Fiber optic sensing technology for Structural Health Monitoring of bridge infrastructure

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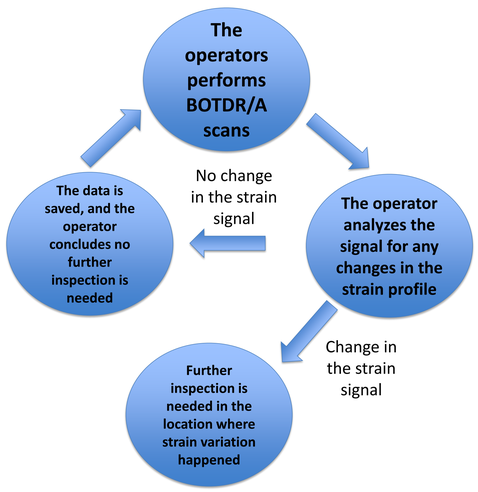
Introduction

The aging of civil infrastructure can have a big impact on the economy of a nation. For that reason, methods are needed to continuously monitor the aging process of the structure. This approach is known as structural health monitoring (SHM) and fiber cables provide a great sensing capability to achieve high sensitivity in a distributed way.

Figure 1. New Hampshire bridge where sensing textile was installed

Structural Health Monitoring system



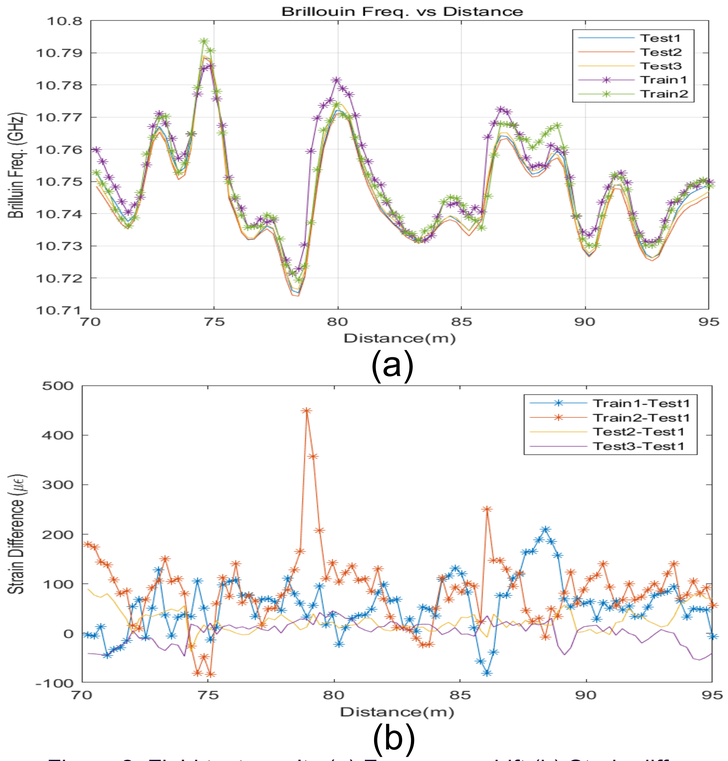
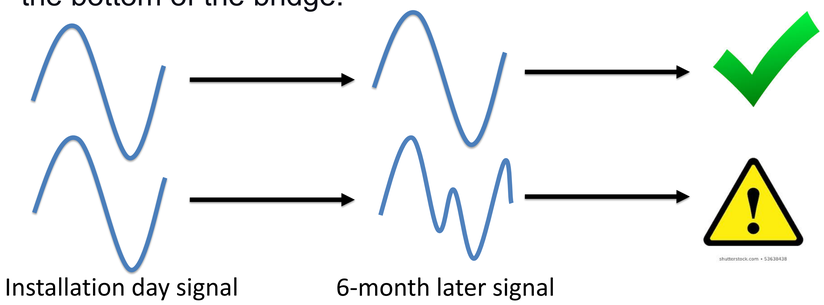


Figure 2. Field test results (a) Frequency shift (b) Strain difference

Field test results

The fiber sensing textile was installed on a railway bridge located in New Hampshire to measure the effects of a train passing by the bridge. Data were collected before the event and during the event. When compared, we see an increase in the total strain in the structure. This response is due to the increment of load in the bridge which creates stress at the bottom of the bridge.



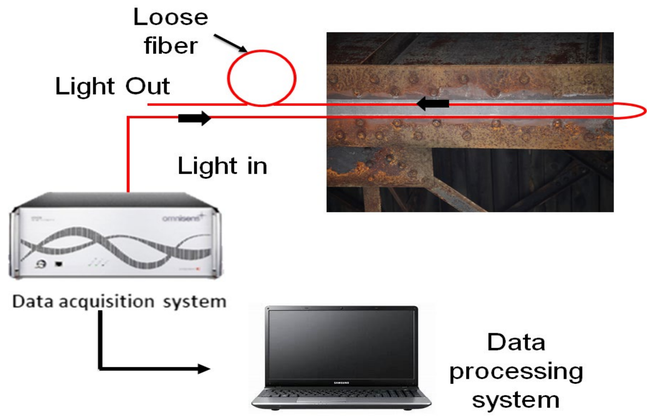


Figure 3. Distributed Fiber optic sensing system

Conclusion

The proposed sensing textile demonstrated its capabilities to monitor strain changes on infrastructure. Additionally, its ability for long-range monitoring makes this technology attractive in different industry areas such as oil and gas and railway. Further investigation on the performance during different weather conditions is currently in progress.

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