

CERMIT: Collaborative Training Technology for Emergency Response Management

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Introduction

Training and simulation in Emergency Response Management (ERM) has drawn increased attention from researchers and practitioners. For one year, van Laere et al. observed and evaluated exercises and real emergency incidents in a Swedish municipality. While their study showed that training and simulation are important in ERM, a good emergency management plan is not enough. *“People need to have experience of how to apply that emergency management plan and how to deal with unforeseen issues”* [1]. According to ERM experts it is crucial that those actors involved practice together. Hence, training must focus on coordination and communication, probably the weakest link in the event of an emergency. Our work is an initial step towards providing interactive training and operational tools for ERM actors.

Components of ERM Training

Central components of Emergency Response Management (ERM) are collaborative processes, information-flow, -sharing, and -prioritization. For ERM actors, the processes of reaching common ground, a Common Operational Picture (COP) [2], and a common understanding of the emergency situation are of key importance. We present a concept and a groupware system to support co-located and remote actors in organizational ERM training and work practice.

Crisis management training exercises tend to focus on information handling and decision making in major crisis scenarios. However, the most difficult and critical moment seems to be when discerning between irrelevant/harmless incidents and major crises upon the arrival of early signals [3]. In the case of a real event, a small well-trained task-force needs to make decisions based exclusively on the information at hand, supplied in the best case by units in the field. Access to and sharing of such information in a more intuitive and more in-depth way is crucial for the team. Typical challenges in ERM are multi-authority and massive human involvement, conflict of interest, and high demand for timely information. *“To support fast response during complex incidents, responders must make rapid coordination decisions,*

which pose constraints on their capabilities to analyze coordination problems and explore the solution domain” [3]. The arguments for staying with single-user devices (PDAs and PCs) in this field range from the consideration that good communication is enough, concerns about the latency and responsiveness of the tools, to issues with the cost and effort required to convert current systems or introduce new ones.

In current EMR work practice, the actors in an emergency situation rely on collaboration by means of phone or radio. Actors can be classified into two groups:

- Field units dealing directly with an emergency situation
- Members of the Management and Information Group (MIG) coordinating the actions of the field units

The members of the MIG engage in co-located collaboration to take – and maintain – control of the emergency situation. The field units rely on remote collaboration, partly among one another and partly with the members of the MIG, in order to solve the problem at hand. In such a setting, it is critical to achieve a COP and a common understanding among all the actors. We suggest that employing tabletop technology together with a system to provide live data from mobile devices can assist in this task.

The concept suggested here revolves around a shared geographical representation of the emergency situation. Each involved actor can contribute data to the representation to create a COP. Data of relevance ranges from field unit reports to headquarter commands. The goal of this project is to create a tool to better support information loops and situation awareness among ERM actors. Our prototypical system consists of a multi-user tabletop interface and mobile devices. The tabletop interface is based on the tracking of light pens. Changes made on the tabletop interface are reflected on the mobile devices and vice versa, realizing an information loop.

System Design and Realization

We have developed a collaborative system for ERM, partly inspired by a sub-set of six design guidelines – drawn from ten – for tangible groupware [4]:

- Use physical interaction handles as exteriorizations
- Assure coinciding action and perception spaces
- Support body motion and simple everyday skills
- Respect body-space, using less intrusive devices
- Support a clear binding between physical handles and virtual models
- Give visual feedback consistent with user expectations

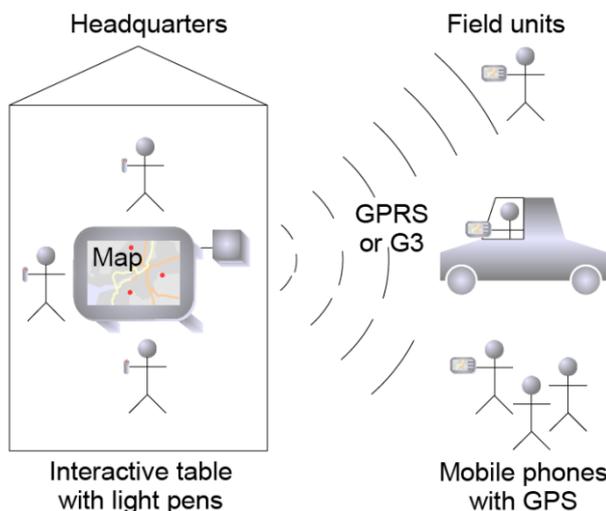


Figure 1. Experts located at the headquarters collaborate on a tabletop interface offering an interactive map. GPS mobile devices give field unit actors access to the same map as shown in the tabletop interface.

The development of the prototypical system involves an interactive tabletop set-up together with several mobile devices (Fig. 1). The COP is displayed, jointly authored, and edited by all connected actors with both device types, i.e. using a light emitting pen on the table (Fig. 2) or a stylus on the mobile device. Field units each operate a mobile device; experts at headquarters jointly operate an interactive tabletop system. The tabletop allows multiple simultaneous interactions by means of light pens. A geographical map with items representing obstacles, routes, and units is displayed on the mobile devices and on the table. Each device in the system receives updates on dynamic data such as unit positions or item modifications. This way, tabletop as well as mobile devices are able to take part in authoring the COP. As we believe that intuitive tools and the possibility to share information are crucial both for training and real sessions in ERM, we have designed a prototypical software system to work with alternative tabletop technologies. Here, the tracking of input devices on the tabletop is realized using the *Ortholumen* system [5].

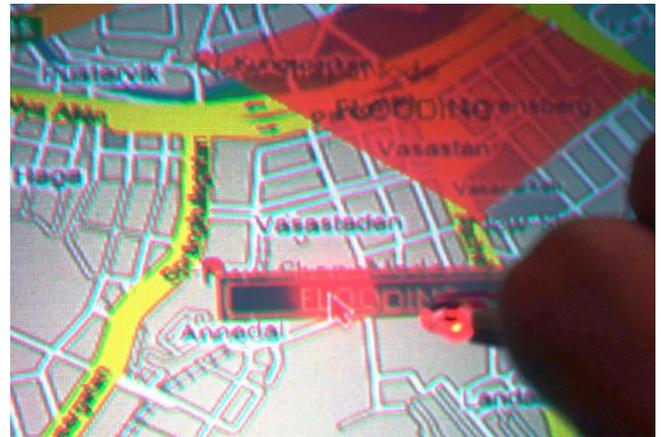


Figure 2. Flashing the Light Emitting Pen on the map spawns a menu to create and interact with the COP. While the main menu items are New Obstacle, New Unit, New Waypoint, New Route, and New ShapeNode, this image shows how an obstacle and a shape node are connected.

Summary and Ongoing Work

The project presented here aims to enable Emergency Response Management (ERM) actors to interact with geographical data in a more natural way. We conjecture that enhancing the ERM work environment with collaborative technology can increase the readiness and responsiveness in both training and real-life situations. Ongoing work focuses on improving the GUI. We anticipate adding multiple layers of information. Also, we are working on overcoming the limitations due to the single point of view perspective of the tabletop interface. Finally, we want to further investigate the use of unfocused laser pointing technology and experiment with existing alternative tabletop technology in order to evaluate the differences in coordinating different units.

References

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