

Research Results

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

This research investigated the inspection and preservation of infrastructure through robotic exploration.

WHAT WAS THE NEED?

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 safety concerns on high volume highways.

WHAT WAS OUR GOAL?

The goals of this pooled-fund initiative were to engage closely with several Departments of Transportation (DOTs) in the early stage of technology development at the INSPIRE University Transportation Center, 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 used structural crawlers and unmanned aerial vehicles (UAVs) as a mobile platform for in-depth inspection of elevated bridges.

WHAT DID WE DO?

The research team evaluated 59 bridges in diverse types, age groups, and geographical locations. Best practices of the technologies were developed and summarized in inspection protocols and guidelines were developed for using commercial drones, structural crawlers, and hybrid uncrewed vehicles on bridge inspection operations.

A framework of automated bridge preservation was developed to integrate advanced robotic, sensing, and non-destructive technologies (NDT) into the visual inspections currently used. While sensing systems always provide



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quantitative measurements, visual inspection and NDT results are mostly qualitative to the assessment of material deterioration and structural behavior. Their integration is promising in delivering a comprehensive solution in bridge inspection and maintenance.

WHAT WAS THE OUTCOME?

The California Department of Transportation (Caltrans) along with the participating DOTs gained valuable knowledge on using structural crawlers and UAVs that could help improve the efficiency of bridge inspections and also help improve safety for both workers and the traveling public. All work on this pooled fund is documented in a final research report.

WHAT IS THE BENEFIT?

The study demonstrated the benefit of automated bridge inspection and preservation of bridges with sensors, nondestructive evaluation devices, multi modal robots, and data analytics. It also provided training to a diverse transportation workforce so they can master the advanced technologies.

LEARN MORE

The final report for this research can be found at:

[Traffic disruption-free bridge inspection initiative with robotic systems](#)