Conflicting signals can confuse rescue robots

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Sensor-laden robots capable of vital search and rescue missions at disaster sites are no figment of a science fiction writer's imagination. Prototypes and commercial models of urban search and rescue (US&R) robots will soon begin to work rubble piles across the country. Too many of these lifesaving robots, however, could be too much of a good thing, according to researchers at the National Institute of Standards and Technology, who report that the radio transmissions of multiple robots can interfere with each other and degrade search and rescue performance.

A NIST analysis of wireless radio field trials for US&R robots, presented at a conference on February 28, found that 10 out of the 14 robots tested experienced communication problems due to radio interference from other systems. Engineers carried out tests on the robots last August at a US&R robot standards development gathering in Gaithersburg, Md., sponsored by the Department of Homeland Security.

The researchers found that neither use of "industrial, scientific, and medical" (ISM) frequency bands nor adherence to protocols designed to minimize interference between systems in the bands could guarantee flawless communication between a robot and its human operator. Radio interference could happen whenever the ISM frequency bands became crowded or when one user had a much higher output power than the others. An example of the latter problem occurred during the tests when transmitters in the 1760 MHz band knocked out video links in the 2.4 GHz frequency band. In another case, a robot using an 802.11b signal in the 2.4 GHz band overwhelmed and cut off a robot that had been

transmitting an analog video link at 2.414 GHz.

The NIST paper lists a number of ways to improve urban search and rescue wireless communications. Options, some of which are currently being investigated by robot manufacturers, include changes in frequency coordination, transmission protocols, power output, access priority, and using relay transformers to increase the range of wireless transmissions (a technique known as multi-hop communications). The paper also suggests establishing new access schemes or software-defined radios that allow interoperable communications.

Ref.: K.A. Remley, G. Koepke, E. Messina, A. Jacoff and G. Hough. Standards development for wireless communications for urban search and rescue robots. 9th Annual International Symposium on Advanced Radio Technologies, Feb. 26–28, 2007, Boulder, Colo.

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