

Feedback/lessons learned during missions NJEx 2013

Tina Mioch

Mission 1:

- MC: Salvatore
- UGV operator: Thorsten
- UAV pilot: Jan
- Infield rescuer: Marius.

Mission 2:

- MC: Ivana
- UGV operator: Ming
- UAV pilot: Marius
- Infield rescuer: Jan

Scenario

Observations:

- Hearing victims scream was experienced as valuable in the scenario.
- Salvatore experienced the scenario as very complex and stressful.

Ideas:

- Have the UAV pilot standing on a long, high ladder above the terrain. He then could play better the WOZ, as he could follow commands that an autonomous UAV would be able to execute, e.g. go to this position. In this scenario, the problem was that the MC (Salvatore) asked many things that could not be done, as the pilot could not see well enough, e.g. fly over the robot, go to that structure, go north, go south, investigate this section, etc.
- If we use real radioactive sources, then we should also add handheld detectors for the infield rescuer.
- Add a no-go area beforehand to TRES.
- Check, when positioning the victims, that the infield rescuer cannot see the victims from the perimeter, where he is allowed to go (or at least only a few)
- Have a protocol for walkie talkie communication. What should be done via walkie talkie, and what via TRES?
- The mission itself needs to be better defined. So not only that it is an earthquake mission, but also why there is radioactivity (hospital), what do we already know (about how many victims suspected), in which stadium of exploration are we (first, second, etc.).
- Might add dangerous substances such as gasoline canisters etc.
- If the role of the infield is expanded (see below), then this would be perfect for ROMA's gaze machine. So the infield rescuer could wear the gaze machine of ROMA during the experiments.

- Operation room needs to be improved -> e.g., the TREX table needs standing up and turning away from UAV camera feed. This might also be improved by changing the roles and tasks (see next section).

Roles

- Decide on how the relation in scenario time is expected to be regarding UGV and UAV. So should the UGV run more than 50% of the time of the scenario? More? How much? What about the UAV?
- Infield rescuer:
 - o How much initiative may the infield rescuer take? Salvatore would like the infield to be more realistic, and suggests that the infield can suggest what would be interesting to see/do, as 1. the mission commander cannot see the site, and 2. the infield can only be at the perimeter. So if the infield could tell the MC that he sees a structure that needs to be investigated, and that he suggests to send a UAV, this would be more realistic.
- UAV pilot:
 - o What is the role of the UAV pilot? Either only WOZ for autonomy, or part of the scenario. If part of the scenario, then he should have TREX (for example fastened before him, carrying it). However, he would not have camera pictures of the UAV (see also section on MC).
- UGV operator:
 - o Make sure that the role of the UGV operator is clear to everyone: how independent may the operator act?
- Mission Commander:
 - o The mission commander (Salvatore) was too busy to be able to use TREX. Both Salvatore and Ivana said that it was difficult to do coordination of tasks and to 'steer' the UAV pilot. One way to solve this is to add the role of 'UAV operator', who would give the commands to the pilot and to interpret the camera feed. This would be closer to the envisioned situation of having an autonomous UAV – the UAV pilot would then be a WOZ and not part of the mission team.
 - o The new role of UAV operator would also make it possible for the MC to stand at the surface table (which wasn't used at all during NJEx), as he then would not have to watch the UAV camera feed.

Process

- Make one person responsible for the technical setup.
- For the EUE, prepare the MC well beforehand. It should be very clear what is expected and what the protocol is.
- Add a protocol for changing the UAV battery during the mission (how should this be incorporated into the mission, what needs to be started again (e.g., OCU of UAV?), how is this communicated in the team...).
- The list of applications that need to be started up at the beginning of the mission needs to be updated.

- Clearly differentiate between actions and 'ghost-actions' -> define clearly the system borders of the experiment. E.g., are system crashes part of the experiment, or do we allow for technical help to fix systems during experiment runs?
- Limit the number of people in the command room, and do not allow people to walk in and out.

Technical aspects

Observations:

- This is the first year, that the robots have different capabilities. For the EUE, we need to make a decision which robot we are going to use.
 - o Suggestion:
 - We will use an arm, as we haven't used it yet in the experiment.
 - We will have the victim detector -> this should be possible to have on the same robot! Only CTU has a thermocam, however, it should be easily mounted on any robot.
 - o Robot distribution:
 - Mission: TNO, DFKI, CTU -> As a consequence, we cannot use ROMAs robot configuration with the fixed camera (which is higher up) for the missions (the arm and the camera mount of ROMA are mutually exclusive).
 - All robots can be used for the task battery tests.
- The microphone on the robot was working (not via ROS, but via the TNO receiver).
- Internet had to be shutdown during the second mission (and was not started in first mission), so no pictures from the infield rescuer were visible. This seems to be a problem in either the setup of the integration into the system or general network limits. Salvatore improvised and let the infield bring him personally the pictures that he made in the field.
- The UGV operator of mission 2 (Ming) thought that the OCU worked well.
- The UGV operator (Ming) liked TREX, and believes it should get a larger role in the communication -> less walkie talkie, more TREX. Would also like more integration between TREX and OCU.
- The MC (Ivana) had difficulties to interpret the camera pictures of the UAV.
- In first run, audio from robot was not working, this Salvatore would have liked.
- Since there is only limited bandwidth available it was recommended to run the mission scenario with just one UGV. This would limit the amount of data traffic. Unnecessary use of the network will also have to be prevented during tests and runs. It might be possible to find a solution for the bandwidth problem in the long run, but it is too much work for now and this would take the focus away from our actual objectives. At the end-user evaluation, there will thus be NO FOLLOW-UP robot.
- Detector for radio-activity has been mounted on the ROMA robot, and the network has been tested. Tests have successfully been done that experts can get signals from the field. Thursday, a mission was done with the sources, and Salvatore was able to pinpoint the exact location of the source with the robot.
- The different capabilities were not fully integrated:
 - o On vision: victim detection is currently not running on the robot, because this interferes with data collection. It is possible to run it on a computer with the data

from the robot. Integration of data from Kinect thermocamera and laser is going to be done in the summer.

- Navigation: some aspects have been tested. As the terrain is quite difficult, for other aspects, the configurations still have to be tweaked.
- In the second mission, a spoken command was given (move forward), and Shanker as WOZ forwarded the command, and the robot moved forward for about 10cm autonomously.
- on TREX: the connection from the robot to TREX works. For the end-user evaluation, it is also planned to send data from TREX to the system.

Ideas:

- The interface, e.g., TREX, should alert the MC or operator if something relevant happens, e.g. a victim was added. It was difficult for the MC (Ivana) to keep track of changes.
- Add to TREX that it is possible to add a SUSPECTED position of a victim, e.g. if the infield rescuer hears screaming from a particular direction, but cannot see the victim.
- Give the robot the possibility to talk back to victims, e.g. attach a babyphone to the robot.
- It would be great to be able to communicate via TREX, e.g., go <here>, take a picture into <this> direction, etc.
- Have a light on the UGV for the tunnel.
- Make it possible to ask UAV pilot to follow the UGV. This was not possible because there was no line of sight between UAV pilot and UGV.