

Vibration-Based Bridge Health Monitoring Using Telecommunication Cables

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We introduce a new system based on existing telecommunication cables for bridge health monitoring (BHM). BHM allows us to diagnose damage in earlier stages, which is essential for preventing more severe damage that may lead to significant economic and human losses. However, conventional BHM systems require dedicated sensors on bridges, which is costly to install and maintain and hard to scale up. To overcome these challenges, we introduce a new system that uses existing telecommunication cables for Distributed Acoustic Sensing (DAS) to collect bridge dynamic responses. We use DAS responses to extract bridge damage-sensitive information (e.g., modal frequencies and mode shapes). This approach does not require installation and maintenance of dedicated sensors on bridges. We evaluate our system with field experiments on a concrete bridge with fiber cable running in a conduit under the deck. Our system successfully identified modal frequencies and reconstructed meter-scale mode shapes.