

Mobile Live Video in Emergency Response: Its Use and Consequences

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Crisis Informatics

Technology-driven change of organizations in general and society at large seems to accelerate at an ever increasing speed. There will soon be few places that are not covered by various novel forms of information technology services. This is also true for the emergency and crisis response domain. In the last 10 years, professional response organizations have invested heavily in information technology to provide better means to communicate and to stay updated in dynamic response work. Robust radio systems and new interactive map systems are in place for vehicle navigation as well as in command center environments, giving the response actors detailed information about locations, buildings, potential risks and available resources.

Now we also see the emergence of mobile live video solutions that allow professional response actors not only to tell someone about what is going on but also to really show what is happening on a specific location. These solutions are a consequence of the ongoing development and global diffusion of advanced consumer mobile devices. People in general can now broadcast live video at a low cost directly from their cell phones. Having live-video broadcasting capabilities on a mass-scale is both promising and perhaps disturbing. Someone might here add, "Yes, but we have had CCTV [closed circuit television] for a while so what is new about this?" Mobile live-video solutions differ in some respect quite sharply against previous fixed-video technology. By definition, *mobile* live video is mobile, which, in a response setting, means fundamental differences compared to fixed video infrastructure in terms of flexibility and availability. From now on, anyone can bring broadcasting capabilities to locations that were previously not covered. Having these capabilities embedded on user-friendly consumer devices and

particularly on cell phones means that in many cases they could be readily available when a situation of interest comes about.

A key consequence of this development is that almost any professional responder can now be equipped with an ordinary cell phone in order to capture events on an accident site and make these images available for higher incident management in command room settings. Studies of early adopters have shown that it is meaningful as well as appealing to be able to make the situation visible and to share aspects of the incident site with personnel in remote locations. These early explorations of live video use among response workers have been conducted using ordinary consumer cell phones with a dedicated, yet small, broadcasting application. When a user presses the broadcast button, the application connects to the Internet and starts sending a stream of pictures and audio. The video becomes instantly available on a protected website, often with the feature of having the video geographically positioned.

Mobile Video Use in Emergency Response Work

Studies of live-video use in response work shows that video broadcasting takes place in several of the core phases of response work. The following three examples illustrate typical use of video in response work.

On-route traffic situation update. The incident commander starts the video broadcast when the rescue unit is leaving the garage of the firehouse. Along the seven to 10 minute route to the accident site, live video and geographical position are instantly available for the command center operators as well as for senior commanders. The on-route video shows important aspects for the command center staff, allowing them to continuously update additional rescue units about the traffic situation and the need to identify alternative approach routes. If anything unexpected were to occur while on route to the incident site – for instance if the vehicle were to be involved in a traffic incident – this information would also be captured in the broadcast.

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Time-critical situation reporting. When the incident commander arrives at the accident site, the cell phone is released from its dashboard phone cradle. The commander then points the camera against the focal point of the incident, sweeps over the location and makes a quick situation report. The commander switches off the camera and puts it in a jacket pocket. A few minutes later, when the commander has a better understanding of the situation, the camera is switched on for yet another 40-second situation update. The short videos of situation reporting are instantly accessed at the command center to provide important material in order to maintain situation awareness. The video is also shared with collaborating organizations which allows, for example, the police to get rich insights of the evolving situation.

After-incident documentation. When the incident response is over and control is established, the incident commander picks up the camera and switches it on. The incident commander sweeps over the location and makes a few comments about what is left after the accident and what decision has been made to hand over the responsibility to the property owner. The incident commander mentions a few phone numbers and names as verbal memory notes for the after-incident reporting and paperwork that await when the commander is back at his office. The videos from this response operation are viewed that day by the incident commander to replay key phases of the response work.

Key Insights

An analysis of how video is broadcast and used among the early adopters in emergency response work in Sweden reveals a set of important insights. One that is perhaps surprising is the focus on providing short video sequences, enhanced by spoken commentary, ranging in length from 15 to 60 seconds. These very short and focused, though somewhat fragmented, sequences provide good insights into the situation. Long sequences provide less information of importance due to the greater attention span required to look and wait for important events. Incident commanders typically produce a set of broadcasts that have the effect of highlighting the progression of events over time in lengthy response operations. Sets of broadcasts can also be used to describe an incident site using different location perspectives. The archived video sequences have also opened a resource for asynchronous use – operators who might be occupied with other tasks can decide to delay the viewing of

a video to a later point in time. Such delayed use of video provides a simple mechanism that reduces the possibility that the operator may experience too many conflicting work tasks. Incident commanders give the use of consumer cell phones for broadcasting video high marks for ease of use. Cell phones are a well-known technology, which reduces potential end-user resistance that often develops when people are faced with yet another new technical device in their work.

Improved Situation Awareness

A key driver for adopting live-video technology in emergency response work is the ongoing trend to improve situation awareness. Situation awareness means in this context the ability to have a sense of control of what is going on and its implications on operative, tactical and strategic levels. Professional responders view the interpretation of the content and meaning of a video as rather easy compared to the interpretation of text or speech. Situation awareness can be generated by verbal communication as well as by environmental cues included in the video sequences. Videos can be used to describe complex aspects of the incident site in place of extensive verbal explanations. The videos enable what the early adopters perceive as objective reporting, not colored to the same extent by subjective interpretation of the situation. The objectivity of a broadcast video is, of course, highly disputable and signals a possibly naive understanding of the potential power embedded in video technology. In order to maintain situation awareness it also seems important to share video across the chain of command within the organization as well with external collaborating partners. Video sequences produced by one organization could be shared and become material for external actors' situation awareness processes. Having the same material, and particularly video sequences from an accident site, improves inter-organizational collaboration in dynamic situations.

Post-Incident Reflection

An interesting and perhaps positive effect of using video produced on the accident site is the value it may provide to formal documentation and learning. Detailed and rich descriptions of the specific location provide contextual cues to otherwise strict textual narratives of an emergency

response operation. Early adopters indicate that the ability to revisit specific video-based episodes of real response work is valuable when completing the formal incident report. Being able to view and analyze a specific episode in time, while knowing the final result of the response work, assists individuals in reflecting about their roles and actions. In this sense, one could assume that video might also be of value in order to provide material for group-based discussions as part of formal training and learning activities.

Ethical and Legal Concerns

A range of legal and ethical concerns designed to align the use of video within existing legal boundaries need to be addressed when it comes to using video as a tool in emergency response operations. A key question is how privacy protection should be handled when people and property can be identified in the video sequences. In addition, we must find a suitable approach concerning the storage and availability of video sequences for external collaboration parties. We must also ask ourselves whether it is okay to merge mobile live video data with other detailed and perhaps sensitive data available in the organization(s) data repositories. These questions focus on how existing legal boundaries must be addressed and taken seriously. However, one should also keep in mind that different countries and states could have significantly different legal constraints. Such differences mean that what might be acceptable in one country could be highly illegal in another. To make the situation even worse, most legal constraints have been defined and enacted based on an understanding of the technological possibilities that were plausible many years ago.

The ethical concerns involved in using video as a tool in emergency response operations is related to the sensitive situations that people are part of when accidents and disasters happen. Capturing suffering and injured people on video could be perceived as very negative if the underlying purpose is not evident. The possibility for misunderstanding means that any member of the response team must make a delicate decision between providing rich input to remote coordination centers while not jeopardizing the trust of the victims and bystanders onsite. We, therefore, envision a need for policy documents as well as individual and team-based reflection sessions where these ethical aspects are discussed. There might even be a need to outline some explicit sanctions

when someone is conducting any video broadcasting in conflict with the ethical aspects in a specific situation. As one could imagine, the ethical norms are highly flexible in these situations and fluid in relation to the dynamics on an accident site.

There are two significant trends that make video use as part of response operations highly complex. On one hand there is a strong movement to improve privacy protection in order to minimize government misuse of surveillance technologies. But on the other, we have people who, without hesitation, publish and share very specific and sometimes sensitive information about their private lives on blogs and in social media such as Facebook and Twitter. At this point we have limited knowledge about the general public's opinion about the use of video by professional responders as part of their response work. If this type of video use is seen as surveillance instead of as a tool for improved collaboration in time-critical response work, then it will soon be socially impossible for response personnel to further explore and use this type of technology support. However, if government authorities use these new technological possibilities in a socially responsible way, there might be possibilities for a closer collaboration between citizens and professional responders with co-production of video to improve response work. Individuals on or near an accident site could inform professional responders about developing situations and professional responders could give advice to individuals involved in immediate and improvised responses. The very idea of this form of radical video-supported response activity underlines the necessity of further exploration of the legal and ethical consequences arising in a fluid emergency and disaster context.

Final Remarks

Information technology and technological progress have changed the ways both society at large and emergency responders in particular operate and organize. New and powerful mobile devices and video broadcasting services enable novel methods of emergency management, as we now are starting to understand the possibilities of mobile video use in emergency response work. Even though novel services may bring many positive aspects, including improved documentation and situation awareness, the ethical and legal implications must also be considered. ■