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ANSYS More than FEM

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Abstract: A standard numerical simulation is only one step in product development. A robust and effective result can be found only in complex of many different but connected analyses. Many years of development in numerical simulations brings extensive multiphysics systems as ANSYS product family. One of the most important step in development process is in optimization of required results.

Introduction

More than 40 years of continual development in FEM simulation methods in ANSYS family shifts technical opportunities in wide range of everyday demands. This long period was started by Dr. John A. Swanson as Swanson Analysis Systems, Inc (SASI) with raw but clever codes for structural physics that could simulate static (stationary), dynamic (moving) and thermal (heat transfer) problems. It enabled to take advantage of currently available computers in combination with many years known mathematical solutions. This longtime process is still in movement now. Not only structural or thermal analyses are able to sufficiently describe nowadays problems that technical engineers should solve. A precision of required simulations goes to particle size less than micrometer but in opposite sometimes a complex fluid simulation solves problems in kilometers of atmosphere. It everything leads to multiphysics solution with general-purpose tools, like ANSYS products are.

Problem description

The simulation system implemented in ANSYS product package grows every year like an evolution process. Structural simulations enable to analyze large models with millions of equations. The interaction of many parts in complicated assemblies is more reliable and quicker. All neither structural nor thermal modules include more independent loads and boundary conditions.

Some steps in FEM analysis systems can be understand as a revolution steps. The process of any numerical simulation was passed from some standalone applications to the complex project environment named ANSYS Workbench. It enabled to implement fluid modules as CFX or Fluent. Besides that more explicit simulation systems were implemented similarly. Many engineers welcomed extensive group of electromagnetics systems.

Actual questions in product development become more and more complex in many physical areas. The multiphysics simulation system can be a solution for this purpose.

Parametrization in FEM

The standard numerical simulation is a complex of many complicated material models, structural models and other physics description. Many inputs are significantly inaccurate or almost unknown. Any competent and efficient tool for this problem can be found in sensitivity study of important inputs of numerical models. The sensitivity study can assess level of influence of any inputs to any outputs. A correlation between any parameters can be observed.

ANSYS product package offer a solution for this process in optimization modules, i.e. optiSLang optimization system. Not only sensitivity can be used with advance but many optimization procedures are available too.

The big advantage of this system is in assessment of the whole product development process. It can be evaluated by a robustness study. It enables to observe quality of any optimized results.

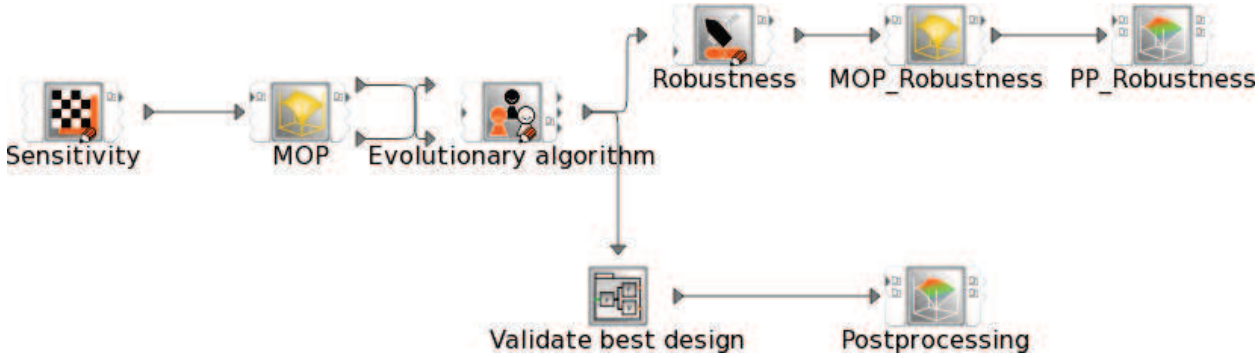

Fig. 1: Optimization process in optiSLang environment.

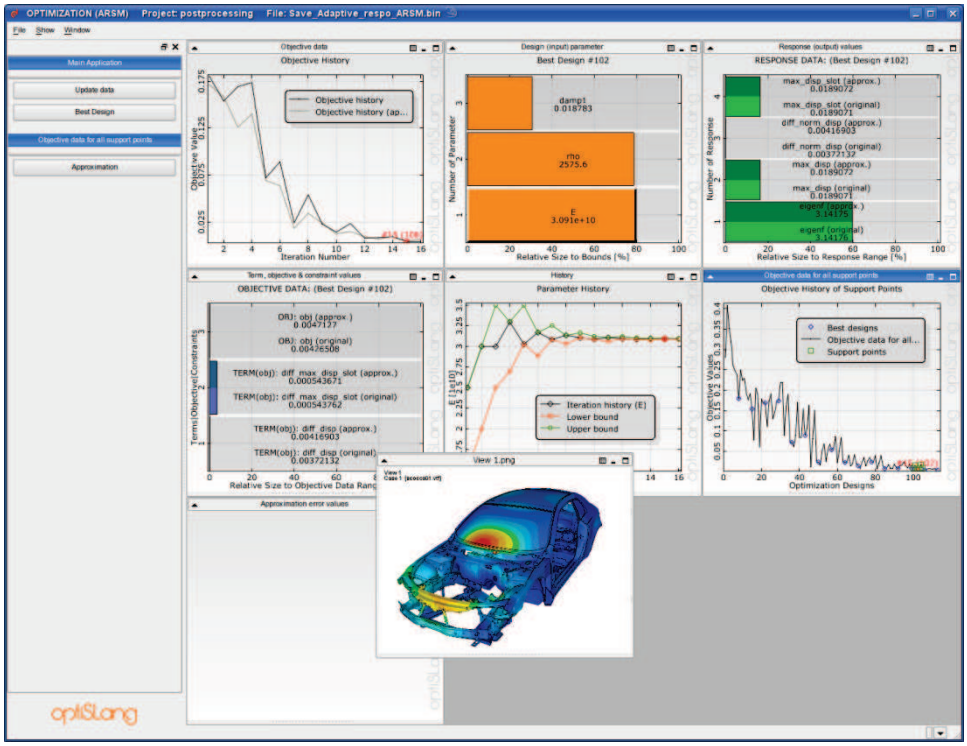

Fig. 2: Example of results of an optimization study.

Conclusion

Not only one numerical simulation brings sufficient results. Actual problems have to be solved in complex multiphysics point of view. Moreover, good stability of results in combination with product costs can be found only in optimized and robust result. Numerical simulation systems are able to solve all those requirements.