FIELD ROBOTICS FOR DISASTER RESPONSE

Organizers: Todd Danko, Lockheed Martin, Advanced Technology Laboratories, Keiji Nagatani, Tohoku University, Department of Aerospace Engineering

Recent highly visible disasters such as the Great East Japan Earthquake and Tsunami and the ensuing damage to the Fukushima Daiichi Nuclear Power Station have underscored the dangers of disaster situations to human relief workers, limiting response strategies.

Robots were used in a limited capacity to perform tasks such as mapping and environmental monitoring during the Fukushima disaster as well as the Deepwater Horizon oil well disaster in the Gulf of Mexico, but the future may hold more comprehensive roles for robots. Today's robots are not yet robust enough to function in many disaster zones or capable enough to perform even the most basic tasks to mitigate a crisis situation.

Field robotics is a research discipline dedicated to the application of robots to unconstrained and uncontrived environments. In other words, field robotics refers to the use of robotic technologies outside of controlled laboratory environments and into environments such as those associated with disaster response, construction, forestry, agriculture, mining, subsea, highway, military and space.

Researchers around the world are working to extend the state of the art of field robotics to allow access to ever more challenge environments for monitoring and mapping, as well as interacting with the environment, potentially impacting the course of a disaster's aftermath.

This session will focus on recent field robotics efforts, specifically in response to disaster situations. Work towards increasing robotic capabilities to better protect humans in future disasters will be discussed.

Specific topics include:

- The application of Quince, a small tracked ground robot designed for surveillance in dangerous environments. Quince was used to help monitor facility damage and construct a dose-rate map in the Fukushima Daiichi Nuclear Power Plant following the 2011 disaster.
- The development of resource-constrained autonomous aerial systems and how they may cooperate with teams of heterogeneous robots to maximize individual aerial and ground robot contributions to achieve extended operational goals.
- The application of Unmanned Construction Systems to mitigate debris flow damages after volcanic eruptions by building embankments to protect local inhabitants while stationing equipment operators a safe distance away.
- The DARPA Robotics Challenge, which is an ongoing competition that was inspired by the use of robots during recent disasters to development hardware and software that will allow future robots to collaborate with human counterparts to perform the most hazardous activities in disaster zones.