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论文

边坡变形的分布式光纤监测模拟试验研究

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摘要:

布里渊散射光时域反射测量技术(BOTDR)作为一项新型光电传感监测技术,因其具有良好的抗干扰、长距离、可植入性和分布式监测的特点而被广泛应用于结构工程健康监测中。而直接将光纤布设在土体中则存在变形协调性差、易折断及空间定位难等问题。本次研究通过室内小比例尺模型试验,分别将光纤植入土工布和土工格栅等柔性复合材料中并一起铺设在边坡模型不同深度处,利用BOTDR监测边坡在外荷作用下的变形特征。试验结果表明,布设在土工格栅中的光纤稳定性最好;土工布中的光纤变形协调性和敏感性优于土工格栅;通过合理布置光纤能够对异常应变进行较为准确的识别和定位。试验初步验证了该方法应用于土质边坡变形监测的可行性。

关键词: 边坡变形,边坡加固,分布式监测,BOTDR,模拟试验,土

SIMULATION EXPERIMENT FOR DISTRIBUTED FIBER MONITORING ON DEFORMATION OF SOIL SLOPE

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Abstract:

Brillouin Optical Time Domain Reflectometer (BOTDR) is a newly developed distributed fiber optic sensing technique. It has some unique functions

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such as distributed, long distance, anti electromagnetic interference, and waterproof. It is very suitable and useful to the monitoring and early warning of geological engineering such as slope engineering. However, poor strain coordination, fragility and difficulty for abnormal strain location are some of the problems for this technique to be applied to soil slope. In this paper, the BOTDR was applied to monitor the deformation of a small scale slope model built in laboratory. The fiber was attached to geotextile and geogrid. The two materials are very popular in slope treatment. They were emplaced in the fill slope at different depths while the slope model was being built. Micro strain of the slope deformation at varied loads were obtained with the BOTDR. By data processing and analysis, the abnormal deformation can be distinguished and its position can also be identified.

Keywords: Slope deformation, Slope reinforcement, Distributed monitoring, BOTDR, Model test, Soil

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