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An effective MDO methodology in automotive industry

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Automotive industry today is challenged by a large number of complexes and often conflicting constraints and requirements such as reduce the cost and weight of vehicles, compress vehicle development cycle time, and improve product performances, e.g., Safety, NVH, Durability, etc. More recently, multidisciplinary design optimization (MDO) is a systematic tool to integrate all the attributes in vehicle design and find a compromise solution to satisfy those stringent performances and requirements. In addition, as most computer aided engineering (CAE) simulations are computation intensive, special optimization methods and processes are often required. This presentation will focus on historical developments and applications of optimization and robustness methods for vehicle designs. It will address significant technologies, such as advanced model bias updating method, data mining based design space identification involving large-scale engineering problems, and score function based reliability design method considering data uncertainty. Lastly, a vehicle example of minimizing the weight and satisfying safety and NVH requirements is presented to demonstrate the proposed methodology.

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Analysis of an active suspension system for light four wheeler vehicle

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The vibration and control system analysis of a new model of active suspension system for light passenger vehicle basically four wheeleris by using mathematical modeling. Further the control dynamics of the system has been devised using data from mathematical modeling and converting it into Simulink (Matlab) models. The primary step was converting the vehicle into a more comprehensive Half car model and Quarter car model for mathematical and vibration analysis of these rigid-body model of the vehicle. The Simulink Models of the Quarter car model have been taken into consideration and further analysis was done basis of this model. Firstly the parametric graphs for the Passive Suspension System were calculated and on the basis of these data a model for the Active Suspension System was created. The model of the Active Suspension System included additional input parameters as the Road Profile inputs (basically road disturbances) through support motion technique. This was followed by the controller design using Control System Simulink model of Active Suspension System. Furthermore, the various parametric interaction graphs were taken out. On this analysis for the Active Suspension System the Electromagnetic Damping property of Solenoids was taken into account.

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