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# A Real -Time Event detection and Notification using Social Media

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**ABSTRACT***:* Social media is getting increasingly important nowadays. Due to the widespread usage of mobile devices, people can document whenever and whatever they want in several modes (i.e., pictures, videos or text). Social media gives an opportunity to communicate the current situation to other people or to emergency agencies even when mobile phone or emergency lines may be overloaded. New opportunities arise to use this platform to detect events and extract crucial information about the scope and nature of that event. A major challenge for the extraction of event information from social media is its unstructured and noisy nature. In this paper, in order to detect and describe the real time event, the 5W (What, Where, When, Who, and Why) model is proposed. Firstly, users of social media are set as the target. Secondly, the spatial and temporal information from the social media are extracted to detect the real time event. Thirdly, a notification is sent to users along with GIS based annotation of the detected event. Our model can grasp new events, the location and the time an event becomes bursty. The proposed method is evaluated with case studies. The results show the accuracy and efficiency of the proposed method by detecting real time event in Twitter.

**KEYWORDS:** Event detection, Emergency event notification, social network.

## I. INTRODUCTION

Social media network is used by millions of people around the world to socially connect to their friends, family members, and coworkers. Twitter is one such micro-blogging service. Since Twitter is widely adopted today and permanently accessible it is very well suited for event detection. A Tweet is a status update message, often used as a message to friends and colleagues which is limited to 140 characters. A user can follow other users, that user's followers can read his/ her tweets on a regular basis. Since its launch on July 2006, Twitter users have increased rapidly. The number of registered Twitter users exceeded 30crores in 2016. The service is still adding about 6,000 users per day and currently, 4 lakhs tweets are added every minute.

An important feature of twitter is its real-time nature. Twitter users write tweets several times in a single day. Users can know what other users are doing and what they are thinking about now. Several important instances exemplify their real-time nature, in the case of an extremely strong earthquake many pictures gets transmitted through Twitter. People will thereby able to know the circumstances of damage immediately. In such a manner, numerous update results in numerous reports related to events. They include social events such as parties, cricket, games, and political campaigns. They also include disastrous events such as storms, fires, traffic jams, riots, heavy rainfall, and earthquakes. Actually, Twitter is used for real-time notifications to help during an earthquake or fire emergency or live traffic updates. This paper presents an investigation of the real-time nature of Twitter that is designed to ascertain whether we can extract valid information from it. We propose an event notification system that monitors tweets and delivers notification promptly using knowledge from the investigation.

In this research, first we browse through numerous tweets related to target event. Second, we propose models to extract events from those tweets and estimate locations of events. Finally, we send notification to users in that location by displaying a GIS based annotation.

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## II. RELATED WORK

Initially Event Detection was based on prior user queries. Fung et al. [6] proposed to first identify the bursty feature related to the user query and then organize the documents related to those bursty features into an event hierarchy. In [7], a user specifies an event of interest using several keywords as a query. The response to the query is a combination of news feeds and emails that are sufficiently correlated and collectively contain all query keywords within a time period. The proposed work is also related to event detection using click-through data [8]. Event ranking with user attention is reported in [9] where the events are firstly detected from news streams. User attention is then derived from the number of page-views (collected through web browser toolbars) for all the news articles in the same event. Leskovec et al. [10, 11] proposed the method for outbreak detection based on cost-effective function.

Recently, with the high speed development of the social networks such as Twitter, research has been going on for using this big data for targeted advertising , marketing , localization of natural disasters, and predicting sentiment of investors . Sakaki et al. [4] investigated the real-time nature of Twitter, and its use in event detection. The twitter users are regarded as sensors. Their messages are used for detecting earthquake. A reporting system is developed for use in Japan by their proposed methods. Unfortunately, automatically detecting and resisting real time urban emergency events using social media is not that easy. First reason being, the huge volume of the social media data. Processing and analyzing is a challenging job. Checking for redundant and incorrect information is necessary. Second is the high Velocity of data moving in and out is faster than that of analyzing and processing them.

## III. PROPOSED METHODOLOGY

The proposed model aims at extracting and analyzing the information from social media. The social network can be seen as a sensor. And social network users can be seen as social sensors. The proposed model is set as a hierarchical data model including three different layers. The different layers of the proposed method are illustrated in Figure 1.

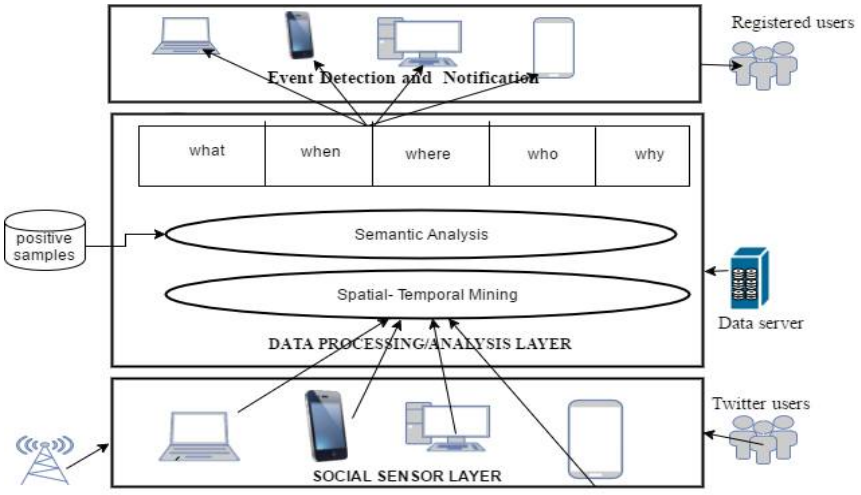


**Figure 1: Three Layered architecture model**

(1) **Social sensors layer**. In this layer, we collect data related to real-time events. The social network such as twitter can be seen as a sensor receiver. For example, if a user makes a message in twitter about a fire occurrence. Usually, social media provides API for downloading the real time data.

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(2) **Data Processing/Analysis layer.** In this layer, basic elements like what, when, where, who, and why of the proposed 5W model are extracted from the sensing data of the social sensors layer. Knowledge base and positive samples of the event are implemented in this layer, which are used for improving the accuracy of this layer.

(3) **Event detection and notification layer.** In this layer, the detection and description of the event is notified. Of course, the spatial and temporal information of this event is also given. A GIS based description of the detected event is shown.

The 5W model provides five basic elements of an event, which is summarized as follows.

(1) **What**. The most important element of the proposed 5W model is to detect what happened in the urban environment. For example, if a user posts a message in Twitter about a fire occurrence, the proposed 5W model must detect that real time event. Besides the short text provided by Twitter user, multimedia data such as images and short videos can also be got. For example, a user may upload the real time image of a fire when he sees it.

(2) **Where**. Besides detecting what happened, it is needed to reveal the location information of the event. Fortunately, social media services have become a location information platform of users. Stefanidis et al. [18] reported that approximately 16% of the Twitter feeds in their experiments had detailed location information with it in the forms of coordinates, while about 45% of the tweets they collected had some geolocation information at the city level. The check-in information can be used as the location information of the event.

(3) **When**. Twitter has a very good real time feature. Each Twitter message has a timestamp, which can be used for revealing the occurrence time of an event.

For example, at the beginning, the number of Twitter messages about it may be low. When someone posts it on the main websites as headline news, an event may be in an outbreak state. So many social sensors talk about it. Of course, at last, an event may be in a decline state. The number of Twitter messages about it may be low again.

(4) **Who**. Social sensors may act as the witness of an event since they are at the place of the event. For example, when a Twitter user takes a picture of a happening fire event, he can be seen as the witness of that fire. Besides the witness, some people act as the participator of the event. For example, a person may be participant in a riot.

(5) **Why**. An event requires an immediate reaction or assistance for emergency situations. Hence, it is important to collect the reason after the decline of that event. The upload message by social sensors may reveal the reason for the event. For example, a Twitter user may post a message “OMG, I saw a car crash a man who cross the red light”. The message posted by witness or participator can be used to investigate the potential reason of that event.

A set of queries Q is created for a target event. Example, we set S = {“earthquake” and “shaking” or “tremors”}. We set s as 3s. We set conditions as N positive tweets come in 10 minute for a particular event. The location information of each tweet is obtained by the check-in information. Once a new event is detected notification is sent to users. In case of emergency events an e-mail or sms alert is sent to registered users.

Algorithm to detect an event is as follows:

1. A set of queries S is used to extract a target event.
2. Compare query S with the tweets T for every s seconds.
3. For each tweet t, obtain features when, what, who, where and why.
4. If N no. of tweets are generated (ex. 10 tweets in 10 minutes) for a query S then proceeds to step 5.
5. Declare it a new event E and notify all registered user.
6. Check if the target event is an emergency event, if yes Send alerts SMS/ e-mails to registered users.

**The Case event:** We select an “earthquake” event happened in 07:20 at Bangalore”. The proposed 5W model is used to detect and describe that event.

**What**. Five concepts about the “earthquake” are used to search in Twitter from last 24 hrs.. The search location is set as Bangalore. Among all the messages returned a few messages has check-in information and images. These can be used to detect another four elements (When, Where, Who, and Why).

**Where**. The spatial information extracted from messages. The location of the “earthquake” is annotated by the red circle in the map. The uploaded images of the users are shown along with the annotated user. The uploaded images show the different condition of the “earthquake” event.

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**When**. It is noted that the first appearing time of these messages is 07:25, which is only 5 minutes later than the appearing time of that "earthquake" event. The starting timestamp of that event using the proposed 5W model is 07:25.
**Who**. In the "earthquake" emergency event, witnesses who upload the image can be mined from the messages. In this case study, 21 users who post the valid messages can be seen as witness of the "earthquake".
**Why**. The message with high number of forward or posted by official users is prone to reveal the reason. Also, if the message is posted by the witness, it is more likely to say the reason. In this case, no reason can be mined.
**Image**. The image is very important in case of emergency events. The real time image of an "earthquake" can help firemen or disaster management authorities to know the condition of the situation.

## IV. CONCLUSION

In this paper, the real-time nature of Twitter is used to detect events. Each Twitter user is considered as a sensor, and detection of an event is based on sensory observations. Semantic analysis was applied to tweets to classify them into a positive and a negative class. Check-in or GIS information is mined to get the locations of events. The tweets are from people who witness or participate in an event. Thus, this model is a novel approach to notify people promptly of any events happening around them. In case of emergency events and disasters this service could help the disaster management agencies, and government bodies like Fire department, Police department, etc., to act swiftly, thus minimizing the loss of life.

In the future, we plan to analyze the temporal sequence of the tweet set from a single location to determine whether multiple problems on the same location are the result of a single event, or relate to multiple events.

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