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非概率可靠性中一维优化算法的改进及其在桥梁评估中应用

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AN IMPROVED ONE-DIMENSIONAL OPTIMIZATION ALGORITHM IN NON-PROBABILISTIC RELIABILITY INVESTIGATION AND ITS APPLICATION IN BRIDGE ASSESSMENT

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- 摘要
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摘要 为了减少非概率可靠性指标的计算量，提出了改进的一维优化算法。将区间变量转换为标准化区间变量后，得到了关于失效面的极限状态方程。在扩展空间中，通过缩小区间变量的取值范围能方便的确定目标函数的单调性。进一步，为了显示求解非概率可靠性指标的计算过程，提出了非概率可靠性指标的改进一维优化算法的计算步骤。讨论了在役桥梁的非概率可靠性评估。最后，通过实例分析，论证了改进的一维优化算法的有效性和实用性，适合在役桥梁非概率可靠性指标的求解。

关键词： 在役桥梁   改进一维优化算法   非概率可靠性指标   区间变量   单调性

Abstract： An improved one-dimensional optimization algorithm was proposed in order to reduce the workload for calculating the non-probabilistic reliability index. After an interval variable is transformed into a normalized one, the limit state equation referred to as the failure surface is obtained. The monotonicity of the objective function has been simply determined by narrowing the scope of interval variables in normalized infinite space. Moreover, the calculation steps of the improved semi-analytic approach were presented to display the solving procedure of the non-probabilistic reliability index. Non-probabilistic reliability evaluation about bridge in service was discussed. The effectiveness and practicality of the improved one-dimensional optimization algorithm has been proved to be suitable for solving non-probabilistic reliability index of bridge in service.

Key words： bridge in service   improved one-dimensional optimization algorithm   non-probabilistic reliability index   interval variable   monotonicity

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