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基于震源机制且考虑场地土分层差异效应的多点地震动: 理论与程序开发

Multi-point seismic motions based on focal mechanism and considering local site multi-layer soil effect theory and program implementation

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中文关键词: [多点地震动](#) [基岩谱](#) [局部场地](#) [非平稳](#) [规范反应谱](#)

英文关键词: [multi-point earthquake motion](#) [beck-rock spectrum](#) [local soil site](#) [non-stationary](#) [code-specified response spectrum](#)

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中文摘要:

结合前人工作, 首先形成了适用于我国目标场地的基于震源机制, 且考虑局部场地效应的地表多点地震动具体生成途径, 包括: (1) 依据随机振动理论建立能够反映包含多个土的局部场地整体过滤效应的传递函数, (2) 基于本文改进的过滤函数而得到的适用于我国目标场地的基岩谱, 进而通过分区建立局部场地的整体传递函数以反映不同场地土之间的差异, (3) 在前人工作基础上考虑了场地的非平坦性因素, (4) 为了程序编制方便, 给出了多土层过滤后相位角变化的显示表达式; 然后, 依据上述理论框架成功实现了程序MEMS V2011.6 (Multi-support Earthquake Motions Simulation Version 2011.6) 的编制和可视化运行, 该程序可直接生成界面图形并输出数据文件, 具体功能包括: 设置震源参数、分区输入土层参数、显示土层传递函数、设定非平稳参数、调控频率、生成多点地震动时程、验证多点地震动间的相干性以及拟合规范(桥梁、建筑和电力设施)反应谱等; 最后, 以一桥梁土层为算例, 程序生成了目标场地基于震源机制的地表多点地震动, 并分析了地表地震动对场地土和震中距因素的敏感性。本文内容具有坚实理论基础和实用性, 可直接为工程提供参考。

英文摘要:

In this paper, a framework for generating multi-point earthquake motion of target field in China, basing on focal mechanism and taking account of the spatial variability of soil properties, is given and proposed. The main contents include: (1) the transfer function of site including multiple soil layers is established based on random vibration theory, (2) based on the improved bedrock spectrum applicable to the target site in China, the variability among different site conditions is reflected by establishing the transfer function of local site, (3) non-flat factor of site surface is considered on the basis of previous literature, (4) explicit expression phase-angle change by the filtration of multiple soil layers is also given for the convenience of the subsequent program code. Then, according to the theory framework, the visual program MEMS V2011.6 (Multi-support Earthquake Motions Simulation Version 2011.6) is developed and run successfully. The specific functions of the program involves the focal parameters assignment, inputting soil parameters, calculating and displaying transfer function of site soil with multi-layer, adjusting non-stationary parameters and frequency, generating multi-point earthquake motion histories, verifying the coherence of spatial seismic motions, fitting code-specified spectrum for bridge, building and electronic facility. In addition, based on a bridge example, the multi-point seismic motions of target field are generated using the program MEMS V2011.6, and the sensibility analysis of the generated ground motions to local site effect and epicentral distance is analyzed as well. The content in this paper involve theory and practicability, and can provide directly reference for engineering.

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