Human-in-the-Loop Robot-Augmented Intelligent System for Emergency Reconnaissance

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ABSTRACT

This study proposes a human-in-the-loop robot-augmented intelligent system for emergency reconnaissance. The system improves situational awareness of first responders by providing robot-collected information through an intelligent and interactive interface. Unmanned aerial vehicles (UAVs) and unmanned ground vehicles (UGVs) equipped with RGB-D camera, thermal camera, GPR, and LiDAR are deployed to acquire information on disaster sites. The collected sensor data are further processed to present actionable information to first responders, such as victim location, buried void shape, and accessible hole through an augmented reality interface. A virtual reality platform is used to validate and evaluate the proposed system. Participants are invited to complete a search and rescue mission with robot-augmented intelligent system to find survival victims under rubbles in the virtual environment. The experiments demonstrated that the proposed system reduces the searching time and false alarms, and increases the accuracy of detecting victims, which will change the search and rescue paradigm from an experience-based practice to an information-based one.