6th International Conference on Advances in Experimental Structural Engineering
11th International Workshop on Advanced Smart Materials and Smart Structures Technology
August 1-2, 2015, University of Illinois, Urbana-Champaign, United States

A new stochastic approach of vehicle pavement interaction

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ABSTRACT
Petroleum is the dominant fossil fuel in the United States (U.S.) constituting 36 % of the total primary energy sources including natural gas, coal. Because of the petroleum-based vehicles, the transportation consumes 93 percent of the used petroleum. As a result, the transportation sector is responsible for 27% of greenhouse gas emissions in the U.S. and is the second largest contributor, implying that its role is very important in achieving sustainability. Thus, one effective way to enhance the sustainability is to control the energy dissipation of the vehicle. The energy dissipation is highly dependent on the pavement condition, which has been empirically determined as a zero-mean Gaussian process. To dates, various researchers have adopted numerical approaches to simulate the vehicle pavement interaction under stochastic pavement roughness. However, such approaches are computationally inefficient and converging results may not be obtained if the problem gets complicated. Thus, we propose a new stochastic approach to solve the vehicle-pavement interaction problem, analytically for obtaining energy dissipation of the vehicle. A simple quarter car model on a rigid pavement is presented. The versatility power of the proposed method can handle more general road roughness representation and ease the computation.

KEYWORDS: *pavement-vehicle interaction,stochastic road roughness, pavement life-cycle*