



Copula based long-term bridge health monitoring

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Removing environmental influences in bridge health monitoring

【Background】

Maintenance of civil infrastructure has become a keen technical issue nowadays. This is particularly important for the bridge structure which contains large potential risks. Most bridge structures may experience lots of environmental and operational conditions. A real and accurate understanding of the influences from these external conditions is necessary in the monitoring of bridges. However, many previous studies still cannot depict the relations between the structural safety and environmental influences very well. Suitable multivariate models are demanded to extract the information of dependences between the bridges and its associated environment.

【Objective】

This research is intended to remove environmental influences in bridge health monitoring. The data including the temperature and acceleration for the past ten years is utilized to test the applicability of the proposed approach. Based on the results, the selection of the best copula model in characterizing the monitored time series will be discussed. Certain improvement in the bridge structural health monitoring will also be investigated.

【Approach】

It was found copula can be used to describe the dependence between random variables in sensor observations. ARIMA model can predict data future movements very well when the data shows evidence of non-stationary. In this research, copula theory together with ARIMA model has been utilized to remove environmental influences in model parameters for bridge health monitoring. Instead of linear regression, the correlations between different factors have been considered in a nonlinear way. Polynomial regression is utilized.

【Publication plan】

JSCE Annual Conference in August

【Results】

The results showed that it is essential to establish a multivariate model for removing environmental influences in bridge health monitoring since correlation between residual of environment effects and frequency is not that obviously.

