DR 8.2: Proceedings of the TRADR awareness activities

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Using technologies and special devices is getting more and more present in fire rescue activities. From hand-held instruments to detect hazards to listening devices used to find and later extricate people under rubble, all these materials find actual application in USAR (Urban Search and Rescue) and CBRN (Chemical Biological Radiological Nuclear) scenario helping the decision making process and allow a better assessment in a multi-emergency event. Awareness activities have been carried within the National Fire Corps in Italy and end-users in TRADR project (FDDO and GB) by delivering information to every level covering the operational, tactical and strategic level of response and make rescuers working and driving Robots. The work presented here is the achievement of this dissemination.

Executive Summary

The report presents the activities that helped first responders to get an awareness in using robots, either aerial or ground, in emergency response, CBRN surveillance, USAR search and others. In order to develop a culture of using robots before in training and then emergency cases, a past experience was done with NIFTI project where first responders used, tested and drove robots in simulated or real scenarios (Mirandola earthquake, 2012). These activities kept on going with TRADR project where a consistent and concrete awareness after lessons learned from NIFTi raised up as well. Novelty, again, is to employ an added tool in an integrated response system and the advancement over the state-of-the-art would be to build a joint team composed of humans and robots in a multi-incident scenario. This team would communicate each other and information would be delivered to an Incident Command Post to enhance the decision making process. (Furthermore, working groups have been issued producing document, common understanding, unique language about using Robots within TRADR end-users. This, to achieve the goal of working in close cooperation with robots enhancing the safety of first responders standing far and off from hazardous scenarios.)

Role of raising cultural awareness in TRADR

TRADR adopts traditional means of publicizing project results in scientific journals and high-profile conferences (aiming for a high percentage of joint publications), and puts in place an efficient dissemination plan that combines several innovative means for dissemination (e.g. Industry Days, scientific workshops, trade fairs, TRADR portal, public appearance) with community building (summer schools, community, presentation in research networks; working group, etc…).

An important aspect of TRADR dissemination is the development of an operational capability: the possibility to deploy TRADR systems in actual disaster responses. To this end, TRADR helped, step by step, to develop a cultural awareness of using robots in risk assessment and in disaster responses, through the involved end user organizations. Together with other WPs, and external contacts such as *Roboticists without Borders*, a framework for handling robots in a disaster response was partly developed, producing guidelines for training, protocols, organization, and logistics. This framework was shared with end user organizations and the scientific community alike, and improved over the year 1. For instance, end-users meetings, scientific and technical workshops, exchange of information, Skype video call were helpful to achieve a common understanding in developing robots for disaster response and enhance their operational capability.

Contribution to the TRADR scenarios and prototypes

Previous emergencies and national/international exercises provide the TRADR end-users new input to better address rescue activities, information management, risk analysis and assessment of hazards before starting rescue at every level, from an operational to a strategic level.

All these pieces of information gathered during the experience helped in designing scenarios and prototypes useful and in-line with the demands a first responder requests in USAR or CBRN rescue or monitoring activity.

The continuous exchange of information within TRADR end-users, practical exercise and training performed on a daily basis allowed an actual approach to use robots in complex scenarios.

1 Tasks, objectives, results

1.1 Planned work

The goal of "Raising cultural awareness at national level" was to develop a culture of using robots in training and emergency cases, and a network between TRADR and national disaster response instances. The plan was to host several small, dedicated workshops, civil defense exercises and training activities at TRADR end user facilities, all dedicated to inform end users about robot-assisted disaster response.

Sharing of information via the TRADR web portal, and end user web portals (e.g. http://www.vigilfuoco.it) was also used. Initial guidelines and slim procedures concerning Urban Search & Rescue (USAR) or Chemical, Biological, Radiological and Nuclear (CBRN) events as well as guidelines for assessment using robots were developed. The target performance was to enhance the safety of first responders standing-off from the scenario while using robots. The novelty was to employ an added tool in an integrated response system and the advancement over the state-of-the-art to build a joint team made up of humans and robots.

Conclusions, remarks and general disseminations activities were presented in year 1, such as: Scientific publications; TRADR portal; Scientific workshops; Trade fairs; Industry Days; Publication of benchmarks; Open Source APIs; Innovation-related activities; Competitions; Newsletter; Summer schools; Partner exchange program; Public Relations; Public appearance.

1.2 Actual work performed

The activities held to better address the requirements in designing credible scenarios started by hosting several small, dedicated workshops, civil defense exercises and training activities at TRADR end-users facilities. During these sessions, end-users of every level of competences (simple fire-fighter, fire officers, technicians, pilots, etc…) and specific skills (USAR, CBRN, Rope rescuers, etc…) were involved in presentations showing robots capabilities. This way, rescuers had the occasion to drive and handle robots in simple scenarios having in mind some important "natural" key points like:

- the safety of the rescue team is the priority at any incident;
- all hazards on scene must be identified and communicated;
- all hazards must be dealt with by introducing control measures;
- only when hazards are identified, communicated and controlled, can work continue;
- the scene is dynamic and new hazards may affect safety;

The awareness of handling robots in incidents, could enhance safety and promote safety during operations.

These experiments with end-users started from NIFTi project and found a fertile soil in TRADR, where the gained awareness helped to more and more fine tune the relations between Humans and Robots in disaster response. Actually, Partners from NIFTi and later TRADR, worked in close liaison with end-users, like a laboratory, to let them aware and get educated in using robots and tools associated.

	
End-user evaluation (Rome, 2011). Training in handling robots	End-user evaluation (Rome, 2011). An end-user tests a robot in a simple obstacle case.

After workshops, several assessments on-site of possible scenarios were performed and obstacles were added by Partners during the simulation; this to measure the levels of difficulty possibly to face during a mission.

	
Presentations to other end-users (Prato, 2013)	An end-users drives a UGV using the robot interface (Prato, 2013)

After simulations were carried out, de-briefings were necessary to analyze the level of confidence in using robots and the information management effectiveness after using cameras, devices embedded in the robots.

A de-briefing session after a simulated mission in an urban scenario (Calambrone, Pisa 2014)

In order to proceed and raise up an awareness in handling robots in disaster response, other concrete activities were performed. These are listed below and pre-TRADR project activities are included as reference.

Laboratory with Partners.

Exercises, testing, demos were planned and organized during NIFTi project at end-users training facilities in National Fire School and Fire Stations. Specifically in Italy, demos were held in Italian Fire Stations like Prato, Pisa and Italian Fire Corps Operational School – SFO, in Montelibretti, Rome province. These activities were attended by rescuers (every level of competences) from Roma, Prato, Pisa, Torino, Florence, Venice, Salerno, L'Aquila and specialized and skilled USAR and CBRN units at National level. This activity continued in TRADR project and a first occasion was during a Joint Exercise held in Calambrone, Pisa (2014). This last helped to test interoperability between firemen from Italy, Germany (FDDO) and The Netherlands (GB).

TRADR end-users presentations to other rescuers

Internal and external displays and presentations provided dissemination within the end-users working with TRADR project. Activities were held during operating situations where skeptical first responders, public and Media had the opportunity to get a better idea on deploying robots in disaster response (Prato, 2013 and Pisa 2014).

Activity on the field (surveillance, monitoring, video documentation, forensic...).
Italian end-users adopted drones and UGV in surveillance and other relevant actions. Below, a table is presented with activity and a short description of the job done by robots. Some Italian fire stations had the chance to use UAV and UGV in specific occasions and in particular situations of the year.

Robots performed activities like:

Activity	**Description**
Monitoring and Assessment	after building demolitions, in order to assess any further risks in the surroundings (L'Aquila, 2009); structure damage assessment of several cultural heritage buildings in Mirandola, in the Emilia-Romagna region in Northern Italy (2012); monitoring of cracks in bell towers limiting rope rescuers interventions (Venice, 2014); of shoring after their placement, this to limit use of rope rescuers (L'Aquila, 2009);

	Aerial view of a wide areas hit by snow (Belluno province, 2014); After evacuation to allow the deactivation of a bomb from the 2nd World War (Vicenza province, 2014)
Mapping	after earthquake to check and verify cadastral units (L'Aquila, 2009);
Reconnaissance	of river banks, dams and flooded areas (L'Aquila, 2010); After fires to assess possible way to enter fire scenarios and ensure safety operators (Salerno, 2014)
Testing	using drones in missing people scenarios (L'Aquila, 2014)
Video Documentation and Media Communication	"Venzone 2014 – SERMEx" exercise, use of drones for aerial overview and images/videos delivery to a Command Post (Venice, 2014)
Forensic	after floods (L'Aquila, 2010); support to forensic activity (Venice, 2014)
CBRN Emergency	UGV used to assist first responders in gathering a radiological source (Co 60) inside a suspicious container (Genoa, 2011)

Furthermore, activities were also arranged, like:

Exhibitions, Testing with factories, Industry Days. Exhibition days between Partners and Private Factories selling drones (UAVs) and the continuous exchange of information contributed to the spreading of a new culture in using robots in emergency response and monitoring activities (Pisa, 2014). Experiments and tests with factories, simulations of missing persona scenario, integration test between drones and incident command post mobile units were performed (Prato and Torino, 2014);

Working groups, doctrine and guidelines. In order to raise awareness activities the Italian Fire Corps proposed a national working group, nominating a technical board, to study applications of drones in emergency response. The working group concluded the research by issuing a document including all the possible application of robots in emergency activities. An abstract is presented in point 2.1.

All these activities gave a more concrete contribution in raising, at a first stage, a proper awareness in the culture in using robots as supports or vital elements in emergency response. This activity was also useful in giving fruitful contributions in benchmarking. The guidelines that the working group developed are presented in the DR 8.3.

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2 Annexes

2.1 Feliziani, Corrao, Lo Russo (2014), "UAVs – Chance to use them in the Fire Corps"

Abstract

The UAV (Unmanned Aerial Vehicle), commonly referred as "drones" are remotely controlled from a mobile or a fixed station. Use primarily military in recent years have been increasingly taken into consideration also in civil field, in particular in the lower weight class (below 25 kg), for requirements of ground surveillance, detection of environmental conditions, aerial overview, data transmission, or for applications in harsh environments such as fire monitoring, infrastructure and facilities inspections, road traffic monitoring, or for tasks of public policy as coastal surveillance and search and rescue. In fact the hypothesis of use of drones is particularly indicated in the activities characterized by the "3D-rule" or Dull (monotonous, tedious), Dangerous and Dirty (when in contaminated environments). A further factor in the deployment of drones is due to limited exercise and cost, compared to conventional aircraft, particularly in conditions of limited availability of resources. In order to assess the application of these systems within the activities of the Italian Fire Corps and to address the matter within a unitary and harmonized system, the Italian Fire Corps Department of the Fire Department has instituted a special committee with Decree No. 285 of July 24, 2014 with tasks of:

1. define the operational scenarios in which the use of Unmanned Aerial Vehicles

(UAVs), also in synergy with other means and technologies supplied to the Italian Fire Corps, which could be useful for improving the quality and safety of the institutional activities of the Corps;

2. define the regulatory requirements, both in operational and technical aviation, for ensure the safe operation of UAVs by the Fire Corps, including the provision of education and training to rescuers to conduct and maintain UAVs;

3. define the technical requirements of construction and functional equipment of UAVs to fulfill Italian Fire Corps rescue or other institutional missions;

4. perform testing activities in non-critical scenarios, in order to consolidate and verify as defined in the above points and with the objective of proposing one or more types of UAVs with its sensors and equipment, of potentially interest for the Italian Fire Corps.

Previous activities are presented, especially the ones conducted during the NIFTi project period. Guidelines have been designed, also as a result of close cooperation with end users started with NIFTi and continued and extended in TRADR, highlighting the interoperability when a multi incident scenario happens and robots are deployed.