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New Plug-In for SIMPACK Version 8.5: SIMBEAM

The need for modelling flexible body behaviour in MBS models has increased significantly over the last couple of years. Quite often the flexible structures can be modelled as FEA models which use beam elements only. With modern fully parameterised MBS models it was only natural to combine the powerful parameterisation features of SIMPACK with the capabilities for generating and analysing beam structured flexible bodies right within SIMPACK. This new Plug-In SIMBEAM now allows the user to create flexible bodies within the SIMPACK GUI inside their MBS models. The defined flexible structures are incorporated into the system equations via a modal description.

Simple Definition

The creation of such flexible components is very simple and straightforward. The user selects the body on which the flexible components should be created. Each flexible component is then created between two markers on that body. Materials and cross-sections for the flexible components are defined as separate elements and can be reused in the whole model and even be read from and stored to the SIMPACK database. A material and a cross section is assigned to the flexible component and the number of beam elements which should be created between the two markers is defined. After this the definition is complete. Typically one body consists of a set of flexible components which are connected to each other.

Flexible and Parameterised

The flexible components of one body may branch at any marker and even form closed loops. The only requirement being that all flexible components of one body must be connected to form a single flexible body.
The direction of the beam elements, the cross-section and the material can vary for each flexible component which is created on a body. This way complex structures such as twisted stabiliser bars and tubular trellis frames can be easily defined. Since the flexible components reference standard parameterisable SIMPACK modelling elements such as markers they are fully parameterised. Once defined the flexible components are stored in the model .sys file along with all the other model data like bodies, joints and forces.

Built-in Modal FEA Solver

After the flexible components have been defined for a body the elastic properties in the modal space are calculated with a single mouse click in the SIMPACK GUI. The built-in FEA solver first creates the mass-, inertia- and the stiffness-matrices for the system and then performs a modal analysis. These results are written to the SIMPACK **f**lexible **b**ody **i**nput file (.fbi) which can be run through FEMBS and then be used to define an elastic body in SIMPACK like any other flexible body results from traditional FEA programs.