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人车路系统三维耦合振动分析及舒适度评价

Dynamic analysis and comfort evaluation of the three-dimension Body-vehicle-road coupled system

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中文关键词: 人车路系统 梁单元 弹性板 仿真分析 舒适度评价

英文关键词:body-vehicle-road coupled system beam element elastic deck simulation analysis comfort evaluation

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中文摘要:

基于将车身视作三维弹性梁、车轮为刚性体的全车模型,人体采用坐姿并联动力模型,路面简化成Kelvin地基上的板,通过轮胎的刚性滚子接触模型将车辆与路面耦合在一起,考虑人车、车路耦合作用的用于评价车辆乘坐舒适度的三维人车路耦合系统振动模型,并推导出其运动平衡方程;通过Galerkin法对路面方程进行离散,采用New-mark积分法对耦合系程组进行求解,对人车路系统振动响应进行了分析;采用人体加权振动加速度均方根值对车辆乘坐舒适度进行评价,并对系统各参数对车辆乘坐舒适度的影响进行探讨。数值分析表明模型下车辆乘坐舒适度指标与本文模型的指标相差最高可达到约30%;在分析车辆振动响应及乘坐舒适度时,不能忽视车辆与路面、人体与车辆相互作用,系统各参数对车辆乘坐舒适一定程度的影响。

英文摘要:

The vehicle body is supposed as 3d elastic beam and the wheels as the rigid body.The human body is simplified as the parallel dynamic model.The road i supposed as the deck on the Kelvin base.And then by the dynamic model of tire stress,the vehicle and the road are coupled.The dynamic model of the body-vehi road is presented,and its functions are derived.The road function is divided with the Galekin method,and the system functions are solved with the New-mark method.The vehicle riding comfort of the vehicle is appraised with the RMS of the body vibrating acceleration.The effects of the system parameters on the ve riding comfort are also analyzed.The results indicate that the error can be achieved the highest about 30% between the model of this paper and the tradition body-vehicle interaction and the vehicle-road interaction cannot be ignored when analyzing the vehicle vibration and the vehicle riding comfort.The system parameters put much influence on the vehicle riding comfort.

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