

New sensor system tracks firefighters where GPS fails

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Firefighter Ray Hodgson hits the talk button on his walkie-talkie: "I have fire showing, possibility of a rescue on the third floor. Engine 35, initiate a rescue group. Also back him up with a hose line."

A fire has been set in a three story building at the Maryland Fire and Rescue Institute, where firefighters hone their skills and test equipment. In this case they're testing a device they hope will save firefighters' lives. Everyone taking part in the drill knows how difficult and dangerous it is to locate a missing firefighter in a smoky inferno.

"When you go into a burning building, you don't really see anything. You can't see your hand in front of your face; you're going on instincts. It's almost a surreal experience," says Matt Leonard, a firefighter in the District of Columbia and a deputy chief in Prince George's County, Md.

"We've had instances where we've lost firefighters in a building and had a hard time finding them. It's very frustrating," says Hodgeson, a firefighter for 44 years. He knows firsthand the sinking feeling of hearing the dreaded words that one of his colleagues is missing. That's why this team of experienced firefighters is taking time to test out a new type of sensor that can track their whereabouts deep inside buildings, where standard GPS units often don't work.

"This has been a need for a long time," says Carol Politi, CEO of TRX Systems, the company developing the sensor. "Sept. 11 was widely publicized and there was not even an understanding of whether certain

firefighters were actually in the buildings at the time of that tragedy."

With support from the National Science Foundation (NSF), electrical engineer Politi and her team at TRX Systems are developing a portable device called the Sentrax Tracking Unit. It straps on like a belt and consists of a suite of sensors. "The sensors include [accelerometers](#) and [gyroscopes](#). Those are sensors similar to what you have in your Wii for example--pressure sensors ranging sensors. It allows us to create a picture of what a user has done," says Politi.

"The sensors monitor the movement of the user," explains Ben Funk, vice president of Engineering at TRX. "So when the user moves forward or backwards, left or right, it determines how far a person moved in each direction."

During the fire drill the sensors create a map of the building as the firefighters move through the smoke.

"Twenty-eight-nineteen, we have a mayday on the third floor from the rescue group," Hodgson relays. "Initiate a search."

During the demonstration, Hodgson assumes the role as incident commander as the others move through the burning building in teams of two. One of the firefighters, outfitted with a sensor, crawls through the smoke and purposely gets lost. The Sentrax Tracking Unit maps his location at every twist and turn, sending the data to a nearby base station--in this case, the incident commander's laptop. The system can transmit via a variety of different radio-waves to accommodate different receivers.

"The tracker advises they're on the back Delta Charlie quadrant in the back bedroom," says Hodgson into his walkie-talkie.

In minutes the firefighter is located by a member of his team.

Hodgson relays the good news: "Command to all units on 28-19, I have a confirmation. They have found the victim on the back quadrant and they're coming out with him. We can step down."

"I think this is tremendous for the fire service," says Hodgson. "If my firefighters get in trouble and need help, it's going to cut my time down to about a tenth of what it takes right now to go in there and do a blind search."

In addition to firefighters, Politi says the Sentrix System can benefit other first responders, such as the police, FEMA or the Red Cross, as well as the military and miners.

"First responders, [firefighters](#), they're the most difficult [to track]," explains Funk, "because of the types of motions that they're performing. They're crawling; they're going up and down stairs, forward and backwards."

According to Politi, the system incorporates all signals of opportunity, such as GPS and WiFi. It also incorporates RF signals. "Combining these with inertial and any available, or inferred, map information will allow locations to be tracked even in difficult applications," she explains.

Before making the system broadly available to first responders, Politi says they are delivering the system for training and tracking applications in less adverse environments. "These early adopters are helping to mature the system and ready it for more critical life safety applications," she notes.

The goal is pinpoint precision--to keep a watchful eye through the smoke and flame.

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