RUTGERS
Center for Advanced Infrastructure and Transportation

Project Overview Report

1. UTC Identifying Number

   DTRT13-G-UTC28

2. Center Identifying Number

   CAIT-UTC-NC47

3. Project Title

   National University Transportation Consortium: a Speaker Recognition Based Damage Detection

4. Principal Investigator & Contact Information

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5. Rutgers/CAIT Project Manager

   Patrick Szary, Ph.D.

6. Customer Principal

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7. Project Description

   This project has to be seen as a part of a major research project that the PI has been trying to put together over the past couple of years, with researchers at Harbin Institute of Technology (China) and at Rutgers University. The focal idea is the use of dense arrays of small miniature sensors in assessing the damage of highway concrete/steel bridges. Small solar-powered smart sensors that can be placed inside refractors in the road pavement have been developed at Harbin Institute of Technology. These sensors can be easily mounted on a bridge deck and record large amount of vibration data, e.g. accelerations, during the regular operation of the bridge. Because of their small dimensions, it is possible to install tens of those sensors on a normal highway bridge deck and this will allow us to collect time histories of the bridge response at locations that are very close to each other. Using the results of the previous UTC project, characteristic features will be extracted from these time-histories and various types of correlation will be extracted from them. Studying the pattern of such correlation and their variation with structural damage will allow us to assess the presence of certain levels of damage in the bridge and provide indication for immediate action and repair, if needed. Once the different methodologies have been studied and tested, the ultimate step will be to develop a prototype that can be tested in the BEAST facility at Rutgers University: here, it is expected to install the small sensor dense array on one of the bridge deck specimens and conduct extensive tests considering different environmental conditions and damage levels.

8. Implementation of Research Outcomes (or why not implemented)

   Because of the nature of the proposed research, there is a strong interchange between civil engineering and electrical engineering / computer science. The advances in computer and sensor technologies are pushing many areas (including structural health monitoring of civil structures) towards a greater use of measurement data, machine learning and statistical tools. This project will build on the results of a previous project and will continue the effort to extend to the diagnosis of the health of bridges and buildings methodologies that are currently used in other sectors of our society (e.g. bank security).

If successful, it will represent a breakthrough in the way bridge inspections will be conducted in the future.

9. Impacts/Benefits of Implementation (actual, not anticipated)

   TBD

10. Dates and Budget

    Start Date: 9/1/2016
    End Date: 6/30/2018
    UTC (CAIT) Dollars: $ 93,451
    Cost Sharing: $ 93,451
    Total Dollars: $ 186,902

11. Keywords

12. Web Links (Reports and Project Website)

    https://cait.rutgers.edu/cait/research/national-university-transportation-consortium-speaker-recognition-based-damage-detecti