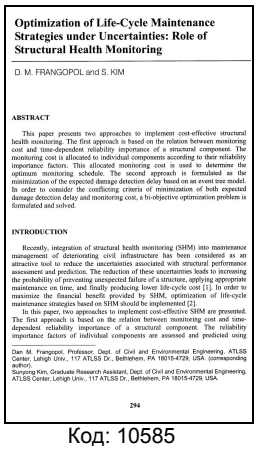

Optimization of Life-Cycle Maintenance Strategies under Uncertainties: Role of Structural Health Monitoring

D. M. FRANGOPOL and S. KIM

ABSTRACT

This paper presents two approaches to implement cost-effective structural health monitoring. The first approach is based on the relation between monitoring cost and time-dependent reliability importance of a structural component. The monitoring cost is allocated to individual components according to their reliability importance factors. This allocated monitoring cost is used to determine the optimum monitoring schedule. The second approach is formulated as the minimization of the expected damage detection delay based on an event tree model. In order to consider the conflicting criteria of minimization of both expected damage detection delay and monitoring cost, a bi-objective optimization problem is formulated and solved.

INTRODUCTION

Recently, integration of structural health monitoring (SHM) into maintenance management of deteriorating civil infrastructure has been considered as an attractive tool to reduce the uncertainties associated with structural performance assessment and prediction. The reduction of these uncertainties leads to increasing the probability of preventing unexpected failure of a structure, applying appropriate maintenance on time, and finally producing lower life-cycle cost [1]. In order to maximize the financial benefit provided by SHM, optimization of life-cycle maintenance strategies based on SHM should be implemented [2].

In this paper, two approaches to implement cost-effective SHM are presented. The first approach is based on the relation between monitoring cost and time-dependent reliability importance of a structural component. The reliability importance factors of individual components are assessed and predicted using

Dan M. Frangopol, Professor, Dept. of Civil and Environmental Engineering, ATLSS Center, Lehigh Univ., 117 ATLSS Dr., Bethlehem, PA 18015-4729, USA (corresponding author);
Sunyong Kim, Graduate Research Assistant, Dept. of Civil and Environmental Engineering, ATLSS Center, Lehigh Univ., 117 ATLSS Dr., Bethlehem, PA 18015-4729, USA

Код: 10585

D.M. Frangopol, S. Kim

Optimization of Life-Cycle Maintenance Strategies under Uncertainties: Role of Structural Health Monitoring

Издательство DEStech Publications, Lancaster, 2010 год

7 стр; формат: 23,5 x 16 см; библиографический список: 8 единиц
ISBN: 978-1-60595-024-2

This paper presents two approaches to implement cost-effective structural health monitoring. The first approach is based on the relation between monitoring cost and time-dependent reliability importance of a structural component. The monitoring cost is allocated to individual components according to their reliability importance factors. This allocated monitoring cost is used to determine the optimum monitoring schedule. The second approach is formulated as the minimization of the expected damage detection delay based on an event tree model. In order to consider the conflicting criteria of minimization of both expected damage detection delay and monitoring cost, a bi-objective optimization problem is formulated and solved.

Ключевые слова:

Содержание.