

DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

Vehicle-bridge interaction dynamics and applications to monitoring of bridges

Professor Yeong-Bin YANG Honorary Dean, School of Civil Engineering, Chongqing University China

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Abstract

This presentation provides some key contributions made by the speaker and co-workers since the 1990s. The starting point is the AASHTO (1992) impact formula used to account for the vehicle loads on bridges, which lacks clear physical meaning. To resolve this, effort was made by considering the vehicle-bridge interaction (VBI), the first time ever, and by employing the VBI element derived (Yang and Lin 1995) to establish a new set of physically meaningful impact formulas for bridges (Yang et al. 1995). Next, optimal design rule was firstly proposed for the design of simple beams commonly used in highspeed railways, in that the vibration of the beam will reach the minimum if it has a length equal to 1.5 times of the vehicle length (Yang et al. 1997). Such a rule was globally recognized by engineers in highspeed railways in countries including Europe, China, Japan, and Korea. Inspired by the works on VBI, a moving test vehicle was firstly proposed for scanning the frequencies of bridges (Yang et al. 2004). Such an indirect approach was verified to be feasible in the field test (Lin and Yang 2005) and renamed as the vehicle scanning method (VSM) (Yang et al. 2019). It was also extended to detection of mode shapes (Yang et al. 2014) and other properties of bridges. Recently, the vehicle-bridge contact response was used instead to avoid vehicle's self disturbance (Yang et al. 2018). Field tests were conducted in a number of bridges in Taipei, Chongqing, and Xiamen.

About the Speaker

Dr. Yeong-Bin Yang got his Ph.D. degree from Cornell University in 1984. He is a member of Chinese Academy of Engineering and European Academy of Sciences and Arts, and foreign member of Austrian Academy of Sciences. Currently, he is Honorary Dean of School of Civil Engineering, Chongqing University, and Professor Emeritus of National Taiwan University (NTU), and Editor-in-Chief of International Journal of Structural Stability and Dynamics (IJSSD). Previously, he was President of National Yunlin University of Science and Technology (YunTech), Dean of College of Engineering, NTU, Chairman of Civil Engineering Department, NTU, President of Asian-Pacific Association of Computational Mechanics (APACM), and Chairman of East Asia-Pacific Conference on Structural Engineering and Construction (EASEC). He was the founding president of Association of Computational Mechanics Taiwan, and president of: Institute of Engineering Education Taiwan, Chinese Institute of Civil and Hydraulic Engineering, Society of Theoretical and Applied Mechanics, and Chinese Society of Structural Engineering. He has received a number of Awards, including Zienkiewicz Medal, APACM (2022), Li-Guo-Hao Bridge Innovation Medal, Tongji University, China (2022), Nishino Medal, EASEC (2016); Tsuboi Award, IASS (2008); Munro Prize, Engineering Structures (2003), Outstanding Scientist, Nobel Laureate Dr. Y. T. Lee's Foundation, Taiwan (1998), Distinguished Research Award, National Science Council, Taiwan (1988-1998), etc. In addition, he has published 4 books, 280 SCI papers, with a citation number of 14,666 and h-index of 60.

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