

Risk-based decision making using structural health monitoring information

Daigo Kawabe

Keywords: Risk-based decision making

【Background】

Although the quantitative information about the state of the structure is obtained by structural health monitoring (SHM), there is not a practical way of proposing the best decision for structure authorities once the output from SHM would be obtained.

【Objective】

This study aims to realize one-stop monitoring that propose the best actions from the output of SHM based on decision theory. Especially, this study investigates the scour monitoring of railway bridge pier as a case study. The goal of this study is to propose a framework for making a decision whether operation should stop or not and whether inspectors should send the site or not by identified natural frequency of the target bridge pier in realtime.

【Approach】

Whether the identified frequencies of the pier in realtime illustrates clearly anomalous or not is determined by Bayes Factors. When there are no clearly anomalous, the benefits and costs of sending inspectors are calculated. This study verifies the series of steps that if the benefits outweigh the costs, the inspectors sending is carried out using simulation data.

【Publication plan】

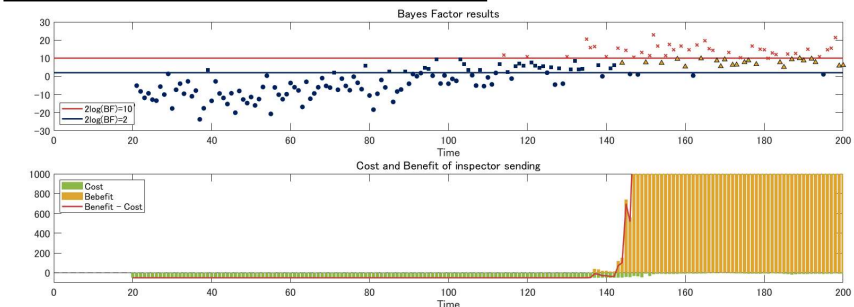
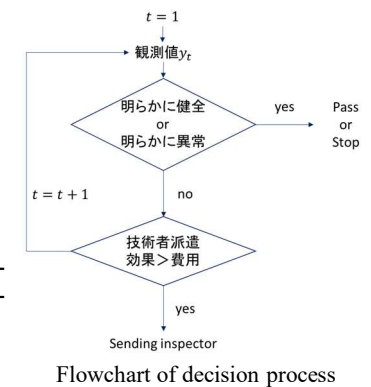
- 2024 IABMAS 2024
- 2024 IFIP W.G. 2024
- 2024 JSCE Annual Conference 2024

【Results】

SHM output that transmits from healthy to damaged condition were applied to the proposed framework, which figured out the optimal time to send inspectors based on cost and benefit analysis.

Table Bayes Factor interpretation in this study

$2\log(BF)$	Interpretation
$2\log(BF) < 2$	Clearly healthy
$2 < 2\log(BF) < 6$	Not sufficient information to justify
$6 < 2\log(BF) < 10$	Clearly damaged



Simulation results in Bayes Factor and cost benefit analysis.