Experimental investigation of a moving vehicle for identification bridge dynamic parameters

Shota Urushadze [1*], Jong-Dar Yau [2]

[1] *Institute of Theoretical and Applied Mechanics, Academy of Sciences of the Czech Republic, v.v.i, Prague, Czech Republic. ORCID: 0000-0002-0009-8306*

2 Department of Architecture, Tamkang University, New Taipei City, Taiwan 25137, jdyau@mail.tku.edu.tw

*Corresponding Author E-mail: urushadze@itam.cas.cz

ABSTRACT

According to the idea of indirect bridge frequency measurement proposed by Yang and co-workers [1-3], a moving test vehicle can be regarded as a message receiver to detect vibration data of the bridge that it passes over. In the present study, an experimental setup was produced for the indirect frequency measurement of a simply supported beam using a passing test vehicle with the features of adjustable frequencies and moving speeds. The test vehicle was designed as a single-degree-of-freedom system with vertical vibration and guided by a set of tensile cables that move the vehicle along the beam axis while maintaining full contact with it. The presented experimental results demonstrate that the indirect bridge inspection method is applicable to frequency monitoring of bridges.

Different from a large number of fixed-sensors deployed on a bridge, the indirect method to extract the bridge frequencies from the response of a passing test vehicle possesses the following advantages: mobility in sensor deployment, economical sensor maintenance and monitoring workers, and efficiency in frequency measurement.

One of the characteristics of the moving test vehicle in previous research is that the natural frequency of the test vehicle is fixed. Considering the mobility and portability of a moving data receiver (sensor) in carrying out indirect measurement, an instrumented test vehicle with the characteristic of adjustable frequencies offers more flexible comparison when measuring bridge frequencies. In this study, a single-degree-of-freedom (SDF) test vehicle with adjustable frequencies in the vertical direction and moving speeds was designed and tested.

Keywords: Bridge health monitoring; indirect method; moving load; vehicle-bridge interaction.

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Biography: Shota Urushadze Ph.D. has been working since 1995 in the Institute of Theoretical and Applied Mechanical of the Academy of Science of the Czech Republic. Since 2008 he is working as a Chief Research Fellow. He has absolved several research fellowships at distinguished European research facilities. Shota Urushadze is a Head of Laboratory since 2001.
His main activities are: research, review etc. in dynamics of civil engineering structures, steel structures, laboratory and in situ measurement, earthquake engineering, technical seismicity, modelling and simulation on computer, evaluation of signals. His research interests include dynamic identification of structural degradation, testing and vibration of bridges, vibration damage assessment of historic masonry, earthquake problems, steel orthotropic bridges.