MECHANICAL ENGINEERING DEPARTMENT
ME/IE 8773-8774

DESIGN & MANUFACTURING SERIES
Topic: TRANSPORTATION
Host: Rajesh Rajamani

Development of an Early Rollover Warning Device for Road Vehicles

by

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http://www.pti.psu.edu/VSRC/Index.htm

Wednesday, March 1, 2006
3:30 p.m.
Room 1130 ME
Coffee and refreshments will be available at 3:15 p.m. in Room 1130 ME before the seminar

ABSTRACT — This seminar presents a general overview of recent research activities initiated at the Applied Research Laboratory (ARL)'s Vehicle Dynamics and Simulation Research Center in the areas of heavy vehicles and buses dynamics, FEA tire modelling and virtual crash tests and simulations. The seminar will specifically focus on the technical issues and developments involving the development of a rollover-warning device (RWD) for heavy vehicles.

The design and development of a rollover-warning device (RWD) will be discussed for road vehicles, particularly for heavy vehicles with high center-of-gravity height to track-width ratios and thus lower roll stability limits. The proposed RWD employs Artificial Neural Networks to essentially 'learn' the dynamic behavior of a road vehicle from field representative data and predict the instantaneous roll stability of the vehicle stability under present operating conditions. The prediction of the instantaneous stability limit is derived from the instantaneous dynamic states of the vehicle that can be directly measured using relatively simple methods and measurement systems. The prediction methodology, based on the dynamic state, specifically the load-transfer ratio (LTR) and its time rate of change, is described. The selected states are implemented using a Fuzzy Logic rule to determine the onset of potential roll instability and the desired warning level. The design of the RWD is based upon extensive computer simulations and thorough experimental verification. Considering the passive mature of the design that can be implemented in an open-loop manner, its success strongly relies on the lead-time provided by the warning and the timely corrective action taken by the driver. The performance of the device is somewhat limited under more severe maneuvers that tend to develop slowly, such as during an on-ramp maneuver.

BIO — Dr. Moustafa El-Gindy is the founder and director of Vehicle Dynamics and Simulation Research Center at the Applied Research Laboratory (ARL) and is a member of the Graduate Faculty of the Department of Mechanical Engineering and of the Intercollege Materials Program at the Pennsylvania State University. He is the founder and executive editor of the International Journal of Heavy Vehicle Systems. He serves as the chairman of the American Society of Mechanical Engineering's (ASME) Vehicle Design Committee.

Informal Faculty Luncheon: Wednesday, March 1, 2006, 12:00 noon. Meet in 1100 ME and walk to lunch with other faculty. Prof. El-Gindy will be able to attend.