

Modeling And Optimization Under Uncertainty Of Drivetrain Dynamics For Clunk Disturbance

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Summary : Free modeling and optimization under uncertainty of drivetrain dynamics for clunk disturbance pdf download - quality and performance are two important customer requirements in vehicle design driveline clunk negatively affects the perceived quality and must be therefore minimized this is usually achieved using engine torque management which is part of engine calibration during a tip-in event the engine torque rate of rise is limited until all the driveline lash is taken up however the engine torque rise and its rate can negatively affect the vehicle throttle response which determines performance therefore the engine torque management must be balanced against throttle response in practice the engine torque rate of rise is calibrated manually this research describes an analytical methodology for calibrating the engine torque with and without considering uncertainty in order to minimize the clunk disturbance while still meeting throttle response constraints a set of predetermined engine torque profiles which span the practical range of interest are used and the transmission turbine speed is calculated for each profile using a bond-graph vehicle model the turbine speed quantifies the clunk disturbance using the engine torque profiles and the corresponding turbine speed responses time-dependent metamodels are created using principal component analysis and kriging the metamodels predict the turbine speed response due to any engine torque profile and are used in a deterministic and reliability-based optimization to minimize the clunk disturbance while still meeting the throttle response target compared with commonly used production calibration the clunk disturbance is reduced substantially without negatively affecting the vehicle throttle response also the methodology has been successfully applied in minimizing clunk using experimental data the results validated the proposed approach and showed that it can be used in both experimental and analytical studies

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