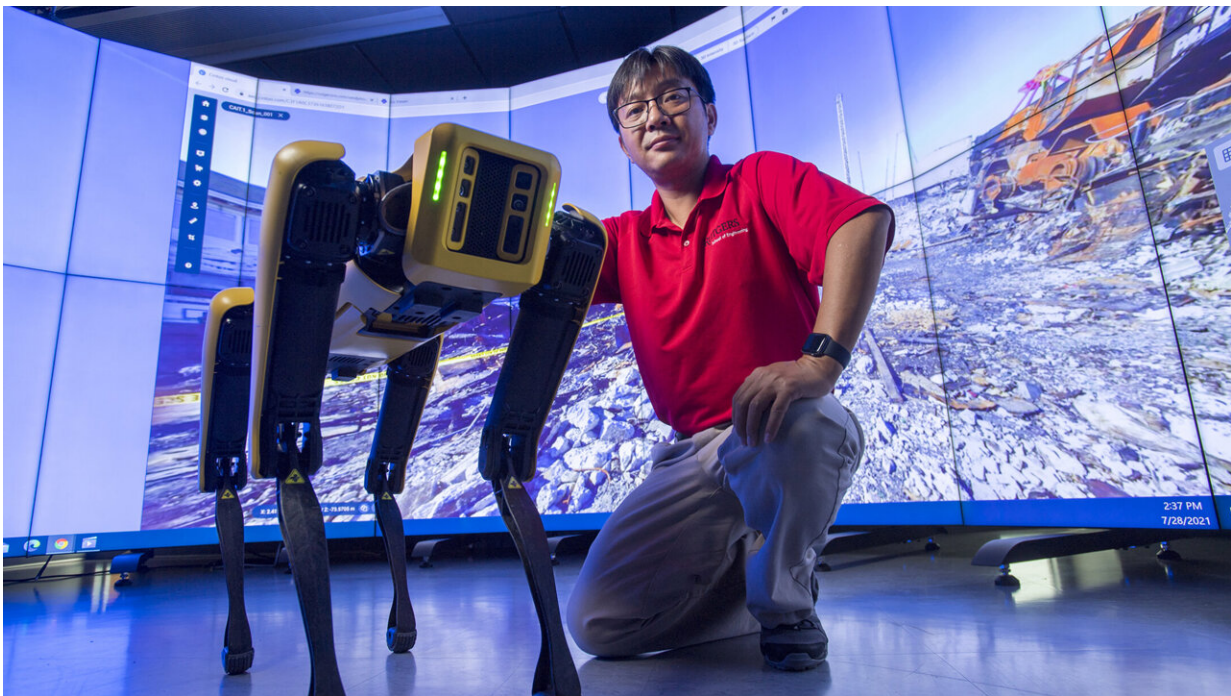


# Robot dog simplifies infrastructure maintenance

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Jie Gong is part of a team examining ways to automate infrastructure inspection projects in a way that is efficient, safe, and accurate using technology such as Spot, the mobile robotic dog. Credit: Nick Romanenko/Rutgers University

Able to climb stairs, navigate rough terrain, and respond to commands, Spot, the mobile robotic dog, offers researchers an autonomous technology for innovations in infrastructure maintenance and repair. Jie Gong thinks robots hold the key to mitigating dangers that can occur

during industrial inspections and can serve as innovative tools to maintain the transportation network and aging infrastructure throughout the country.

"Infrastructure repair and maintenance projects heavily rely on construction crews equipped with machinery tools," says Gong, an associate professor at the Rutgers University School of Engineering. "Often these traditional methods call for the shutdown of roads and bridges that can be costly and disrupt traffic, put workers in live traffic conditions that can be dangerous, and require the inspection of places that are hard to reach by people."

Gong is part of a team examining ways to automate infrastructure inspection projects in a way that is efficient, safe, and accurate.

He recently acquired the mobile robotic dog, Spot, as part of a Center for Advanced Infrastructure and Transportation (CAIT) University Transportation Center (UTC) research grant supporting maintenance and robotic systems. The purchase was a collaborative effort between the Rutgers University School of Engineering and its strategic equipment funds, the Department of Civil and Environmental Engineering, and Rutgers CAIT.

The new robotic technology, which is part of a growing industry trend, can navigate rough terrain and address some of the dangers workers may face doing inspections.

Gong is examining the efficacy of Spot as robots are an emerging force in the infrastructure repair and maintenance industry. From flying drones to smart and autonomous robotic systems, these innovations are poised to make a dynamic contribution to infrastructure repair and maintenance activities.

Gong's project, "Delivering Maintenance and Repair Actions via Automated/Robotic Systems," will help researchers learn how robots and autonomous technology can be used in new ways to improve current best practices for maintaining bridges, highways, and other infrastructure, specifically when it comes to applying repairs and detecting defects. Better understanding how to apply innovative technology, such as Spot, can help to ensure the safety and durability of transportation infrastructure going forward.

Operated with a tablet controller, users can set Spot's body positioning, obstacle avoidance, navigation routes, and more with the touch of a few buttons, according to Boston Dynamics. Once set up, the adaptive system can be deployed and inspect hard-to-reach or dangerous environments, carry infrared cameras and other imaging devices on unstable terrain, automate data collection, and more depending on user needs.

The technology can help alleviate dangerous work environments, get a more accurate and holistic view of different infrastructure assets and environments and supplement the construction workforce.

"Boston Dynamics's Spot platform will enable us to deploy inspection sensors such as infrared cameras and 3D imaging devices on dynamic infrastructure construction sites in ways that were too dangerous or not possible before," Gong says. "Because the robot can climb stairs, navigate rough terrain, and walk on sloped surfaces autonomously while mapping its environment, inspecting highways, bridges, transit stations, and other vital infrastructure can be done in a faster, safer, and more accurate way."

Some of Gong's other recent research has included collecting infrastructure damage data after natural disasters to develop high-tech tools for analyzing and learning from the destruction. He has led missions following Hurricane Sandy and other storms, with the goal of

turning the disaster data his team collects into actionable information to inform more resilient rebuilding in coastal cities and other at-risk regions.

He anticipates that Spot's ability to inspect and navigate similar dangerous environments while carrying critical equipment and automating data collection will make it a valuable asset going forward.

CAIT director and professor of civil and environmental engineering Ali Maher believes the new technology has the potential to help facilitate collaboration between UTC partner schools and address the various additional asset management and maintenance needs of CAIT's regional transportation stakeholders in future research projects.

"This robotic platform brings new capabilities to CAIT in terms of rapid and efficient condition assessment and inspection for general infrastructure asset management and more specifically deciding on when and what to repair and maintain," Maher says. "We look forward to using this technology in helping our stakeholders address critical transportation needs in the region moving forward."

Provided by Rutgers University

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