

Scientists Link Unmanned Vehicles with Network for Homeland Security

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Researchers at The University of Alabama in Huntsville have developed unmanned aerial and ground vehicles, but the real innovation is how these vehicles can work together with an information network to provide real-time data to first responders and emergency personnel.

Researchers at The University of Alabama in Huntsville sit in a darkened basement conference room at Von Braun Research Hall. A projector flashes an aerial view of the university's campus on the screen. The Google Earth image has been enhanced by software that has created three-dimensional buildings on the south end of the campus.

A small image appears in the northeast corner of the aerial photograph, representing the university's unmanned aerial vehicle (UAV) — the Flying BASSETT. Minutes earlier, the UAV had dropped off an unmanned ground vehicle (UGV) nicknamed the Rover, which was slowly trudging toward what could be a hazardous spot.

As Rover approached the suspicious location, a sensor issues an alert. The alert pops up in the corner of the display screen — cyclohexane. It is a colorless liquid that is flammable and is deemed harmful for the environment.

As the scientists track the movements of Rover from a safe distance, the path of the UGV changes from white, to yellow and finally to red. The screen is refreshed every two seconds to provide real-time tracking. The ground vehicle has provided valuable information to the researchers by

giving them a location, but also what types of danger they may face. The UGV also carries a camera that can provide a close view of the site. Simultaneously, the UAV continues to hover overhead and provide streaming aerial video of the location.

Dr. Gary Maddux, a research scientist and the director of UAH's Systems Management and Production Center, said the UAV could use sensors, but they are more practical on the ground vehicle because most chemicals are heavier than air.

Researchers at The University of Alabama in Huntsville developed the UAV and UGVs in their laboratories. And, while the development of unmanned vehicles are proving to be valuable, the real innovation is how these vehicles can work together with an information network to provide real-time data to first responders, according to Maddux.

“The real value in our research is our ability to integrate these unmanned systems,” Maddux said. “I view our unmanned aerial and ground vehicles as extended nodes of a large information network.”

The first “node” of this network revolved around the development of the Flying BASSETT — UAH's first unmanned aerial vehicle.

The BASSETT was developed initially through a grant from the Department of Justice in support of homeland security. UAH researchers interviewed first responder organizations across North Alabama prior to developing hardware. “We were able to establish the concept of a global view of homeland security through interviews we conducted in 2003 and 2004,” Maddux said.

This autonomously guided helicopter can operate in flight by either responding to pilot directions or through programmed Global Positioning Satellite (GPS) coordinates. The system carries the latitude and longitude

coordinates to eight decimal points making the location highly accurate. Maddux said the Flying BASSETT can carry up to 20 pounds, hover for 60 minutes and potentially make a trip of 25 miles.

The BASSETT's capabilities include the ability to "see" real-time images through a Sony digital camera, an infrared camera, and a three-channel video switcher.

UAH's Systems Management and Production Center has also developed Rover, a lightweight, unmanned ground vehicle. The four-wheel-drive vehicle is a foot long and weighs about three pounds. The light weight of the Rover allows the UGV to be transported and deployed closer to a troubled site by the Flying BASSETT, and the two unmanned vehicles work in tandem to transmit live data and video feeds to a control station at a safe distance from a problem site.

Maddux sees the two unmanned vehicles as "tools" to give vital information to emergency personnel who may be called out for a disaster, whether it is a toxic chemical spill, a nuclear disaster or some other type of emergency.

"Situational awareness is a key part of responding to a disaster," Maddux said. "We want to provide as much pertinent information as possible to police, fire or medical personnel, or a soldier."

The combination of the two unmanned vehicles working together and getting real-time information using Google Earth satellite images gives Maddux the confidence to say that UAH's capability in this arena is unique. "We believe we can demonstrate capabilities that don't exist anywhere else," he said. "Our researchers continue to look at how all of these pieces fit together and work seamlessly as a system. That is our objective. That is the real value of this system for first responders."

Source: University of Alabama Huntsville

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