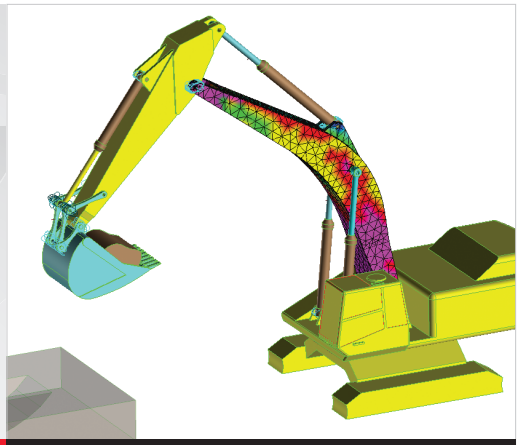
Integrated Motion-Structures Solution

Mechanical Systems Simulation with MD Analysis Technology from MSC.Software



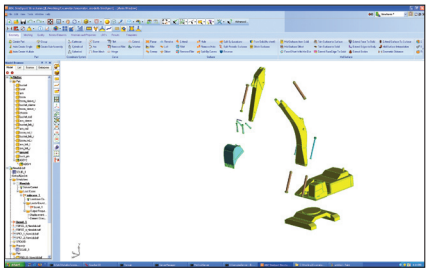
Introduction

Product designers strive to gain insight into product performance under various operating conditions using CAE tools for virtual product testing and event simulation. Among the primary tools commonly used in analyzing mechanical and structural system performance are motion analysis and finite element analysis (FEA).

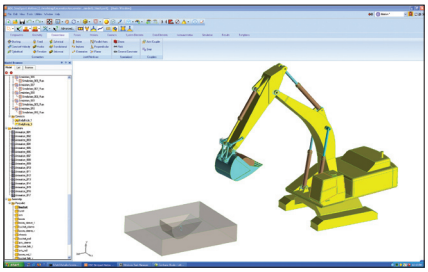
Motion analysis provides an efficient solution by enabling designers to predict the kinematic (displacements, velocities and accelerations) and dynamic (forces and moments) behavior of mechanical assemblies. Although a motion solution is well suited for predicting overall system behavior, it typically approximates the structural components to be rigid. Consequently, motion analysis does not predict deformations or stresses in individual components of an assembly.

Finite element analysis, on the other hand, can include linear and nonlinear material characteristics of individual components in an assembly, and therefore provides detailed insight into component behavior, including prediction of stress and potential failure. Modeling an entire assembly for system response prediction with finite elements, however, can be cost prohibitive due to large compute system resource requirements and relatively long CPU computation times.

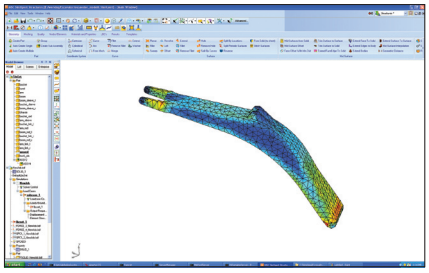
An integrated motion-structures solution from MSC.Software offers the best of both worlds: a simple, robust motion model with selected flexible finite element components. This new motion-structures technology is built from two of MSC's core solvers, Adams and Nastran. Adams is the most widely used motion simulation software in industry, allowing users to build and test virtual prototypes of complex mechanical systems. Nastran is the world's leading software for FEA of structural and mechanical systems. By integrating these two technologies within the common user environment of SimXpert, MSC.Software delivers unparalleled efficiency and accuracy for the multidisciplinary (MD) solution of motion-structures problems.



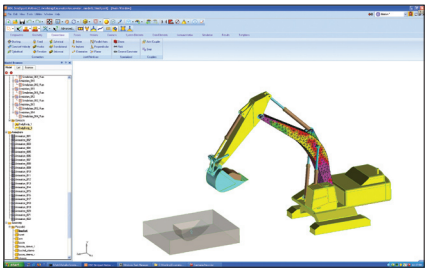
Assembly



Motion Workspace



Structures Workspace



Motion Model with Integrated Flexible Component

Benefits

MSC.Software's new motion-structures solution provides key benefits, including:

- Higher accuracy prediction of motion system performance with integrated multidiscipline motion-structures simulation
- Detailed stress analysis of motion system components for preliminary design
- SimXpert common user environment for greater solution efficiency
- Simulation process automation for best practice capture and reuse with SimXpert templates

MSC Software

Features

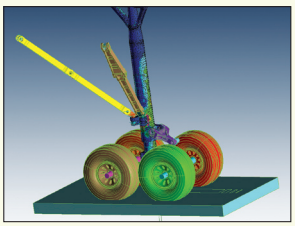
Common User Environment: SimXpert provides a complete CAE pre and post modeling environment which supports both motion and FEA workspaces under a common user environment. The SimXpert common environment provides two key benefits: improved solution efficiency and reduced data translation errors. With no need to learn separate GUIs for motion and structures, engineers can perform integrated motion-structures simulation in a fraction of the time previously required. And without the need to translate data between different motion and structures models, manual data translation errors are eliminated. Additionally, the template technology in SimXpert enables automation of motion-structures simulation with best practice capture and reuse.

Flexible Body Modeling in Motion Analysis: The prediction of overall system performance provided by a motion model can often be improved by accounting for the flexibility of certain key components in the motion model. Traditionally, this is handled with a multi-step process outside of the motion model involving the generation of a mesh for the flexible component using an FEA pre-processor, followed by a modal analysis of the flexible part with an FEA solver and storage of modal output data in a Modal Neutral File (MNF), and finally importing the MNF back into a motion solver. This traditional process is cumbersome and inefficient, and can lead to translation errors from the manual data translations required between different solvers from typically different vendors.

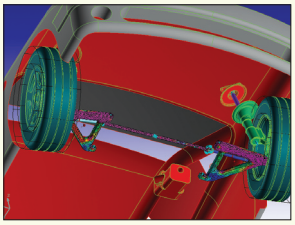
With MSC's integrated motion-structures solution, this multi-step process is eliminated and replaced with a seamless communication between MD Adams and MD Nastran within the SimXpert common user environment. The motion model is created in the SimXpert motion workspace, followed by meshing and modal analysis of the selected flexible component in the SimXpert structures workspace, and automatic transfer of the modal results (MNF) back to the motion workspace for an integrated motion-structures solution, accounting for the flexibility of key components in the motion model.

Motion Load Transfer for Structural Analysis: In some cases it is desirable to perform a detailed stress analysis of a key component in a motion model, at multiple stages throughout the range of motion. This requires a FEA of the component, with loads and relative position of the component predicted by the motion model at various stages of the motion. The traditional approach involves translating load and position data from a motion model to a structural model at multiple stages throughout the range of motion to compute component stresses. With MSC's integrated motion-structures solution, motion loads and component position are automatically mapped from the motion workspace to the structures workspace in SimXpert. In the structures workspace, the component is meshed for a detailed stress analysis using FEA. This automatic mapping from motion to structural model takes place in the common user environment of SimXpert, and thereby eliminates manual data translation between models.

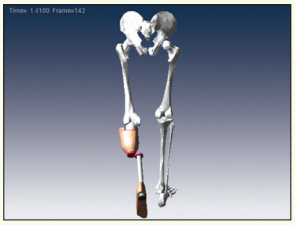
Improve Mechanical System Performance Prediction



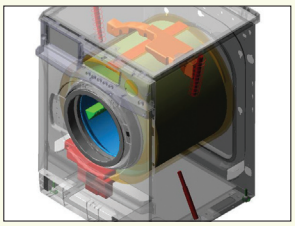
Aerospace



Automotive



Biomedical



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