CRACK DETECTION IN WAVEGUIDE STRUCTURES BASED ON THE WAVE REFLECTION COEFFICIENT MODEL

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Abstract

The crack detection problem has been extensively investigated due to its practical importance on structure health monitoring. Recently, the guided wave method has become one of the most popular methods to detect cracks in large waveguides, such as rail and pipes, since this method enables a long-distance and large-area detection of the cracks from a fixed transducer position. As some propagating waves may be partially reflected by cracks in the waveguide, the reflection and transmission characteristics associated with the presence of the crack may be used to give some indication of both the location and size of the crack. Based on the amplitudes of the wave reflection coefficients, a novel crack method is developed to detect the crack. Compared to the conventional pulse-echo method, this method is possible to makes crack detection more robust and accurate. Furthermore, the waves used in this reflection-based method do not require the low dispersive property which, however, is essential to the pulse-echo method. That is to say, more low-decay-rate but long-distance-propagation guided waves become candidates in detection, so that this method has more potential capabilities in the long-distance and large-area crack detection.

Academic CV

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Dr. Zhenyu Huang has been at the School of Electronic Information and Electrical Engineering since 2000 after leaving the School of Mechanical Engineering, Shanghai Jiao Tong University where he graduated in 1997 and received his MSc in Electromechanical Engineering in 2000. He has four year PhD studies from 2004 to 2007 in the Institute of Sound and Vibration Research (ISVR), University of Southampton, UK. And now he is an associate Professor of vibration and engineering acoustics. Dr. Huang has a wide-range of interests in vibration and engineering acoustics including the vibrations of ground, water and air vehicle, active and passive control of sound and vibration, energy harvesting and some electromechanical engineering applications. Additionally he has been a consultant for several companies and research institutes, advising on vibration and acoustic analysis, testing methods, control measures and design.