Robustness Assessment of Vehicle Dynamics Performance of a Tactical Defense Truck

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Presented at:

2006 Virtual Product Development Conference
Huntington Beach CA
July 2006

Abstract:

Modern military truck specifications include several challenging and conflicting *performance attributes* such as high wheel travel, lateral acceleration, ride quality over various terrains, vertical acceleration over half rounds, stability during lane change maneuvers, etc. An MSC ADAMS CAR model of a Tactical Defense Truck can be used to assess the ride quality and vehicle dynamics performance attributes. In order to select an optimal design that meets all the requirements a *design space exploration* of design variables such as the spring's damping and stiffness, the tire's characteristics, and the torsional bar stiffness can be performed.

In this paper the *design space exploration process* and the regions of the design space where the performance attributes are acceptable are presented in a graphical form. This modeling process enables a quick feasibility study that identifies whether or not a region of the design space exists that meets all performance requirements. A selection of an optimal *design variable set* is demonstrated.

Due to tolerances, loading and environmental uncertainties, and vendor, material and manufacturing variations of the components, the optimal set of design variables selected exhibits random variation. In order to meet the performance requirements during testing and in the theater of operations a *robustness assessment* of the design variable variation on the performance attributes is required. A reusable workflow process for robustness assessment is presented and the impact of design variable randomness on the optimality of the design point is presented graphically on the design space.