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<u>**In the Aftermath of September 11:**</u>

<u>**What Roboticists Learned from the Search & Rescue Efforts**</u>

Robots proved helpful, research agenda clear

MENLO PARK, *Calif.* **– September 10, 2002.** One year ago tomorrow, Dr. Robin Murphy, Professor of Computer Science at University of South Florida, packed up search and rescue robots and graduate students from her lab, and joined other robotic specialists at Ground Zero to offer their assistance.

At the recent National Conference on Artificial Intelligence, Murphy reflected on their experiences at the WTC – both what they did well and what they could have done better.

"This was the first time robots were used in a real search and rescue effort," Murphy noted. Some of the robots she brought to the WTC had just been part of a national search and rescue research robot competition sponsored by the American Association for Artificial Intelligence.

At the WTC, robots found about 10 sets of remains. More important, they demonstrated their usefulness, and showed researchers what needs to be done to make robots robust and fully useful for disasters.

Murphy made a compelling case for using robots in such disasters. She pointed out that there are not enough trained people available. One pinned survivor, for instance, requires, on average, the efforts of 10 rescuers for about 10 hours to be freed. Further, statistics say that it is only in

the first 48 hours that survivors will be rescued, after which most victims have perished. Using robots can minimize the number of personnel on site, and reduce the fatigue and errors.

While dogs are often of great assistance in search and rescue operations, at the WTC they were hampered by rain on the second day, which limited their sense of smell to only 0.3 meters. Because there was no air, they couldn't go more than 18 inches into the rubble, when the shells of survival were thought to be 100 feet.

Work to do

During her talk, Murphy outlined her vision of robust search and rescue robots for the future. She sees mobile robots as scouts able to navigate, adapt and perceive. Some will be "man-packable" – humans can pack them into the disaster zone in one to two backpacks. Some will be "man-portable," meaning they can be carried in a regular vehicle without a trailer. Still others will be so small that they can fit into small subhuman confines, able to tell their orientation as they snake through open spaces in rubble.

"Tethers" — cables that provide power, communication between the robot and human operator outside the rubble, and a lifeline — will be largely a thing of the past, according to Murphy. In addition, wireless communications also need more work. A robot was lost and died in place at WTC when its wireless antennas shorted across some rebar and communications were lost. Robots need intelligence to identify such problems, free themselves, and resume working with human operators to cooperatively seek and identify victims, she notes.

Murphy hopes to see the day within ten years when robots and computers will work with humans, not only going where no human should go, but also assisting with the cognitive tasks of sorting through the images beamed back by the robots. Human relief workers have great difficulty understanding what they see in images of rubble and in mapping where it is. Their acuity is impaired by the physical conditions of the site, and exacerbated by the fatigue of long shifts and fitful rests. Robots and computers, by contrast, are not compromised in the same ways.

Dr. Murphy will be giving a similar talk on 9/11 at the University of South Florida at 2pm and at Penn State on 9/12 at 4pm (see www.crasar.org/calendar.html for details).   Video, still, and information about the robots at 9/11 and the advances in rescue robotics since then is also available at www.crasar.org.

About AAAI

Founded in 1979, AAAI is a nonprofit scientific membership society devoted to advancing the science and practice of AI. Its mission is to: (1) advance the scientific understanding of the mechanisms underlying intelligent thought and behavior, (2) facilitate their embodiment in machines, (3) serve as an information resource for research planners and the general public concerning trends in AI, and (4) offer training for the current and coming generations of AI researchers and practitioners.

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