DESIGN AN INTELLIGENT CONTROLLER FOR FULL VEHICLE NONLINEAR ACTIVE SUSPENSION SYSTEMS

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Abstract- The main objective of designed the controller for a vehicle suspension system is to reduce the discomfort sensed by passengers which arises from road roughness and to increase the ride handling associated with the pitching and rolling movements. This necessitates a very fast and accurate controller to meet as much control objectives, as possible. Therefore, this paper deals with an artificial intelligence Neuro-Fuzzy (NF) technique to design a robust controller to meet the control objectives. The advantage of this controller is that it can handle the nonlinearities faster than other conventional controllers. The approach of the proposed controller is to minimize the vibrations on each corner of vehicle by supplying control forces to suspension system when travelling on rough road. The other purpose for using the NF controller for vehicle model is to reduce the body inclinations that are made during intensive manoeuvres including braking and cornering. A full vehicle nonlinear active suspension system is introduced and tested. The robustness of the proposed controller is being assessed by comparing with an optimal Fractional Order $PI^{\lambda}D^{\mu}$ (FOPID) controller. The results show that the intelligent NF controller has improved the dynamic response measured by decreasing the cost function.

Index terms: Full vehicle, nonlinear active suspension system, intelligent system, neuro-fuzzy system, control design.