Implementation of Modal Representation for Full Vehicle VPG Simulations

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Abstract

The modal representation method matured in LS-DYNA 970. It is a useful tool for full vehicle, long duration Virtual Proving Ground (VPG) analyses. The CPU time for VPG analysis could be dramatically reduced with such application.

Modal representation method uses linear combination of the pre-calculated mode shapes to represent portion of the full vehicle model in transient dynamic analysis. The linear modal response of this portion of vehicle is superimposed to the full vehicle's nonlinear explicit analysis. The explicit element processing is only applied to the rest of the model and thus reduces the total CPU time.

A pickup vehicle was used in this study to demonstrate the application of this method to full vehicle VPG analysis. The mode shapes of the pickup box were calculated and superimposed to full vehicle VPG analysis. While the results were compatible to the results from a traditional explicit analysis, significant CPU time was also reduced by using this method.