HCI for Emergencies

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Abstract

Emergencies put people in a particular state of mind and often also in difficult physical situations. When designing information technology for emergencies, these two sides have to be taken into account in the various activities supporting design. This includes studying and understanding the users and the influential factors for good designs, engaging the users in the design process as well as evaluating designs in realistic ways. There are challenges specific to emergencies in all of these activities, as well as in new technologies ranging from wearable computing to distributed information systems. This workshop is meant as an opportunity for interdisciplinary discussion as well as practical hands-on exchange of experiences regarding these challenges. The goal is to work towards a better understanding of the challenges, technologies, practices, and design methodologies relevant to HCI in emergencies.

Keywords

HCI, emergencies, Emergency Response Information Systems (ERIS), CSCW, multi-modality, user-centered design, universal design.

ACM Classification Keywords

D.2.2: Design Tools and Techniques - Evolutionary prototyping, User interfaces; H.1.2: User/Machine Systems; H.5.1: Multimedia Information Systems; H.5.2: User Interfaces; H.5.3: Group and Organization Inter-

faces; H.5.4: Hypertext/Hypermedia; I.3.6 [COMPUTER GRAPHICS]

HCI for Emergencies

We use the term emergency in its broadest sense. Examples of emergencies include (but are not limited to) situations such as an apartment fire, an imminent heart attack or other life-threatening health vent, a hurricane or other disaster hitting a populated area, a panic during a large public event, a malfunction in an airborne plane, a search for a suspect after some crime has been committed. Moreover, we do not only consider professional emergency responders as our users but everybody who is involved in emergencies and may use information technology, including victims and any member of the general public.

Information technology can be useful in such situations to gather, process and communicate information, to increase users' situational awareness, to support collaboration among users [5, 6] and to improve users' decision making. Additionally, they can be used to train users for such situations. Technologies may range from mobile devices that support individuals to distributed information systems that support large groups, such as Emergency Response Information Systems (ERIS) [7].

The challenges for designing information technologies that effectively exploit this potential and provide usable and safe services in emergency situations are manifold. Here are a few examples:

- the physical environment may be adverse to the use of conventional information technology: e.g. hot environments full of smoke, protective clothing, …

- stress, emotions and cognitive load may make processing information [3] and operating devices particularly difficult: e.g. an ill elderly person may find it too difficult to read and operate a health monitor; users of an emergency response information system may have difficulties interpreting incomplete information, …

- the benefits provided by technologies (e.g. context awareness) might also engender undesired side effects: e.g. the ability to automatically locate people does increase safety but also reduces privacy, …

These and many other difficulties make designing good interaction with information technology for emergencies particularly difficult and prompt the need for new ways of user interaction that are specifically conceived for people who are affected by emergency situations [1] at the different possible levels. This includes for example mobile devices for the on-site work of operatives such as fire fighters and information systems for governmental agencies dealing remotely with alerting and informing the public or with the logistics of an evacuation.

Designing HCI for Emergencies

The properties of emergency situations explained above make designing good interaction with information technology challenging in different ways, prompting questions such as:

- What are the specific design challenges for emergencies? (available attention, (situational) awareness…)

- What constitutes good design for emergencies?

- Which technologies are particularly relevant? (ubiquitous and wearable computing, information systems, …)

- How can good designs for emergencies be achieved?

- How can designs for emergencies be evaluated?

- Which are the specific interaction techniques or guidelines that could be recommended for emergency situations? E.g. what kind of multi-modality, …

- Which particular aspects differentiate different kinds of emergencies and do they need specialized (possibly conflicting) principles and guidelines?

In the following we provide a few examples to illustrate these questions. A typical challenge for many emergency applications is that they are not used frequently but when they have to be used it must be possible to do so quickly and without error. Moreover, because of physical constraints, the design of specialized hardware may be as important as of the software. Another challenge is that the wish for safety often prompts conservative solutions thus making innovations difficult to achieve. A frequent principle for good design is that when systems malfunction they should degrade as gracefully as possible, that is they should deliver remaining functions as much and as long as possible, allow for fallbacks, and should, if possible, support recovery. Successful solutions often do not only consider the technology itself but also the operational procedures in which it is used. In fact, it is the socio-technical system comprised of the technology, the actors, the working procedures and the organization that is the subject of design in our understanding. To achieve such designs it is crucial in our experience to involve the prospective users in the design [cp. 4]. Maintaining such a participatory design over a longer time span is an additional challenge.
A principal problem with understanding the needs in emergencies and also with evaluating the suitability of a given technical solution is that emergency situations are difficult to observe and also difficult if not impossible to recreate completely for experimental purposes.

Nonetheless, it is only through such realistic experimentation that designs can reliably be evaluated. Techniques for recreating the user experience in emergency situations to be sufficiently close to reality to answer design-related questions is therefore a fundamental methodological challenge. Approaches for simulating emergency situations and the use of mobile information technology for living labs and (serious) games can help addressing this challenge [2].

Organisation of the Workshop
This workshop is meant as an opportunity for interdisciplinary discussion as well as a practical hands-on experience in designing innovative interaction for IT for emergency situations. To create a theoretical and empirical background and to collect challenges and possible design techniques from the group, there will be presentations from the attendants in the morning. Based on this shared information we plan to jointly identify 2-3 emergency situations with interesting design challenges to which the approaches available in the group can be applied. The organizers will provide supporting material for 2-3 emergency scenarios. Based on the submissions we will also ask attendants to bring materials related to their research. As such, the workshop will help learning about different approaches by applying them to concrete tasks and to better understand their respective usefulness.

The organizers intend to make this workshop a rich experience in studying and designing for emergencies. This can be achieved for example by simulating impaired vision by blindfolding someone, actually trying to crawl like a fireman during reconnaissance in a hot environment, performing some activities in a larger agitated group or under time pressure.

Audience and Expected Contributions

The workshop welcomes all contributions that are related to HCI for emergencies. This includes problem descriptions, solution descriptions and theoretical contributions (for example about reasoning under stress). Contributions may come from the industry, computer science, interaction and industrial design, usability, requirements engineering etc. on the one hand and emergency areas such as fire services, medical services, civil protection agencies etc. on the other.

The questions given above may help in identifying relevant contributions. In particular, we encourage the submission of articles on design techniques that have been used to design HCI for emergencies. Ideally, the participants would be able to bring materials required for their approach to the workshop to demonstrate their use and potentially have a small group of participants apply it to a given task. Equally important would be the attendance of problem owners from the emergency domain that could explain about their problems and evaluate the designs created during the workshop.

Workshop Goals

We hope to start a continuous discussion among the workshop participants on the different topics concerning HCI for emergencies in an online forum before the workshop and open this discussion to other interested parties after the workshop.

Further Information

Further and up-to-date information on the workshop, its structure and the organizing and program committee will be made available on a permanent web-page.

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