

Damage identification for civil infrastructure employing a strain energy based approach

Toshiyuki Oshima

Professor
Kitami Institute of
Technology
Kitami, Japan
oshima@mail.kitami-it.ac.jp

Toshiyuki Oshima, born 1946,
received his civil engineering
degree from the Univ. of
Hokkaido, Japan.



Tomoya Aochi

Senior Engineer
Kaihatsu Koeisha, Co.Ltd.
Sapporo, Japan
aochi@kai-koei.co.jp

Tomoya Aochi, born 1972,
received his civil engineering
degree from the Kitami Institute
of Technology.



Shuichi Mikami

Professor
Kitami Institute of
Technology
Kitami, Japan
mikamisi@mail.kitami-it.ac.jp

Shuichi Mikami, born 1954,
received his civil engineering
degree from the Kitami Institute
of Technology, Japan

Yasunori Miyamori

Associate Professor
Kitami Institute of
Technology
Kitami, Japan
miyamoya@mail.kitami-it.ac.jp

Yasunori Miyamori, born 1975,
received his civil engineering
degree from the Univ. of
Hokkaido, Japan

Sherif Beskhyroun

Research Associate
University of
Saskatchewan
Saskatoon, Canada
sherifnoor@gmail.com

Sherif Beskhyroun, born 1970,
received his civil engineering
degree from the Univ. of Cairo,
Egypt

Tomoyuki Yamazaki

Research Assistant
Kitami Institute of
Technology
Kitami, Japan
yamazatm@mail.kitami-it.ac.jp

Miki Hatamura

Engineer
Kaihatsu Koeisha, Co. Ltd.
Sapporo, Japan
hatamura@kai-koei.co.jp

Summary

The identification of structural damage is an essential goal of health monitoring for civil infrastructures. Damage of a structure reflects on a change of modal parameters, such as natural frequencies, mode shapes and modal damping. A method of damage identification for civil infrastructures based on strain energy is proposed in this paper. The method is described theoretically and applied to the experimental data from a steel bridge. Several damage scenarios were introduced to the members of the test structure. Experimental results show that the proposed approach may be successfully implemented to detect damage and to locate regions where damage occurred.

This research also aims at establishment of experimental environment to enable the verification of applicability and the effective evaluation of the structural health monitoring (SHM) technology that uses the high performance sensor system on real bridges. The primary goal of the project is the development of test beds that meet wider requests for SHM experiments. Several steel bridges on an abolished railway in Hokkaido, Japan will be available for the establishment of the test beds. The test beds can be utilized by not only researchers of this project but also other researchers. The final goal of the project is international contribution by means of cooperative utilization of the test beds.

Keywords: damage identification, civil infrastructure, local excitation, vibration response, structural health monitoring.