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Uncertainty in condition prediction of bridges based on assessment method – case study in Estonia.

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Abstract

In this paper the uncertainty in condition assessment based on most common assessment methods, visual inspection and non-destructive testing, is investigated. For decision-making the averaged or estimated value is suitable, but if the basis of a decision is only a subjective visual inspection, then it could lead to a wrong decision. The second most traditional assessment method is non-destructive testing (NDT), which can give reliable results, but the interpretation of measurement is needed. To investigate the errors in both evaluations, benchmarking tests were carried out in Estonia within two groups, a group of experienced inspectors and a group of unexperienced students, to show how the importance of experience affects results. To present the influence of assessment uncertainty to condition prediction curves based on continuous-time Markov model are calculated and for updating, Bayesian inference procedure is used.

Keywords: reinforced concrete, non-destructive testing, visual inspections, assessment error, asset management, bridge assessment.

1. Introduction

The structural condition of bridges has a wide and direct impact for performance of the road network as a system. To keep the structural reliability high, bridges need to be regularly maintained. To optimize the maintenance strategies of existing bridge stock, their present condition needs to be assessed and determined. Based on COST Action TU1406 Working Group 1 Technical Report, most data are obtained by conducting visual inspection as an index form [1]. Visual inspection is a method that may yield subjective and unreliable results [2], but due to its simplicity and cost-effective data collection, this method will most likely remain the main aid for bridge assessment.

To improve the quality of acquired data, selected non-destructive tests (NDTs) are carried out additionally into regular bridge assessment practice. The NDTs are good for their repeatability without damaging the element under investigation, but to be compatible with visual inspection, they must be easy to use.

Unfortunately, all assessment systems are moreover database oriented and additional benefit can be added with Life Cycle Assessment by integrating deterioration models to predict the performance of these structures. Over the past twenty years, many models have been proposed

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