Transportation Consortium of South Central States

Key Points

Project Number:
18STUNM03

Start Date:
03/15/2018

End Date:
09/15/2019

Principal Investigator(s):
Fernando Moreu
University of New Mexico
fmoreu@unm.edu

Chris Lippitt
University of New Mexico
clippitt@unm.edu

Lead Institution:
University of New Mexico

Funds Requested to UTC:
$50,000

Funding Source(s):
Tran-SET

University of New Mexico

Total Project Cost:
$100,000

Augmented Reality Enhancing the Inspections of Transportation Infrastructure: Research, Education, and Industry Implementation

Brief Project Description

This study will equip humans (inspectors) with machine capabilities to carry out their inspections more effectively using augmented reality (AR) approaches that can be used by transportation owners. This study will empower bridge inspectors to cost-effectively collect data. The participation of experts in infrastructure maintenance and sensing in the workshop stage of this study will allow students to get exposed to industry careers related to infrastructure management and maintenance using AR.

Problem Statement

North American infrastructure systems, including transportation networks, are increasingly decaying in terms of safety and capacity. Network demands are changing. Consequently, the cost of bridge repair and adaption for higher loads are increasing, surpassing available funds. There is limited data, however, about the decay of performance of these systems over time. Inspectors try to collect intelligent information in the field that informs their assessment, and their reports serve as the main source of information used by managers to make critical infrastructure decisions. However, infrastructure owners and managers are in need of more quantifiable information to improve their objectivity and the safety of inspectors.

Field inspectors are expensive, sometimes work in conditions that are not safe, and provide subjective information. Current sensing approaches, however, are not collecting parameters that inform the decisions that need to be made based on those measurements. Not to mention the costs associated to instrumenting the inspections, which are not affordable by transportation infrastructure managers. Secondly, structural models are developed by academicians and research companies to better model responses, but those computational advances are not useful to current inspection needs.

Objectives

This study designs a new approach between an interdisciplinary academic research team, Los Alamos National Laboratory (LANL), the Canadian National (CN) railway and BNSF, owners of railway infrastructure, and the New Mexico Department of Transportation (NMDOT). The technical objectives of this study include:

- Contact LAC, CN, NMDOT, and collect their needs and suggestions for the use of AR for transportation infrastructure inspections.
- In collaboration with LANL, elaborate pilot research program to develop the various applications that can be benchmarked with LAC, CN, and NMDOT.
- Benchmark the accuracy of the measurements with LAC, CN, and NMDOT
- Teach the first class on AR for Transportation Infrastructure Inspections in UNM for high school students.
- Workshop with Universities, National Laboratories, stakeholders, to summarize the achievements.

Intended Implementation of Research

Education and Workforce Development

The involvement of precollege, undergraduate students, and inspectors and infrastructure owners will enable the training of students and existing inspectors in augmented reality technologies while developing them and testing them in their operations. This project will develop STEM courses in AR for undergraduate students that will be taught by graduates. This research will also expose existing inspectors to AR technologies to assess existing infrastructure health.

Outreach

The participation of a wide variety of transportation experts in the review panel will ensure significant outreach in this project. This research project will also be presented during Engineering Open House activities, high school meetings, and other community events like STEM and STEAM-H that introduce young students to the importance of transportation engineering. The STI will host the competition on AR between high school students. The LANL summer school will develop this technique with their students.

Anticipated Impacts/Benefits of Implementation

This study will provide a means to augment the ability of inspectors to quantify bridge conditions and performance on site in collaboration with their inspection departments and needs. Results will aid further development of AR technology. Results will also further expand the exposure of students to industry and will prepare them to work for engineering and technology. The collaboration between industry and academia will result in training of inspectors in areas of demand vis-a-vis their day-to-day operations.

Weblinks:

http://transet.lsu.edu/research/research-in-progress/

https://rip.trb.org/View/1505456