



## **Reference-free Displacements for Condition Assessment of Railroad Bridges**

**Fernando Moreu\***, Jian Li, Hongki Jo, Robin E. Kim, Sandro Scola, Billie F. Spencer, James M. Lafave

*\* Presenting Author*

*Corresponding Author: Fernando Moreu*  
*Contact Email: [moreualo@illinois.edu](mailto:moreualo@illinois.edu)*

### **ABSTRACT**

Current railroad bridge inspection and rating practices recommend observing bridge movement under live load to help assess bridge condition. Recent research has shown that transverse displacements of timber trestle bridges can capture critical changes in bridge serviceability (ability to safely carry out railroad operations) as a function of railroad loading, speed, and direction. Measuring bridge movement under trains in the field is difficult and expensive because a fixed reference point is not normally available, indeed having to erect independent scaffolding to create good reference points near a timber bridge. This research demonstrates the potential of using reference-free accelerations collected with wireless smart sensors to estimate railroad bridge transverse displacements under live train loads. Focus is placed on timber trestle bridges, which comprise approximately 24% of the total inventory length of railroad bridges in the U.S. The results show that wireless smart sensors can estimate transverse displacements of timber railroad trestles and could become an effective tool for campaign monitoring of railroad bridges (with applications toward helping overall bridge assessment).

### **KEYWORDS:**