

Send in the robots -- Robot teams handle hazardous jobs

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Searching buildings for weapons of mass destruction and supply routes for improvised bombs are extremely dangerous but important jobs. That's why Scott DeLoach is working to create robots and robot teams to handle these and other tasks.

DeLoach, associate professor of computing and information sciences at Kansas State University, has received a \$219,140 grant for "Test-bed for Intelligent, Mobile Sensors" from the Department of Defense. The funding will support DeLoach's projects on intelligent sensor networks, with equipment including robots, sensors, laptops and servers.

"The equipment will significantly enhance the quality of projects by providing a flexible infrastructure to execute large-scale demonstrations," he said. "In addition, the projects will aid in training students in intelligent, mobile sensor systems research and create a stronger graduate student base for completing large projects."

To send robot - or remote sensing - teams into the field to perform work such as detecting bombs requires the robots and their controllers to have certain capabilities. DeLoach is working to make these teams feasible.

His projects look at how robot teams can respond to changing environments and team capabilities when performing a task, for example. To do this, the robots must have knowledge of the team's organizational structure, individual team member capabilities, the environment and the team goals, along with appropriate reasoning

mechanisms.

"The goal is to establish 'organizational reasoning' as a key component in a new approach to building highly robust cooperative robot teams," DeLoach said. "So far, we have developed a model of autonomous teams that allows teams to reason about organizing and reorganizing, and a goal model for dynamic systems that allows us to capture the dynamics of the environment in which such teams operate. We have also developed a high-level simulator that allows us to test the team reasoning algorithms to determine if they actually allow the team to adapt to their environment and the problem-solving process."

DeLoach's research also has created a search application for weapons of mass destruction for use within the simulator; a similar improvised bomb search application is in the works.

In addition, DeLoach's work seeks to allow a small number - one or more - of operators to control multiple teams of robots rather than multiple operators controlling a small number of robots.

In addition to bomb sensing, DeLoach's robot technology could be applied to uninhabited air and ground-based vehicles for reconnaissance, surveillance, weapons deployment and mine detection; search and rescue operations; border patrol; response to chemical, biological, nuclear, radiological and explosive events; and fire warning and detection systems.

"These applications include any situation where teams of robots can be used with or without human control," he said. "The goal of our projects is to develop mechanisms that integrate human and semiautonomous agents into teams for use in constantly changing environments."

Source: Kansas State University

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