

Crowdsourcing Information for Enhanced Disaster Situation Awareness and Emergency Preparedness and Response

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Abstract

In recent years, social networking services, such as Facebook, Google+, Twitter and Plunk, have played an increasingly more important role in disaster management. Past experiences with disasters such as major wildfires and floods have told us that when existing surveillance sensors cannot provide a surveillance system with sufficiently complete information needed for situation assessment, crowdsourcing information collection can be an effective solution: People armed with wireless devices and social networking services can be used as mobile human sensors. Eye-witness reports from them can complement data from in-situ physical sensors and provide the system with more extensive and detailed sensor coverage. During and immediate after a major disaster, people are likely report their observations, needs and requests via social networking services. The information provided by such reports, if processed and validated efficiently, can help to improve the responsiveness of rescue and relieve operations.

This presentation will discuss the challenges that must be overcome and solutions to be made available within the disaster management infrastructure in order to make crowdsourcing information collection and processing an effective tool and part of standard operating procedures for disaster preparedness and response. As an example, we note that a major limitation of using social network to explore disaster areas is the lack of coordination among volunteers. Without providing them with well-planned routes, some places may be visited by multiple people while others may not be visited at all. The collected information therefore cannot provide a comprehensive view of threatened areas. Repeated visits of some places will prolong the time required to explore the whole threatened area. More importantly, in some situations such as wildfires and severe storms, the volunteers may visit dangerous places in their exploration. Their mobile devices almost surely lack the capabilities for situation analysis and decision support. In these situations, the system not only needs to help volunteers navigate and report dynamically, but also continues to assess the threats to each volunteer so as to keep the volunteer safe. This presentation will describe the design of a crowdsourcing-enhanced emergency operation decision support system with these essential capabilities, as well as the underlying algorithms and message exchange protocol used to provide the system with these capabilities.

Challenges in using information from massive crowd to support rescue and relieve operations immediately after a major disaster arise from the fact that information regarding

the disaster tends to grow at an exponential rate and the validity and trustworthiness of information provided by individual reports are questionable. After a disaster, people who care about the emergency are likely to contribute to the information explosion in various ways. While some people report their first-hand observations, many others re-post, digest, organize, comment, or re-iterate the information they received via communication channels such as blogs and news programs. These activities shape together an explosion of information items which to some degree duplicate each other. As a consequence, the more the society cares about a disaster, the less efficient it is for people to read about it online in order to obtain a full knowledge of the emergency. The presentation will describe tools that can leverage crowdsourced human power to detect nearly duplicate information about a disaster and large number of reports containing partially duplicated information to assess the validity and trustworthiness of the information contained in them.

Keywords : Crowdsourcing, Disaster Situation Awareness, Preparedness and Response