Traffic Disruption-Free Bridge Inspection Initiative with Robotic Systems

Inspecting and preserving infrastructure through robotic exploration.

WHAT IS THE NEED?

Currently, bridges and tunnels are visually inspected and manually maintained under traffic control with the aid of heavy lifting and access equipment. If access to the work area must be made from bridge decks, the indirect cost associated with road closure multiplies.

In such a case, travelers are frustrated with traffic congestion, and both the travelers and inspectors are subjected to a safety concern on high volume highways.

WHAT ARE WE DOING?

The Missouri Department of Transportation (MoDOT) is the lead state for the pooled fund study TPF-5(395) to engage closely with several state Departments of Transportation (DOTs) in the bridge inspection technology development at the INSPIRE University Transportation Center (UTC).

The INSPIRE UTC [https://inspire-utc.mst.edu] at Missouri University of Science and Technology was awarded in December of 2016 by the U.S. DOT. The UTC center was created for the development and technology transfer aimed at infrastructure inspection and preservation solutions. The center is focused on the development of advanced technologies to aid in bridge inspection and maintenance.
WHAT IS OUR GOAL?

The goals of this pooled-fund initiative are to engage closely with several DOTs in the early stage of technology development at the INSPIRE UTC, and leverage the center resources to develop case studies, protocols, and guidelines that can be adopted by state DOTs for bridge inspection without adversely impacting traffic.

The national study will use structural crawlers and unmanned aerial vehicles (UAVs) as a mobile platform for in-depth inspection of elevated bridges.

WHAT IS THE BENEFIT?

The study will demonstrate the benefit of automated bridge inspection and preservation of bridges with sensors, nondestructive evaluation devices, multi-modal robots, and data analytics. The study will provide cost-effective, consistent, and reliable solutions in bridge condition assessment and maintenance. It will provide training to a diverse transportation workforce so they can master the advanced technologies.

WHAT IS THE PROGRESS TO DATE?

California commitment was posted on November 29, 2018. The pooled-fund State partners are California, Georgia, Missouri, New York, Texas, Virginia, and Wisconsin.

The lead agency is MoDOT. The Principal Investigator of this study is Dr. Genda Chen from Missouri University of Science and Technology.

During the first quarterly report, the following activities took place:

• Task 1. The research team kickoff meeting was held in St. Louis, Missouri, on August 7, 2019. The selection criteria for bridges to be tested were established and discussed with the DOT representatives at the kickoff meeting.

• Task 2. The first prototype of a Bridge Inspection Robot Deployment Systems (BIRDS) for combined flying and traversing capabilities was demonstrated during the 9th International Conference on Structural Health Monitoring of Intelligent Infrastructure, St. Louis, on August 4-7, 2019. For more information, see this link: https://inspire-utc.mst.edu/researchprojects/as-4/

Next step: Field test team is being put together for bridge inspection, maintenance, and robotics system integration for UAVs, which involves the following tasks:

• Task 1. Participating DOTs will be contacted to share the bridge selection criteria and plan for the selection of representative bridges to be tested.

• Task 2. The first prototype of a BIRDS for combined flying and traversing capabilities will be further improved for ease in operation.

For further information, please check the progress report at this link: https://www.pooledfund.org/Details/Study/648.

IMAGE

Picture 1: Unmanned aerial vehicle inspecting infrastructure