UNCERTAINTY QUANTIFICATION IN VEHICLE'S CENTRE OF GRAVITY USING POLYNOMIAL CHAOS EXPANSION: AN ANALYTICAL APPROACH

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Abstract

The Centre of Gravity (CG) of a vehicle is important in anticipating its behavior in different conditions. The Centre of Gravity (CG) is, generally, calculated using measured reaction forces at supports. There are many uncertainties involved in measurements of these reaction forces. Hence, analysis of these uncertaintie's impact on overall CG location is very crucial. Due to these input uncertainties, the CG also, becomes uncertain. The uncertainty in CG can be determined by statistical quantities viz. (1) mean and (2) standard deviation for all practical purposes. In this work, the uncertainty quantification analysis is done and analytical expressions for mean and standard deviation of CG location are obtained. The general polynomial chaos expansion theory for uniformly distributed stochastic process is employed with Galerkin projection method to obtain expressions. The results from these expressions are compared with Monte Carlo simulation results.