First Order Risk Assessment Automation Tool

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ABSTRACT

First Order Risk Assessment, or FORA for short, is an LCFC-SimuTech co-developed automation tool [1] which displaces the certain tedious Abaqus CAE operation and report composing with an easy-to-use pull-down input menu. It is practical and inviting especially in early design phase of notebook products or likewise due to the limited information available in hand.

Keywords: risk assessment, automation tool, early design phase

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1、Introduction

In early design phase the notebook DOM's have to provide customers the variant risk assessments of their design proposal out of rare mechanical details in mind. However, the customers will not stop asking an estimate regarding the structural integrity which is the ticket to product award. Here comes the CAE to provide simulation-base evaluation in any form wither previous agreed in-between or suddenly requested from the customers.

Recognized the internal feature of chassis is almost impossible to get even close to the final version, a work-around to evaluate the structural integrity in the stage is to compare the stiffness of the cover itself without any presumption, i.e., focus on the fundamental but crucial structural element.

2、Introduction

2.1 Conventional workflow

In early design phase mechanical designers have to provide customers the risk assessment, supported by CAE, on structural integrity of preliminary chassis proposal to settle down fundamental design factors. However, there is limited information to deliver quality simulation result in the stage. Simulation is barely instructive but sort of newspaper dispatch day in and day out. "Garbage in and garbage out", like said the simulation guru analysts. [2] [3] [4] [5] The conventional workflow has to be changed to improve productivity and working atmosphere.

2.2 Solution

Develop a new spontaneous reliable risk assessment tool, which evaluates necessary design factors by solid mechanics, learns from the experience, and explores the innovation territory. In order to encourage more the dynamic interactions between mechanical designers and simulation analysts, an easy-to-use automation tool embracing engineers with different knowledge levels of finite-element-method is called up in the initiatives. Further, it is expected to automatic create and deliver formatted reports avoiding waste of precious man power.

A global stiffness evaluation methodology is proposed so in response to the need for workflow improvement. A de-featured cover placed in certain constrained fixture as shown in Figure 1 is subjected to a specific load and the deformation is calculated. The stiffness of that cover is thus defined as load divided by deformation. This is not intended to correlate to any product fragility nor reliability tests but to concentrate on establishing a solid foundation for product development. [6]

The cover stiffness can be numerically characterized, even better to be correlated with experimental data, [7] [8] [9] by specifying the length, width, thickness, material and other design factors. Standardization of mechanical characterization is the key successful reason to accommodate design differentiation as diverse as possible, and thus survives the workflow.

3、Deliverables

3.1 FORA workflow

- Requestor information readiness
- Mechanical design readiness
- CAE plug-in input shown as Figure 2
- Cloud computing
- Report emailing

3.2 The readiness

Since it is programed so to be operated by the requestors themselves, not through simulation engineers, there are two things to be prepared for FORA execution.

The requestor has to provide his contact information and several others in the pop-out menu to automatic receiving the report through email dispatch system shown as Figure 3. The emailing protocol has been authorized by IT the intranet owner.

It is necessary some re- arrangement and de-feature operation of CAD model to comply with FORA definition of terms and simulation model requirement. It involves possible renaming of CAD parts or assemblies¸ re-entitlement of CAD files and deletion of specific structural features shown as Figure 4.

4、Result

Although the productivity improvement is not measured by certain specific metric, the authors have some inspiring observations after FORA implementation. Most of all the accountability of simulation is much more appreciated than before for significant reduction of meaningless back and forth in two engineering functions. This results in healthy "what-if" scenarios concerning nothing but do-the-thing-right mentality. Other benefits are total working time reduction, speedy quality report and design of change guideline out of factorial sensitivity study. The automation tool itself cannot provide those benefits without the sequential productive interactions between engineers.

To break the upstream barrier of CAE engagement in early design flow, ones should look up to the simplification of design-simulation interaction and communication. Revisit the basic physics behind the scene and numerically represent the design guide depicting the direction where the product development should go. The more scientific disciplined the workflow, the more productive and innovative manifests the product development.

5、Conclusion

FORA is not only save the simulation engineer's life but actually provide more instructive information to inspire the mechanical designers when compared to the conventional workflow. It is productive, interactive, intuitive and mishandling-preventive. Thus makes it easier to proactively integrate simulation into regular design flow and results in quality productivity. After all, there is no risk assessment if the evaluation result is any lack of speed, confidence and reliability.

6、Reference

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7、Acknowledgement

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8、Figure

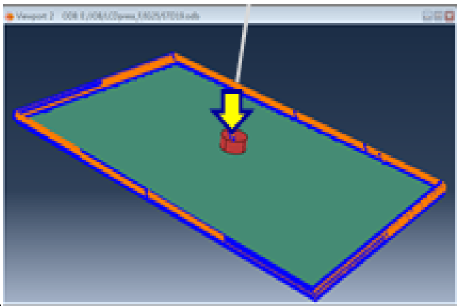

Figure 1

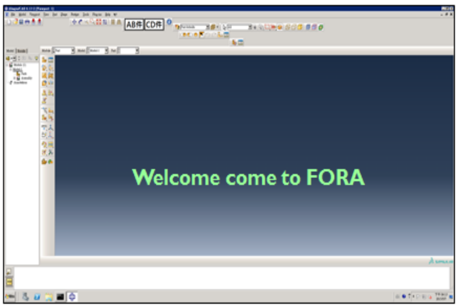

Figure 2

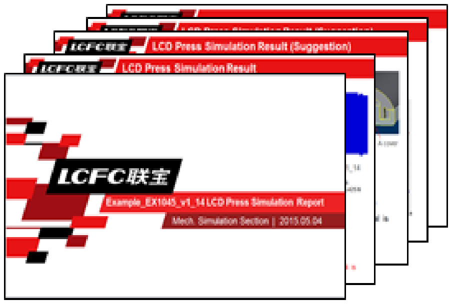

Figure 3

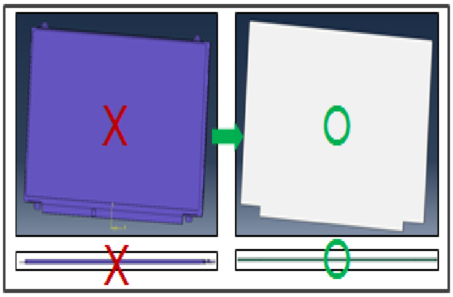

Figure 4