**Structural Performance Evaluation of Existing Bridges by Acceleration Monitoring**

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The aim of this study is to realize monitoring structural performance condition for concrete girders. At first, we have developed a method to restore displacement waveform based on acceleration waveform during train passing by utilizing the linear vibration theory. Numerical experiments have shown that the method can estimate the maximum displacement within approximately 5% errors. Furthermore, the equivalent linearized beam theory has been extended to estimate reinforcing bar stress waveform based on the displacement waveform. These methods realized the structural performance evaluation of bridges such as riding comfort and fatigue fracture from acceleration measurements.