Optimizing Mobile Social Media Interfaces for Rapid Internal Communication by Emergency Services

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ABSTRACT

Social media tools are seeing use in crisis situations. Authorities have recognized the value of such tools and are beginning to use services such as Facebook and Twitter to disseminate official information. However, the use of the social media concept as an internal, operational tool by emergency services is in its early stages. Current social media tools for mobile devices are of potential value, yet security concerns can render such systems unsuitable for operational use, and the user interface can hinder operational efficiency due to the inheritance of a text based model for input and display.

The research to be described is examining interaction methods that may improve the efficiency and usability of mobile device-based social media for operational use by police services. A Twitter like model for police activity reports can provide a means for enhanced situational awareness for police command authorities, and for individual officers or patrol units engaged in the "professional" media interchanges. The proposed model, SUMO, is based on a hybrid symbolic and text interface to rapidly enter status, integrated with geolocation, and sensor-based data to automatically capture key information, and thereby minimizing the amount effort required create a complete status update.

Keywords

Social media, situational awareness, symbolic user interfaces, human computer interaction, mobile devices, geolocation.

INTRODUCTION

Social media tools are seeing increasing use in crisis situations, ranging from terror incidents to civil unrest to natural disasters. From the Mumbai terror attacks in November 2008, to the California wildfires in 2008 and 2009, to the Haiti earthquake in January 2010, social media services such as Twitter[1] and Facebook[2] have proven to be a valuable source or realtime information from ongoing crises and incidents, as well as a lifeline for people caught hazardous and life threatening circumstances. Following the lead of the public, authorities have begun to recognize the value of such tools and are using services such as Facebook and Twitter to disseminate official information. The official channel can augment crowd sourced information and sometimes correct misinformation that has entered the timeline.

However, the use of the social media concept as an internal, operational tool by emergency services is in its early stages. Current social media tools for mobile devices are of potential interest, yet security concerns can render such systems unsuitable for operational use, and the user interface can hinder operational efficiency due

> **Reviewing Statement**: This paper represents work in progress, an issue for discussion, a case study, best practice or other matters of interest and has been reviewed for clarity, relevance and significance.

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[1]Twitter is copyrighted by Twitter, Inc.

[2]Facebook is copyrighted by Facebook, Inc.

to the inheritance of the text based model for input and display derived from the 140 character limitation of SMS text messaging.

Adoption of New Technologies

Police are likely to adopt technologies that improve quality and timeliness of information (Colvin & Goh, 2005). The TAM (technology acceptance model) model by Davis (1989) showed that police patrol officers may accept or reject new technology based on two factors: ease of use and usefulness. The study by Colvin and Goh introduces two new factors: information quality and timeliness. Their study suggests that the two new factors are the most important factors in accepting new technology by police patrol offices. The nature of microblogging services, where information is shared in real time, would appear to meet the timeliness factor. Less clear, is the information quality of microblogging services in the public sphere, and how the public or personal perception may influence acceptance of an authority limited microblogging service by patrol officers.

Tomsic and Suthers (2006) investigated how the introduction of a web-based discussion board changed the social network of a police authority. In their study of the Honolulu Police Department, Tomsic and Suthers observed that the introduction of an online discussion tool had significant effects on the social network and learning of officers. Their findings did not show an increase in collaboration frequency between participants. However, their results supported the hypothesis that there would be an increase in knowledge for participants who used the online discussion tool compared to participants who did not use the tool.

Usability of Police Technology

Today's police vehicles are host to a variety of communications systems, including multiple radios, mobile phones, GPS, and laptop computers (see Figure 1). In Finland, police officers, between patrol and station duties, may interact with up to 34 unique computer systems. Adding yet another technology to be learned and used, such as microblogging, makes usability of critical importance.

Figure 1. Interior of Finnish Police Van, showing multiple communication, computers, camera and GPS. (Image source: YLE)

Police technologies, however, being a collection of products from different vendors, often times adapted and grafted on to standard vehicle cockpits, present a mix of inconsistent user interface styles and methods. Marcus and Gasperini (2006) conducted a case study of the usability of an in-vehicle mobile communication system for the San Jose Police Department. In their study, which they termed a "case of non-user centered design," they identified numerous design failures, including the inability of officers to complete standard tasks, and processes, such as sending messages, that were overly complex and inefficient. Some aspects of the system, they report could cause serious levels of cognitive distraction.

CURRENT RESEARCH

To better understand how microblogging tools can support the operational needs of police and emergency services officers, we have undertaken the requirements analysis through interviews with emergency services organizations in Finland. Our findings are being incorporated into a prototype of a secure microblogging service called SUMO (Situational Updates from Mobile Officers). SUMO utilizes a structure not dissimilar from Twitter, in that registered users can submit status updates from mobile devices, and those updates are captured as part of an organization specific timeline. Command officers can monitor the complete timeline for all patrol officers, or select specific officers, locations, or incidents to monitor. In addition, command officers may issue updates (or replies) to specific officers or to the organization as a whole. Mobile officers can also elect to monitor specific events or locations. A final component of the system is the fusion between the internal professional media timeline and that of social media feeds, specifically where events reported by the public are of value in augmenting overall situational awareness.

The SUMO system model is shown in Figure 2. Based on a secure microblogging server, the system provides a shared timeline to record user events, whether from mobile units, command authorities, or dispatchers. Mobile messages are automatically geotagged, and include the equivalent of hash tags to indicate operational information. Command authorities may filter the timeline based on mobile unit, hash tags, or location. The follow model of Twitter is altered to the extent that any SUMO mobile participant can dynamically adjust following of other SUMO participants. For example, a patrol tracking a juvenile gang may elect to follow other patrol units responding to vandalism incidents.
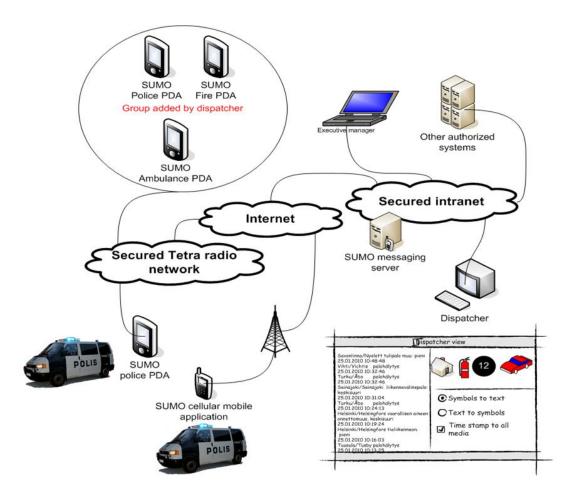

Figure 2. SUMO Overview

The key to the hypothesized operational benefit is the design of the officer's user interface. Status update text entry, such as in Twitter, can be a barrier to success for the police in-vehicle scenario.   Reliance on keyboard entry of text can result in errors, distraction, and delays. Text entry can also be a hazard in pursuit or other high risk/high vigilance situations. Sørenson and Pica (2005) in their study of mobile technology use by police officers identified five distinct rhythms, or intensities, of interaction. These rhythms of interaction were

influenced by the operational mode, such as standing by in vehicle, driving to scene of an incident, and taking action at the incident scene. Our approach in SUMO recognizes that the cognitive/attentional demands can vary throughout a patrol session for the officers and that the user interface itself should adapt so the required interactions are optimal for the user's expected state. The SUMO model is based upon gathering information from in vehicle sensors to determine such data as location, speed, pursuit (light/siren activation), combined with a physical keypad and virtual symbolic keypad for entry of standard status information. In addition, still imagery from vehicle cameras, and audio recordings, may be captured and transmitted as part of the status update. The in-vehicle user interface allows for basic views, situation map showing realtime SUMO updates, a sequential vertical timeline view of updates, and an update entry panel. At any point, the user may request a list or directory of officers and commands, and elect to follow/unfollow dynamically. All SUMO views will automatically update with the selected follows.

In some operational activities, automated status updates may be started, providing real time information at fixed intervals or when changes in vehicle parameters are detected. The updates thus provide situational information to command authorities and other officers while not distracting the officers from the task being undertaken (e.g., pursuit driving). During automatic mode officers may insert additional updates, either from a list of common update topics for the given operational activity, or direct messages using keypad and voice.

To illustrate how the user can view the SUMO system, an early design prototype of the SUMO user interface is shown in Figure 3. The map view itself indicates patrol unit status and location, as well as fusing public social media feeds deemed relevant, by command officers, to the policing task. For example, a local police authority may provide a public Twitter account for reporting suspicious activity, so that relevant public produced tweets may appear overlaid on the situation map as well. Like in Twitter today, officers and commanders may also elect to define keywords, locations, or hash tags from public social network services that they want to follow and include in the authority timeline and map.

Figure 3. Prototype SUMO Vehicle Interface Map View, showing current updates and fusion with Twitter update sent to Police.

Symbolic communication interfaces can provide a rapid, direct selection method of creating messages from a limited lexicon. People with speech impairments have relied upon augmentative communications technology which permits a user to construct spoken utterances by selecting from a set of symbols representing common everyday tasks and interactions. This form of technology has advanced significantly by moving from specialized hardware devices to mainstream products such as the iPod[3], which, when combined with augmentative

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[3] iPod and Apple are trademarks of Apple Computer, Inc.

communications software, becomes an icon driven tool for creating spoken utterances (Sennot and Bowker, 2009). The iPod itself relies heavily upon a visual symbol model for selecting apps, with rapid browsing and easy selection of desired functions.

The design and rationale of icon-based interfaces has been extensively studied in the crisis response context (e.g., Fitrianie &Rothkrantz, 2004; Fitrianie, Yang & Rothkrantz, 2008) and provides strong support for selecting a symbolic interface. Sullivan (2009) is conducting research on a symbolic interface to Twitter that will allow individuals who are not literate, or have cognitive impairments, to communicate via the service.

Selecting a symbol lexicon for police patrols is complex, though manageable if structured to correspond to operational activity, or context, such as on patrol, in pursuit, traffic stop, investigative stop, etc. We believe this approach is supported by our own observations of operational behavior and the research of Sørenson and Pica (2008).

CONCLUSION

Social media tools have changed the way information is disseminated, providing real time, and raw, snapshots on situations ranging from the mundane to the catastrophic. As a tool for situational awareness and information sharing, the value of this technology is of significant interest to police and emergency service organizations. We believe the research on the SUMO model described in this paper will contribute to our understanding of how social media technologies can be adapted to police and emergency services organizations. Of particular importance in SUMO is the perceived and actual usability of the system in the operational context of the police vehicles, and the resulting user acceptance of social media technology.

ACKNOWLEDGMENTS

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