Research Article

Use of Micro Blogging Services in Mass Emergency Situations in Different Countries

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Abstract

This paper presents how people use the Micro blogging (MB) services in emergency situations, and proposing a methodology for investigating if and how cultural differences affect communications broadcasted by people who were on the ground during emergency events. This paper addresses issues of the attributes in micro-blog posts generated during different emergency situations, and the recent political incidents in Syria, Libya, and Egypt are examined, analyzed, and studied in depth detail. The current investigation, approach and methodology were described. The method will help to build for the future awareness detection in social networks. MB services through Social Networking (SN) sites by people in different countries are a common communication channel.

Keywords: Micro blogs, Social Networks, Situation Awareness, Cultural Differences.

Introduction

Today, people are able to access information about the world in ways and speed never before possible (Liang, 2008). Through web search, through automated notifications to mobile phones, or via social networking sites, retrieval of information can be up-to-the minute (Castilo et al, 2011). As Social Networking (SN) technologies become more pervasive, they are affecting the way we access, seek, and provide information (Java et al, 2007).

Micro Blogging (MB) is a the latest form of communication in which users can describe

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their current status in short posts distributed by instant messages, mobile phones, email or the Web (Flanagin and Metzger,2000). MB offers ways to retrieve, produce, and spread information. It is a form of blogging that allows users to send brief text, updates, or micro media such as photograph or a video clip (Hofstede and Minkov, 2008). Those MB services that allow individuals to construct a profile within a bounded system, select a list of other users to whom they share a connection, and view and traverse their list of connections and those made by others in the system, those MB services are known as social live networks (Jain and Mingyan, 2011). For example, Twitter is a popular social live network that has received much attention recently. An important characteristic among social live networks is its real time nature (Hofstede and Minkov, 2008). For example, in twitter users can know how other users are doing and often what they are thinking about now (Hofstede and Minkov, 2008). Because of its growing ubiquity communications rapidity, and cross platform accessibility, MB services are being considered as means for emergency communication which are also MB MB seen as place for harvesting information during a specific event (Java et al, 2007).

In today's SN, a situation is a reflection of the phrase "every citizen is a sensor" (Stephens, 2011). Stephens (Stephens, 2011) demonstrated a real example here by referring to Australia-Queensland floods 2011. Queensland Police Service (QPS) created an avenue for people to provide information that can be more easily monitored by response personnel. They have done this both with their twitter

account, by establishing and using hash tags that were widely adopted during the flood and the current cyclone, and by creating a robust Facebook page. Just by reading through the comments on the QPS site, you get a sense of how people can provide situational awareness information directly to you (Stephens, 2011). It is clear that valuable information is broadcasted in different MB services that can provide indicators into critical situations if captured and analyzed in depth in proper time intervals from when the event occurred. There is still no efficient methodology to extract or define situations from this real-time source of information. Moreover, it is still not clear on how different cultures are adopting to this new shift in the use of social networks and how cultural differences will affect this process.

Goals

The adaption of MB services by people from different countries has produced high level of user-generated information. So much information is now broadcasted during emergencies that are almost impossible for human to effectively find and analyze without the interference of technology to help. The current research was divided into three stages. In this paper, the first stage will be introduced in which data from different countries will be collected from different MB services during specific emergency events. This data will be analyzed in order to help develop a situation awareness detection methodology. This detection methodology will be the key to automatically detect future micro blogs that are broadcasting information related to emergency events. The next stage of this research – which is not covered in this

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paper - will include monitoring users' behaviors through specific events and addressing specific cultural issues in regards to that. And the last stage of this research will be to define how differences between blogging from different countries can be successfully used to enhance the awareness of mass emergencies.

Micro-Blogging

MB is a relatively new phenomenon defined as "a form of blogging that lets you write brief text updates about your life on the go and send them to friends and interested observers via text messaging, Instant Messaging (IM), email or the web "(Java et al, 2007). MB is one form of social media that is being quickly adopted. It offers ways to retrieve produce and spread information; the nature of that sharing has a lifecycle of information production and consumption that is rapid and repetitive (Vieweg et al, 2010).

MB as a term is related to social networks. Social networks are considered one of the most popular and impactful concepts in the last decade that was built using modern information technology (Jain and Mingyan, 2011). In social networks, each person could be presented as a node that has connections of various kinds with different individuals. Each node is connected to at least one node. If node 1 is connected to node 2, and node 2 is also connected to node 3, then node 3 and node 1 are semi-connected through node 2. In social networks, this means that micro blogs broadcasted by node 3 will be accessible by node 1 and 2. Social network sites typically share three common elements. They allow individuals to "construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system"(Lampe et al, 2006).

Lampe et al. (2006) studied the uses of the social network "Facebook" amongst University students and identified two main uses: social searching (i.e. connecting or investigating offline contacts) and social browsing (i.e. seeking new contacts or connections). Social searching, i.e. the maintenance of social connections, was the most popular activity (Liang, 2008). Social browsing was epitomized by the need to share one's identity with likeminded others, to investigate new people and to surf through the social network (Liang, 2008). In the last few years, social networks use has shifted from having users updating their blogs once every several days to several times in a single day (Microblogging, 2012), this resulted in the appearance of a new use for social networks which is the live reporting of events (Microblogging, 2012). Those events might be of social nature such as parties, games, protests but they might also be of disastrous nature such as tsunamis, earthquakes, storms, etc. This "situational" update information, which is broadcasted by people through certain events, is defined as "situation awareness" through those MB services.

The real time nature of the micro blogs is what makes those "situation updates" so valuable. Those micro blogs propose a source for an event notification system in which people are the reporters or in other words in which every citizen is a sensor for any event. A real time example for a those

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situation updates is the case of the recent Egyptian uprising in which pro- democracy supported used twitter to build momentum to force the president of the country to resign. During the uprising it was noticed that twitter was used as a vital and important tool to keep the whole world updated specially that the Egyptian government tried to block the foreign media from covering the uprising events. Another example here is the recent Japanese earthquake. During and at the early hours following the earthquake, information micro blogs were broadcasted from different people all over the country. It was even proved that the earthquake was first reported on the social network twitter before USGS even registered it (Microblogging, 2012).

Users of social networks have started emphasizing events in the form of micro blogs and status updates; this means that an efficient database of events is being created (Messinga, 2007). This database of events can be – if harvested and analyzed properly and on time – a valuable source of information in many situations.

Situation Awareness

It was a common belief and might be still in some communities that trained fire fighters, paramedics, policemen, and professional are the people who are responsible for responses to emergency situations. However, in recent years, a small but rapidly growing body of literature has revealed the potential of the citizen-driven emergency response (Castilo et al, 2011).

A situation is defined as "an actionable abstraction of observed Spatio-temporal descriptors" (Hofstede and Minkov, 2008). This situation might have participating agents, passive factors, products, and a location space/time. Situations such as demonstrations, earthquakes, traffic jams are visible in real life and can be followed up through MB services. According to Takeshi et al. (Microblogging, 2012), those situations have several properties: they are of a large scale, they influence people's daily life, and they have Spatio-temporal descriptors.

To develop situation awareness for an event, micro blogs from users during certain emergency events need to be examined and analyzed. Micro blogs related to an emergency event will mostly include mentions of this targeted event. For example users who are blogging a situation such as a hurricane will publish micro blogs such as "hurricane" or "strong wind". However, users might be also blogging things as "attending hurricanes best practices for first aid lecture". Another example here is users may publish micro blogs related to a tsunami such as "tsunami" or "high waves". Those

keywords might be a key to identify an event but at the same time there are users who might be publishing micro blogs that have those keywords but do not mean to mention an emergency event for example " sad to watch the news about a tsunami in Japan".

Moreover, there is a type of micro blogs, which will refer to a real event but is not a real-time event. For example, "last week tsunami in Japan was scary". It is clear that it is necessary to clarify that a micro blog is referring to a real-time event before trying

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to connect to other micro blogs in order to create awareness for an emergency situation.

In one of the situation awareness cases in Australia it did not take more than one "tweet" to create a situation for a major bank, which required direct interventions. The story started when a two line twitter post pushed by a Commonwealth bank customer was published online. The post said: "Commonwealth Bank CBA missed up our loan approval so we are still waiting to exchange contracts". User was contacted after one hour and seventeen minutes by the head of the commonwealth bank service team offering him some help to solve his mortgage problem (Godfery, 2009). Another example here is the Chinese Sichuan earthquake, which occurred in, may, 2008. The earthquake affected a large geographical area with almost 70,000 people confirmed dead and hundreds of thousands injured. MB services became a major place for people to share information, express feelings and opinions, and exchange mutual support and it was amazing to notice this have improved the emergency response of the government and the whole society (Qu, 2008).

A development of situation awareness through MB services can be used in the future to inform and update both public and organizations of mass emergencies, and help them both to act and react to real time data that represents an occurring event. While there was a general understanding of the situation, awareness was as a concept driven by MB services. However, a methodology to detect emergency situations on a real-time basis has not been developed yet. Moreover, the way in which different cultures react to situations through MB services and the factors that affect this reaction have not been examined and analyzed to date.

In the next section, an overview of the body of literature that has examined the development of MB services will be presented.

Related Work

People trust the Internet as a news source as much as other media (Castilo et al, 2011). In the United States of America USA, Internet is considered the most important source for news among the people under the age of 30 and second only to television in the case of general audience (Castilo et al, 2011).

Among online news sites, blogs are considered less trust worth than traditional news sites. A survey in 2005 showed that even among young people, blogs are seen as significantly less trust worthy than traditional news sites (Castilo et al, 2011). However, recent evidences show that public seeks out information from all available sources in the immediate post-disasters time period to make sense of the situation regardless of whether the source is considered by authorities or not (Liang, 2008). At the same time, citizens use all type of information communication applications (especially social media) available at the time to contribute valuable information for authorities (Liang, 2008).

User of MB services and other media tools is a widespread but still evolving phenomenon in both everyday and emergency situations. Many researchers

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have analyzed micro blogs data, but the analysis was typically performed without differences between cultures. However, when culture differences are mentioned in any work, there is the masterpiece that must be mentioned. That is the Hofstede frames work in which cultures were rated based on different dimensions. While for cultural effects on micro blogs, it is still an evolving area and no work has become a masterpiece as Hofstede framework. There were different research works such as the work by Castilo et al in which an analysis of information creditability on twitter was performed. Also, a study by Viewag et al (Stephens, 2011) focused on communication broadcasted by people "on the ground" during specific emergency events such as Oklahoma grass fires and tried to identify information that may contribute to enhancing situational awareness.

Existing research concerning social media use in emergencies include studies of twitter use for earth quake prediction and early warning (Vieweg et al, 2010), studies of community responses to Sichuan earthquake in China (Liang, 2008), and studies of twitter communications across two disaster events that took place in the US: The Red River floods and the Oklahoma grass fires (Stephens, 2011).

Most of the research works agree that so much information is now broadcasted during mass emergencies that will be very hard for humans to find and process in a reasonable time that is enough to react. To abstract useful information from the broadcasted micro blogs, methodologies need to be built, implemented, and tested in order to achieve this goal (Verma et al,

2011). According to Verma, 2011), to ascertain a "situational awareness", a state of understanding the big picture during times of danger is required. For example people require the knowledge of fire location or flood levels, among other details and this specific information is sometimes communicated via MB websites but finding it can be a very time consuming process.

According to (Verma et al, 2011), several recent studies on micro blogs and social media fall into three main categories: modeling the topic (semantic content), modeling the sentiment within the micro blogs, and modeling the amount and character of subjectivity represented in micro blogs. On this paper - as part of this ongoing research - the focus will be on the category of analyzing the "semantic" content of emergency micro blogs and classify them on this basis.

To help detect situations in a real-time basis from different MB services, a real time "classification" needs to be applied in order to classify or filter micro blogs that are pointing to a situation or an emergency. In the next section, an introduction to the ongoing analysis of this research will be presented. The first step will be to find a method to "classify" meaningful micro blogs in order to build a model for classifying those micro blogs.

As mentioned above, in order to filter information that are related to situation awareness, micro blogs content need to be analyzed in order to come up with a way to classify those micro blogs that have information related to a situation. The first stage of this research is to collect five sets of micro blogs that are related to five different

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events. Classification method will be applied to those five sets. First stage will be to classify the micro blogs into English and non-English micro blogs. Once micro blogs are classified into English and none English, another level of classification will be applied to clear micro blogs that contain links, and finally another level will be applied in which replies will be also filters. The reason for those levels of classification will explain in the next section.

When the micro blogs are initially classified, further analysis will be applied to the final data set, which will contain micro blogs that contain efficient information about emergency situations. The objective will be to find a paradigm or some sort of similarities between those micro blogs that will help to build a situation awareness detection methodology. Once a method to detect "situation awareness" micro blogs is developed, this method can be used to automatically detect micro blogs in different emergency situations within different cultures. This in turn will provide the source of testing base required to study the effects of culture differences on those micro blogs.

In the next section, the data sets collected for the purpose of this research will be demonstrated and the initial analysis stage will be explained.

Analysis

Micro blogs that contribute to situational awareness are micro blogs that include specific or general information that will demonstrate details about a situation. An approach will be presented on this paper for helping locate or filter micro blogs that are related to a situation.

Experiments and Evaluation

A large-scale micro blogs were collected for the purpose of this research. Almost 1500 micro blogs per day were collected randomly from three world hot spots in which mass situations where happening. The three spots are: Syria, Egypt, and Libya. Those datasets were collected using the following search terms: Syria, Egypt, and Libya. The reason for choosing those three countries is the volatile nature of micro blogs that come from those countries and the intense amount of information on those micro blogs, which will provide a good source for analysis.

Moreover, further two datasets were collected. The objective this time was to look for two general terms and not specific as the first three data sets. As a result, two data sets, one for the event earthquake and the other for the event tsunami were collected.

After the data was collected, an initial content analysis was performed on the collected data sets. In a country like Syria, where the authorities prevented the foreign media from entering the country or submitting a live coverage from inside the country, the analysis of the collected data provided an interesting level of information about the up rising in the country. It also gave more details about the casualties, and the authorities reaction to this up rising once reflected into maps. The same concept was applied to the other specific sets: Libya and Egypt.

On the other side, on the contrary to the terms: Syria, Egypt, and Libya which were expected to produce micro blogs that came from a certain country or area, the terms

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"Earthquake" and "Tsunami" were general terms that had no limit to a location or area. Having the "Earthquake" and "Tsunami" general data sets was a key to have more of general data sets rather than local sets which are presented on the other three data sets.

On the next section, the way those data sets were collected will be demonstrated. Note than the collection of the data started on the 31st of October 2011 and is expected to end on the 31st of January 2012.

Collecting Micro Blogs

Two applications were used to collect data for the purpose of this ongoing research. The two tools are:

Monitter: Monitter is a real time online twitter search tool that enables the user to monitor a set of keywords on twitter. It also allows the user to narrow the search to a particular geographic location, allowing the user to find out what's going on in a particular part of the world (Monitter, 2011). Monitter" was used to follow the latest trends and hot topics on twitter, which then used by the next application as a search criteria for micro blogs to be downloaded for archiving and analysis purposes.

Archivist: Archivist is a tool that allows the user to retrieve up to 1500 results of keyword search and to export this list into excels sheets or xml files for further analysis. The search will only go back in time for a set amount, usually around 3-4 weeks (Archivist, 2012). Archivist was and is still being used in this research to download a daily set of data that contains micro blogs

related to the up listed search terms: Syria, Libya, Egypt, tsunami and Earthquake. This tool is being used on a period of ninety days.

At the end of the ninety days period, four data sets will be archived. Each data set will contain around one hundred and thirty thousand micro blogs. As mentioned earlier, to identify micro blogs, which contain information that might be referring to a situation, a method to classify those micro blogs is required. This method to classify those micro blogs on the basis of their meaningful information related to a situation will be addressed in a classification model. As we are investigating the characteristics for a model to detect situations on real time basis, the classification model need to be applied, trained, and generated from micro blogs quickly. Most of the work during this research was performed using static sets of data (did not reflect real time events); this was not a problem for this research. The offline data sets are being used to test and generate rules to abstract situations. Once such a classification model is built, it will be applied on real time data in order to test the detection of real time situations.

Currently, the development of a classification model is being based on ontology of "events" and their related annotations. For example, on the event of an earthquake the term "earthquake" is most likely related to an event of an earthquake but in some micro blogs, the term earthquake might not be mentioned but the micro blog is still referring to an earthquake event. To explain this, let us take the following micro blog as an example: "I don't know what is going on, the ground is shaking". This micro blog does not have the

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term "earthquake" but if it was published on the event of a micro blog then it must be referring to an earthquake. As a result, in this model of classification, in addition to the ontology of terms, other information will be required such as the "location" where that micro blog was published and "date and time" in which that micro blog was published on who is the "person" who published that micro blog, and lastly the set of other keywords that will accompany the event and will refer to it either directly or indirectly.

An event might have actively participating agents, passive factors, products, and a location space/time (Microblogging, 2012). Collecting more data about an event will help in classifying that event as an emergency situation or not. To sum this up this model will be based on the following characters: "What", "Where", "When", and "Who". The "What" is refereeing to the ontology of events as in what event is reported in the micro blog; the "Where" is referring to the location where the micro blog was published; the "when" is referring to the time when the micro blog was published; and the "Who" which is referring to the person who published that micro blog.

Currently a set of steps is being applied to the daily data sets in order to help further classify them. The first step, which is the ontology of events, will be described in the next section, where some pre-classifications are currently being applied to the micro blogs in order to help classify events on those micro blogs.

Language of Micro Blogs

To start with analysis it was noted that within the five data sets, the data collected were from different countries and some of them were English language is not the official spoken language. The first approach towards this collection of data was to "pre-classify" the sets to English and non-English micro blogs.

The focus of this research will be on the micro blogs written in English language. To build a classification model to help detect emergency events, ontology of semantics will be required. As a result, the decision was taken to work only with English micro blogs for this research. The statistics of this ongoing classification will be presented in future work submissions.

Once the data sets are classified to English language and non-English micro blogs, another classification will be required to more efficiently filter the micro blogs. This time the classification is going to be dependent on the content of the blogs. This classification will be explained in the next section

Responses in Micro Blogs

It is argued whether a response micro blog that is written as a response to another micro blog will not have event information. During this classification, it was noticed that most of the reply micro blogs couldn't be considered an event or situation awareness micro blogs. It comes from the fact that situation awareness micro blogs usually provide important Spatio-temporal information about an event. Moreover, situation awareness micro blogs usually represent an effort by the user to ring the alarms or ask for help when a specific

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situation is happening.

It is expected that this will be a less complicated task to classify those micro blogs either manually or through automatic filtering. Those response micro blogs contained the "@" sign or the "RT" keyword. The "@" sing in micro blogs is used a symbol that is preceding the mention of a username. While the "RT" is a keyword to forward another tweet or micro blog and it is generally followed also by a username. The outcomes for this classification on the five data sets will be presented in future work.

Once the response micro blogs are removed, the next step will be to filter the micro blogs that had links on them.

Linked Micro Blogs

As the methodology of classifying micro blogs as to whether they contribute to situational awareness is based on the content of those micro blogs, the micro blogs, which have links to websites, will not be analyzed. They will be considered un-necessary for the purposes of this research. A quick filter will run on the five data sets to determine whether they contain links or not. The final outcome of this filtering will be presented in future work.

Event versus Chat Classification

While performing the still going classification on the data sets, it was notices that every micro blog that have a mention of an event did not actually provide emergency information or indications of situation awareness. This had lead to the next stage of classifying micro blogs as micro blogs, which has "event information",

micro blogs that did provide a level of "situation awareness", did provide information about the event, and did not express personal opinions or thoughts.

Trying to come up with a methodology to detect situational awareness, the search started for some sort of paradigm or a common behavior on those micro blogs. It was noticed that most events under monitoring came with conjunction with keywords within the micro blog itself. For example Syria events were usually accompanied with keywords such as blood, bullets, dead, demonstration. Earthquake event did come usually with keywords such as shaking or moving. This lead to the idea of building ontology that is based upon keywords.

The data sets were based on specific keywords that did not necessary represent an emergency event. However, the current monitoring of the classified datasets indicated that situational micro blogs usually appear to be accompanied with specific other keywords, which provided a level of emergency. It was more of the $(A \wedge B)$ query, where A is the event that is being monitored and B is a keyword that is associated with the key word A on the case of an emergency situation. For example: in the following micro blog,

"the house was shaking, I think we just had an earthquake".

In this blog if earthquake is the event and shaking is the keyword, then the conjunction of A and B $(A \wedge B)$ is (Earthquake $\wedge$ Shaking). It can be even expanded to make B become the disjunction of a set of Key words (B C D E F). Ontology

of keywords and related terms that help specify emergency situations is currently under construction. The outcomes of this piece of work will be presented in future submissions.

Conclusions

We investigated classifying micro blogs based on language, responses, and links helped to filter the micro blogs and provide more effective sub data sets that can be studied. The study on those sub sets is progressing toward building ontology of keywords that might be the key for the acquired methodology. The proposed methodology will help the analysis on the complete data sets in communications through the social networking. It is necessary to explore and investigate the data sets will continue more deeply in order to come up with more classification methods that can be applied to the data sets. Once the mythology will be implemented and tested, the work will shift into investigating the user's similarities and differences while MB in certain emergency events. Finally at a later stage the ways to use cultural differences to enhance MB during emergency situations will be examined. This paper study will help to build a situation awareness detection methodology in social networks. It was shown that simple classification methods, which are currently applied to collect data sets, could help build this methodology.

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