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Research Summary: AY2019

Scour assessment by identification of soil stiffness change from vibration monitoring

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Keywords: Scour assessment by using FE model

【Background】

It was found that the most common cause of bridge failures is from flood scouring bed material surrounding bridge foundations. In previous studies we use impact test on the bridge pier to identify changes in frequencies, which is a promising and conventional way of scour detection and then we have the real-time monitoring method which is a remote vibration monitoring for scour detection that guarantees highly frequent real-time scour inspection.

【Objective】

In the majority of cases, the scour occurred in the underwater part, and it is not easy to visually inspect the change of the soil condition around the pier. Therefore, vibration-base scour monitoring has been proposed to simply detect potential occurrence of the scour. This study aims to identify the change of soil stiffness utilizing identified frequency of the target pier through a vibration monitoring and do the Finite Element (FE) model update.

【Approach】

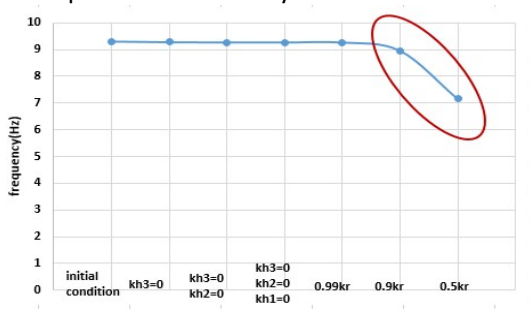
By conducting sensitivity analysis for each spring added on the FE model, only rotational spring is decided to be updated in this study. Based on the Judgement of bridge soundness and the result obtained in this study, a new judgement of bridge soundness with soundness index related to change of rotational spring stiffness is created.

【Publication plan】

- 2020 JSCE Kansai Chapter Annual Conference
- EURODYN2020, Greece

【Results】

Based on comparison of seven different conditions, only rotational spring is decided to be updated in this study.



Soundness index value k	Stiffness change ratio k_s	Rank	Treatment
$k \leqq 0.70$	$k_s \leqq 0.432$	A1	Abnormal condition: repair or reinforcement are needed
$0.70 < k \leqq 0.85$	$0.432 < k_s \leqq 0.681$	A2	Need to check progress of deterioration: e.g. decrease of frequency, etc.
$0.85 < k \leqq 1.00$	$0.681 < k_s \leqq 1.00$	B	Low possibility of abnormal condition
$1.00 < k$	$1.00 < k_s$	S	Healthy