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# 学 位 論 文 要 旨
# Dissertation Summary

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論　文　名: Methodology of vibration test for existing concrete bridges by impact hammer excitation to evaluate their potential damage
(Dissertation Title)

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Road bridges are susceptible to deterioration due to aging, material deterioration, changes in load characteristics and aggressive environmental influences. Proper inspection and assessment for potential deterioration of bridges are needed to maintain their required service level. Bridge inspection is primarily conducted by visual inspection which is a subjective assessment method. Inspection using sensor is expected as a complementary measure to improve the reliability of the condition assessment of the bridges. In particular, vibration testing has been expected as an effective tool for objective condition assessment of the bridges.

The research work presented in this dissertation focuses on the development of a methodology of vibration test for concrete bridges by impact hammer excitation. The developed methodology is efficient to identify few lower natural frequencies and corresponding mode shapes of the bridges. This study also demonstrates an application of the developed methodology to newly constructed bridges and existing bridges without any interruption of traffic flow.

The developed methodology is applied to monitor the vibration characteristics of newly constructed bridges during their construction and the changes in their natural frequencies in all construction stages are clarified.

This study also presents the bending load test of prestressed concrete (PC) girders to investigate the influence of structural damage on the natural frequencies. Results from this experiment show that natural frequencies decrease with increase in structural damage and there is a possibility of damage identification by vibration measurements. In addition, vibration measurement of an existing multi-span bridge is conducted and it is observed that spans with lower natural frequencies are more deteriorated than other spans with higher natural frequencies.

The vibration test methodology presented in this dissertation is expected to support bridge engineers for assessing the potential deterioration on the existing concrete bridges by providing quantitative information.