Vehicle Moving on a Continuously Supported Beam with Irregular Surface

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In this paper a stochastic analysis is performed for single-degree-of-freedom vehicle moving uniformly along an infinite Bernoulli-Euler beam with random surface irregularities and supported by a Kelvin foundation. Both the beam and the foundation are assumed to be homogeneous, and all the material parameters of the system are assumed to be deterministic. Initially the equations of motion for the vehicle and beam are formulated in a moving co-ordinate system following the vehicle, and the frequency response functions for the displacement of the vehicle mass and beam are determined. Subsequently the surface irregularities are modelled as a random process. The displacement variance of the vehicle mass as well as the displacement variance of the beam under the oscillator are determined in terms of the autospectrum of the surface irregularities.