DRISI

Caltrans Division of Research, Innovation and System Information

Research Notes

Maintenance

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Project Title:
Traffic Disruption-Free Bridge Inspection Initiative with Robotic Systems

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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?

In last quarter, the following activities took place: The Missouri University of Science and Technology (S&T) organized an annual meeting with the participating state departments of transportation and presented the selected 27 bridges in three age groups for each participating state. The bridge age groups are: 15-20 years old, 25-30 years old, and 35-40 years old. S&T has sent drawing requests to the participating states to finalize the bridge sites selection where the new technology will be demonstrated.

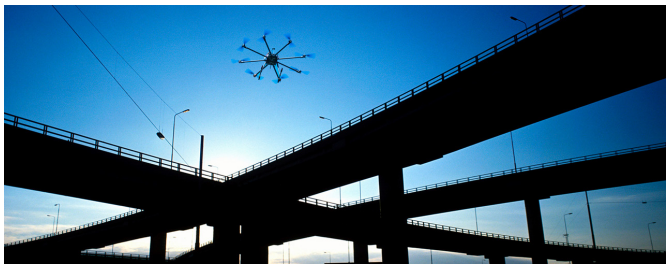
The second prototype of a mobile test facility referred to as Bridge Inspection Robot Deployment Systems (BIRDS) for combined flying and traversing capabilities was tested in open field successfully. The gear mechanism in the first hybrid vehicle prototype was combined into a pulling and spring system to make the hybrid vehicle more stable and robust in field operations.

Next step:
Research staff at the Missouri University will be contacting each of the participating DOTs to collect the drawings to support field testing of the new technology at the bridge sites.

The second prototype of BIRDS will be further improved for ease of operation. The unmanned vehicle, in combination with the climbing robots and UAVs, will be modified and tested for expanded functionality at the INSPIRE University Transportation Center.

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