Transient Motion Control of Passive and Semiactive Damping for Vehicle Suspensions

by

Angela K. Carter

Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Electrical Engineering

APPROVED:

Mehdi Ahmadian, Co-Chairman

William T. Baumann, Co-Chairman

Hugh F. Van Landingham

July 15, 1998
Blacksburg, Virginia

Keywords: Fuzzy Logic, Groundhook, Passive Damping,
Semiactive Damping, Skyhook, Vehicle Suspension

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This research will compare the transient response characteristics of a four-degree-of-freedom, roll-plane model, representing a class 8 truck, using passive and semiactive dampers. The semiactive damper control policies that are examined include the previously developed policies of on-off skyhook, continuous skyhook, and on-off groundhook control, along with a newly developed method of fuzzy logic semiactive control. The model input will include body forces and torques, as well as transient displacements at the tires. The model outputs include the vehicle body heave and roll displacements, the vertical displacement of the tire (wheel hop) and the vertical acceleration of the vehicle body. For each output, the maximum peak-to-peak and RMS values of the response are examined.

The results of the study show that semiactive dampers have minimal effect on improving the vehicle body and tire transients due to forces or torques applied to the body, as compared to passive dampers. For road inputs, however, semiactive dampers are able to provide a more favorable compromise between the body and axle transient dynamics, when compared to passive dampers. The fuzzy logic semiactive control policy that is proposed in this research is better able to balance the body and axle dynamics than the conventional semiactive damping control policies that are investigated. Further research on the application of fuzzy logic semiactive control concepts is suggested, in order to fully investigate the potential of such control schemes for vehicle suspensions.

Acknowledgments

I would like to thank Dr. Mehdi Ahmadian for his assistance and advice regarding this research, and for the use of the Advanced Vehicle Dynamics Laboratory (AVDL). The support provided by the Department of Mechanical Engineering, Center for Transportaion Research (CTR) at Virginia Tech, and other corporate sponsors of AVDL, including Lord Corporation and Volvo Heavy Trucks, is also greatly acknowledged.

I would like to thank Dr. William T. Baumann for his recommendations concerning my program of study, Dr. Hugh F. Van Landingham for serving on my graduate committee, and Xubin Song, PhD. Candidate, for his assistance with some of the simulation programming techniques used in this research. I am also thankful to the Department of Electrical and Computer Engineering for the financial support of a graduate teaching assistantship.

Most importantly, I would like to thank my parents, William and Sheila Carter, along with Tony, Aaron, Janet, Staci, Andrew, Caroline, and Katie Carter, for their ever continuing support and understanding.

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