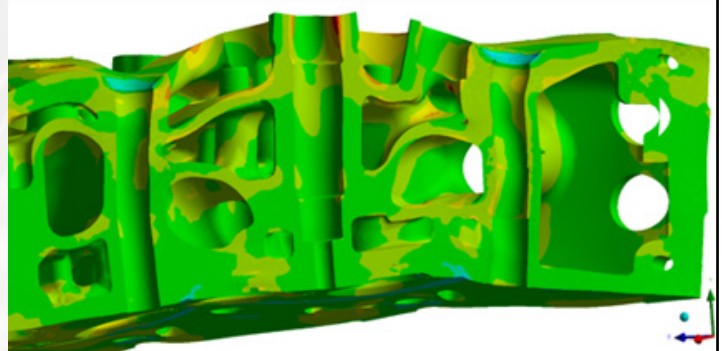


"We worked with RBF Morph to perform the structural optimization of the front chassis and suspension lower arms of a Nissan Micra. Our objective was an increase of driving comfort, achieved by controlling the lateral stiffness while acting on thickness and shape variation of subframe elements. RBF mesh morphing tools were essential to conduct different structural tests and finally achieve optimization".

CLAUDIO PONZO
Chassis Manager
Nissan Motor Corporation

"Static structural FEA and fatigue analysis was carried on a combustion engine cylinder head assembly model. Design and analysis iterations, which are typically carried out manually since the complex casting topology makes geometry parameterisation nearly impossible, were simulated with the RBF Morph Biological Growth Method which allows for effective parameterisation of complex geometry at the mesh level. The outcome was excellent".

MARCEL SCHUBERT
Applied Mechanics Analytical, Technical Advisor
Cummins, Inc.



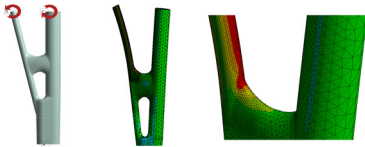
"FSI and multiphysics are key enablers for modern racing car development, where geometries are very complex and high accurate solutions are required. RBF Morph proved to be the driving tool for the FSI two-way coupled approach. It successfully faced our Motorsport challenge, matching the FEM model displacement with the aero loads mapping in a simplified model of a Dallara Le Mans prototype car".

ELISA SERIOLI
Head of CFD Methodology
Dallara

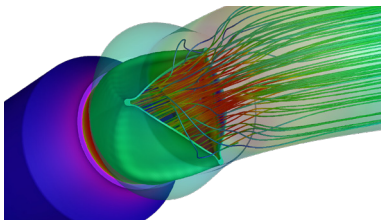
RBF Morph is proud to be a part of Ansys Ecosystem since 2009 as a software Solution Partner.




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.



The RBF Morph team won the "Software Simulation Award" at the Italian Conference AIAS 2019 with the video "Automatic Shape Optimisation with RBF Mesh Morphing and the Biological Growth Method".



The University of "Rome" Tor Vergata won the Ansys Hall of fame 2020 world competition in Academic Session. Engineers used Ansys Fluent, Ansys Mechanical and RBF Morph to perform cardiovascular simulation with moving walls and applied it to the fluid-structure interaction analysis of a custom valve coupled with patient data.

Products Features	Ansys RBF Morph Fluids	Ansys RBF Morph Structures
		
Product and Process Integration with Ansys software allowing morphing phase directly inside the solving stage.	Fluent Ansys WB OptiSLang Twin Builder	Mechanical Ansys WB APDL LS-DYNA OptiSLang Twin Builder
Mesh Topology preservation.	Yes	Yes
Supported mesh GUI.	All 3D	Full
Supported mesh morphing.	All 3D	Full
Surface Morphing by free surface deformation, rigid movement or scaling.	Yes	Yes
Surface Targeting by surface nodes projection on target surfaces.	STL targeting	CAD surface targeting
Volume Smoothing allowing relatively large movement possible in a single step deformation.	Yes	Yes
Hierarchical morphing.	Two step via file	Nested in the tree
Parallel implementation for large models (many millions of cells/elements) calculations.	Full	OpenMP CUDA
Model Parameterization to efficiently manage multi-parameter and multi-step problems.	Fluent Ansys WB	Ansys WB
Back2CAD implementation to transfer shape modifications on model surfaces for re-design phases.	Yes	Yes
Precision of nodes movement to ensure exact nodes locations as well as exact feature preservation.	Yes	Yes
Automatic shape sculpting of the model surfaces.	Adjoint based	BGM based
FSI integration to properly evaluate model response in Fluid-Structure Interaction.	Via GUI Via TUI	Structural modes and keyframes export
ROM integration to take advantage of Ansys Reduced Order Models approach and get parametric shapes in Ansys Twin Builder.	Yes	Yes

