Toward Agent-Supported Situational Awareness in Disaster Response

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Motivation and Method

The **objective** of our studies is to gain an understanding of the current practices and technological state of the art of actual first responders in order to identify areas of interest for human-agent interaction and the design of human-agent collectives (HACs). More specifically, the main points we are interested in are:

- How is command and coordination communicated and accomplished during a Disaster Response event?
- What kind of technologies are currently used in Disaster Response and for what reasons/occasions (communication, collecting information)?

Two studies were carried out: one during a full scale training exercise of Urban Search and Rescue (USAR) responders and another during a series of command assessment sessions in the Fire and Rescue Service Department. The methodological approach used was that of naturalistic observation. Data collected was fieldnotes, photos, audio and video recordings where possible.

Fort Widley

This work uncovered ways in which a shared understanding of the situation at hand is achieved and communicated within and between the three levels of command (operational, tactical, strategic).

Various informational artefacts were found to be used to support this shared understanding as well to track accountability.
Physical artefacts such as the *Tag Check In System*, the *Table of Resources* and the *Sector Map* were mainly used for co-located information sharing.
Digital artefacts such as the *Virtual On-Site Operations Coordination Center* (VO) and personal mobile devices were mainly used to support distant information sharing.


Tag Check In System

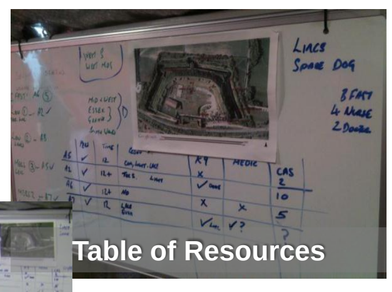
Table of Resources


Sector Command Tent


Sector Map


The VO

Command Assessments

This work explored further how command and coordination are achieved with respect to the gathering and sharing of information. Also, it investigated how is command currently assessed (tools and criteria).

Simulation assessment software
- Mainly underused
- Provides visual feedback (visual realism)
- Keeps timings (temporal realism)
- Visualising tool for Command Structure
- Keeps record of actions

Command Support Officer
- Key role in command and coordination
- Does communications with control and others
- Composes and sends informatives
- Debriefs incident commander about new information
- Executes/communicates operational orders on behalf of the commander
- Updates command structure, actions and the board
- Clarifies with incident commander
- Reminds and confirms actions that need to be done
- Queries/Clarifies with sector commanders/officers

Implications for HACs

The *Fort Widley study* revealed the importance of a well informed shared understanding of the situation at hand for all levels of response.

Further, a set of challenges with existing information management practices in Disaster Response were identified:
- Information Overload
- Information Accountability

Intelligent software agents may be realistically implemented to address these issues.
One example of such an implementation could be the integration of intelligent software agents in the VO system. This integration requires no additional hardware and does not conflict with responders existing practices and activities.

The *Command Assessments study* uncovered critical moments in the planning and decision making of Disaster Response as well as the key role of the Command Support Officer.
The distinct activities and critical features of the support provided by the Command Support Officer have the potential to guide the design of HACs but most importantly open a debate as to the nature of intelligent agents in general and to the nature of the human agent collaboration in Disaster Response.

Further, limitations and challenges were identified in the software infrastructure currently used for training and assessing command such as the running cost and a distinct lack of tailorability. Intelligent software agents can be envisioned to address these limitations and/or to act as co-orchestrators in simulation training exercises.