Robotics: Taking soldiers out of harm's way

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Emmanuel G. Collins envisions an unmanned ground vehicle that could patrol large areas without putting U.S. soldiers in harm's way. Credit: Courtesy of Emmanuel G. Collins

Over the past three years, thousands of American soldiers in Iraq have been horribly injured or killed by improvised explosive devices (IEDs). The explosives, placed near or buried under roadways and often detonated by remote control, frequently target U.S. military vehicles and convoys -- often with deadly success.

At Florida State University, one researcher is working on new technologies that could reduce the carnage. Emmanuel G. Collins, the John H. Seely Professor of Mechanical Engineering at the Florida A&M University-FSU College of Engineering, envisions the creation of an

unmanned ground vehicle that could patrol large areas without putting U.S. soldiers in harm's way.

"We're already using drones (unmanned airplanes) for surveillance in the skies over Iraq," Collins said. "It's much more difficult to design a ground-based vehicle to perform surveillance functions -- but we're working out the logistical issues right now."

Collins serves as director of the Center for Intelligent Systems, Control, and Robotics (CISCOR), a multidisciplinary research center in the College of Engineering that uses state-of-the-art technology to develop solutions for industry and government. In addition to the unmanned ground vehicle, other automated systems being developed at CISCOR include one that will enable wheelchairs to traverse uneven terrain more effectively, and another that will assist automobile drivers in the always-tricky task of parallel-parking.

At CISCOR, Collins and his fellow researchers devise complex algorithms -- precise sets of rules that specify how to solve a specific problem -- in designing systems that allow for the automation of various devices.

"An algorithm is essentially a mathematical equation that tells something how to respond to certain variables," Collins said. "A cruise control system on an automobile is a relatively basic example of an algorithm at work. With cruise control, the algorithm regulates the car's throttle so that it maintains a constant speed, no matter how uneven the terrain or how much weight the car is carrying. It also controls how quickly the car accelerates to the desired speed and makes sure it doesn't overshoot this speed."

Creating an algorithm to control the functions of an unmanned ground vehicle is much more difficult because of the number of variables

involved, Collins said.

"We have to take into account such factors as terrain, any obstacles that might block the vehicle's path, the rate of fuel consumption, the type of ground surface, weather conditions and the structure of the vehicle itself," he said.

Once such an algorithm is prepared, various sensors employing laser, optical and/or radio-frequency technology would feed a constant stream of data to the vehicle's computer to help it make sense of its surroundings and react accordingly. Several versions of such vehicles currently are being tested within the CISCOR labs.

The work taking place at CISCOR has the attention of the U.S. military. The Army Research Lab currently is funding the center with $500,000 per year for eight years to pursue its research on unmanned robotics. Another $200,000 also has been provided to fund research on human-robot interaction, with prospects for a second year of funding.

"To be able to assist in the creation of a new technology that might one day save soldiers' lives is a wonderful thing," Collins said. "But we're also excited about some of the other potential applications for this technology that could be used right here in Florida. Search-and-rescue teams could directly benefit from this research, for example, and office, factory and agricultural environments also could see breakthroughs based on this technology."

Source: Florida State University