

Memo

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From: C. Brooks

CC: P. Hannon

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Re: State of the Practice Synthesis

Progress on Deliverable 2-A: State of the Practice Synthesis Report

The project team has been reviewing and summarizing the state of the practice for bridge sensing technologies in preparation of submitting the first deliverable for the Bridge Condition Characterization task. This State of the Practice Synthesis Report will review existing and newer technologies being used for structural health monitoring of bridges. Our draft report is under development, and we have divided into eight sections, described below, with three main sections describing sensing technologies that are in-situ, on-site (“local”) remote sensing technologies, and remote monitoring technologies typically not collected onsite. The draft eight reports sections are:

1. Abstract
2. Overview
3. In-Situ Monitoring Techniques
4. On-Site Monitoring Techniques
5. Remote Monitoring Techniques
6. Sensing of Exceptional Materials and Structures
7. Case Studies
8. References

Note that as part of the references section, we are building a detailed EndNote electronic reference database that we anticipate sharing via the project website as a supplement to the Synthesis Report. This should be of high interest and value to the research community as so far it contains over 360 references of book chapters, conference papers, journal articles, government reports, theses, web pages, and patents relevant to structural health monitoring of bridges.

Sections 3, 4, and 5 are the main body of the report. Section 3, on in-situ monitoring techniques, currently includes reviews of the following sensing technologies:

- 3.1 Accelerometers and Velocimeters
- 3.2 Electrical Resistance
- 3.3 Electromechanical Impedance
- 3.4 Fiber Optics
- 3.5 GPS and Geodetic Measurements
- 3.6 Magnetic and Magneto-Elastic
- 3.7 Ultrasonic Emissions and Lamb Waves

Section 4, for on-site monitoring techniques, includes reviews of the following sensing technologies:

- 4.1 Eddy Currents
- 4.2 Electrical Time-Domain Reflectometry (TDR)
- 4.3 Infrared Thermography and Spectroscopy
- 4.4 Laser Scanning
- 4.5 Nuclear Magnetic Resonance (NMR) Imaging
- 4.6 Microwave Radar
- 4.7 Ground-Penetrating Radar (GPR)
- 4.8 X-Ray, Gamma Ray, and Neutron Radiography

Section 5, on “remote” monitoring technologies, includes reviews of the following sensing technologies:

- 5.1 Electro-Optical Imagery and Photogrammetry (includes aerial photography and satellite imagery)
- 5.2 Speckle Photography and Speckle Pattern Interferometry
- 5.3 Interferometric Synthetic Aperture Radar (IfSAR)

We will be improving the current draft of the report by ensuring that a reasonably comprehensive list of sensing technologies has been included and that the technologies have

been described with appropriate level of detail at a synthesis level to be of use to transportation professionals and the research community. We anticipate that this document will be of enough interest and quality to be formatted into a peer-reviewed publication submission. The Synthesis Report will be made available through the project website at <http://www.mtti.mtu.edu/bridgecondition> (under “Tasks and Deliverables”), once approved by USDOT-RITA.