Dipartimento dei Vigili del Fuoco, del Soccorso Pubblico e della Difesa Civile

CORPO NAZIONALE DEI VIGILI DEL FUOCO

Italian National Fire Corp

SEVENTH FRAMEWORK PROGRAMME

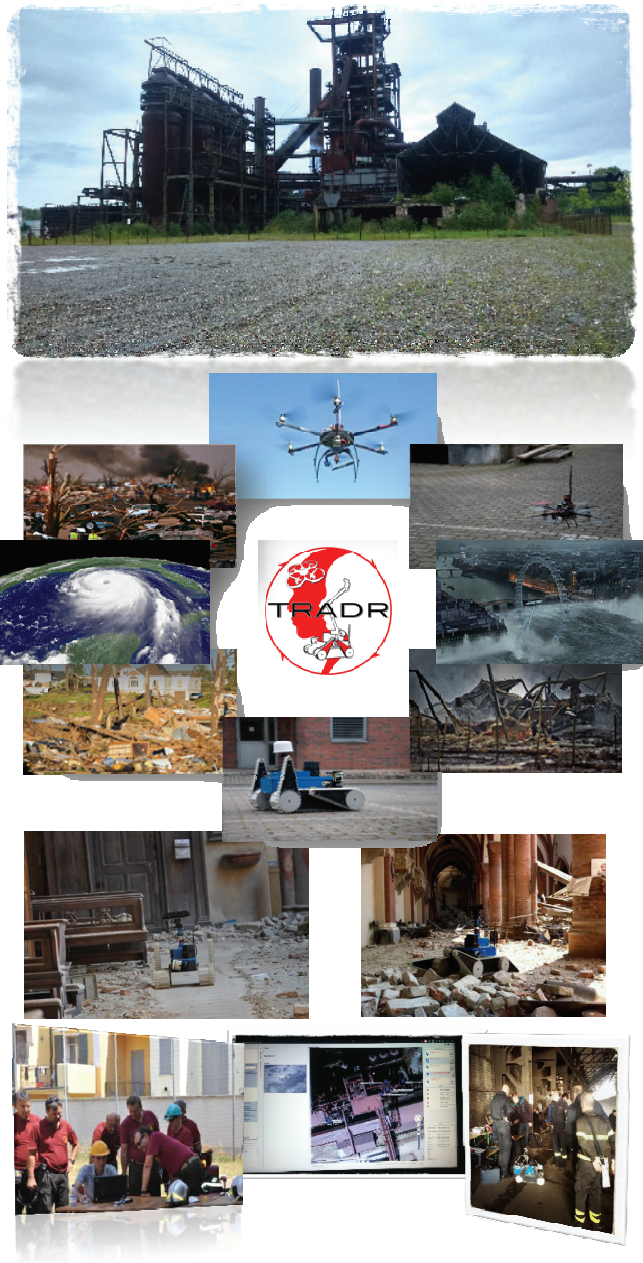
TRADR

Long-Term Human-Robot Teaming for Robot Assisted Disaster Response

Problem:
During large scale disasters, a comprehensive and reliable situational awareness is crucial when initiating operative-tactical measures. Achieving this situational awareness can be risky and time-consuming for operational units, especially during incidents involving hazardous material or rough terrain.

Overview:
Using a proven-in-practice user-centric design methodology, TRADR develops novel S&T for human-robot teams to assist in disaster response efforts, *over multiple sorties during a mission*. The novel S&T makes experience *persistent*. Various kinds of robots collaborate with human team members to *explore* the environment, and *gather* physical samples. Throughout this collaborative effort, TRADR enables the team to gradually develop its understanding of the disaster area over, multiple possibly asynchronous missions *(persistent environment models)*, to improve team members' understanding of how to work in the area *(persistent multi-robot action models)*, and to improve team-work *(persistent human-robot teaming)*. The TRADR use cases involve response to a medium to large scale industrial accident by teams consisting of human rescuers and several robots (both ground and airborne). TRADR missions will ultimately stretch over several days in increasingly dynamic environments.

Objective 1: Persistent Environment Model
Construct models of dynamic environments, fusing multi-modal observations from different robots operating across multiple sorties. The result is a single world-centric model. It is persistent across the sorties, and its contents may change to reflect new observations. A robot can use this model to determine and localize activities, and register its own observations.



End-User perspective:
The strict orientation of TRADR towards End-Users requirements enables the development of utilizable devices that are tested by End-users and improved by their evaluation.

Objective 2: Persistent Multi-Robot Acting
Enable gradual adaptation and grounding of individual- and multi- robot task-level planning and execution within and across sorties, to reflect experience with operating in the disaster area. The result is the capability for multiple robots to learn how to better achieve exploration- or manipulation goals in a previously unknown,
harsh environment. This is persistent: Robots learn within and across sorties during a mission. This self-development is based on the experience from interdependently acting and interacting with other robots, and with human team members (through shared control, human-in-the-loop).

Objective 3: Persistent human-robot teaming
Develop methods for the gradual adaptation of a robot's social skills to reflect experience from collaborating within a human-robot team, to improve trust and mutual understanding. The robot is explicitly aware of its own role within the
team, and can reason how its own behavior can influence the dynamic interdependencies within the team. The result is the capability for a robot to become a better team player over time.

Aim
From End-Users point of view, the aim is to make surveys of complex incidents faster, more efficient and less dangerous. The TRADR system should support the command and control units, as well as it should support the operational units during the operation itself. Additionally, it should probe into areas which are impossible to be explored by humans.

Internet: *http://www.tradr-project.eu/*

Partner:

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