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Tweet Alert: Effective Utilization of Social Networks for Emergency Alert and Disaster Management System

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Abstract - ***Disaster Emergency Management and public safety requires an effective disaster alert system to mitigate the seriousness of disaster. The existing disaster alert system was static so it delays in locating the disaster place and there was no way to take immediate rescue process to save the people. In this paper the social network is used as an emergency network and it is used by the users to post their tweets, the tweets that are posted in social network site through system and mobile users about disasters and they are integrated through easy interface for effective communication. Mobile Ad-hoc network (MANET) is used for the effective communication in place of disasters which is infrastructure independent. The tweets are analysed and if it reaches the threshold value an emergency alert is sent as SMS and E-mail to the registered tweets as well as to the nearest rescue team by analysing Disaster related Keywords and Location Keywords.***

Keywords*: Emergency Network, Disaster alert, Mobile Ad-hoc Network (MANET), SMS or E-mail.*

1. INTRODUCTION

Disasters are ranging from earthquakes, Tsunamis, landslides, Droughts, Wars to Technical or Human-made disasters. In disaster areas people may suffer from life threatening environment impact or economic loss. To mitigate the disaster happening functionality of communication during disaster response should be ensured. Emergency network [2] should be built for disaster response. It can rely on mobile social network which is popular on smartphone users. This provides computing resources and location awareness services.

Mobile Ad-hoc Network (MANET) is a self-configured wireless ad-hoc network of mobile nodes, each node act as a router or switch [14] connected by the wireless communication. An important characteristic of ad-hoc network architecture is its organization can change due to movement of devices. The node exchange information without the need of pre-existing network infrastructure. When Disaster happens the electricity and telecommunication networks may be damaged and Internet access is no longer available. To solve this problem infrastructure-less network should be used. MANET has the characteristics including dynamic topology, infrastructure independent suitable for emergency services.

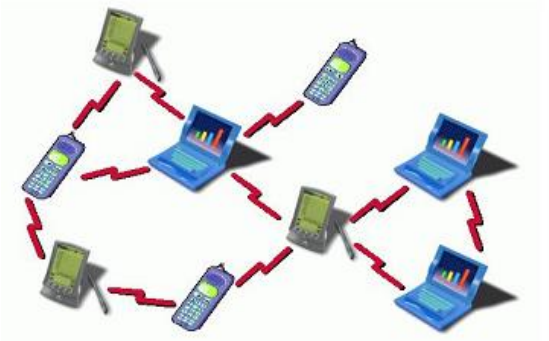

Fig -1: Mobile Ad-Hoc Networks

This paper develops a disaster alert system using the social network for emergency alert and disaster management system using tweet alert. The users post their tweets through system and mobile devices, the tweets are integrated through easy interface. Easy Interface is used for effective communication between two devices. The tweets are integrated and analysed; Disaster related keywords and location keywords are used to identify the tweets which act to identify the location so that emergency support can be given to the needed people via SMS or E-mail. An emergency alert is sent via SMS or E-mail to the registered tweets as well as to the nearest rescue team. The rest of the paper is organized as follows. Section II is the literature review. Problem Background is elaborated in Section III. Then the Proposed model is given in Section IV. Section V and VI describes the algorithms and techniques for effective information retrieval and to analyse the tweets. Composition of Modules is described in Section VIII.

2. RELATED WORKS

There are lot of studies on Disaster alert and response system. X.Haovi proposed BASA for local interactions among devices [1] and people communicate effectively, BASA lacks in scalability. Cong Liu implements E-net for emergency response, in this static analysis [2] delays in emergency management. Jin-Yun Xue developed emergency support to the sufferers through [3] service agents, delays in functioning of rescue wings Internet of things are needed. Horio-Nicolia proposed usage of social media [4] to search about disaster happenings, it delays in emergency onset. G. Katkar implements wireless mobile nodes [5] that can freely allow people to communicate with no-pre-existing network. E. Aoki proposed a study about disaster prevention by combining social networking service and smart phones, in this no alert system is proposed [6]. Y. Yue developed an architecture to support social interactions [7] which had constructed under higher cost. B.Nicolai implements Disaster Management Communication System (DMCS) [8] by gathering information from people and emergency response team, in this it delays in communication and alert system. Peter Simmons proposed a model which uses social media to identify the happening of disaster [9]. K. Post implements nation-wide infrastructure for emergency network in higher cost [10] and the disaster alert system using social network is effective for disaster alert system. J. Rana describes a context-aware social networking applications for communication [11] the social network for communicating for tweet posting which locates the disaster place. B.Liang proposed that smartphone technologies are used for effective communication in disaster response [12]. Hung – Chin Jang Communication is carried out by the MANET [13] which is used also in proposed model. M. Ahmed described a effective usage of infrastructure less network [14]. Rob Procter describes detecting rumours in social media, if the rumours are spread among social network [15] it is proved that within few hours whether it is rumour or not.

3. PROBLEM BACKGROUNDS

There are several disaster alert and response system which was not dynamic. When a natural or man-made disasters strikes a metropolises immediate alert should exists to the nearest rescue team. The alert system does not provide a dynamic analysis in locating the disaster place. The cellular network fails when a disaster strikes, the local wi-fi access fails in communication and Internet access is no longer available so it takes more time in sending alert to the nearest rescue team. The disaster response delays in locating the disaster place and the loss rate will be increased. Static analysis delays the existing in Emergency Management.

The social media so far is used for monitoring the mitigating the disasters [4]. It helps users to communicate the damage of disaster and discuss what really happened and express emotions of sadness. Smartphone applications for social network have become popular now for disaster response. It is useful for both rescuers and people to communicate using smartphone.

4. SYSTEM DESIGN

In this paper Disaster alert and rescue system is improved by Dynamic analysis. Effective utilization of Social network [1] for Emergency alert and Disaster management system is carried out by the tweet alert. The users post their tweets by computers and mobiles, the tweets posted by both devices are integrated and analysed through Easy interface. Easy interface is used to communicate efficiently by providing a strong interaction for various applications. It is a point where two things interact, where a device or program enabling a user to communicate with computer.

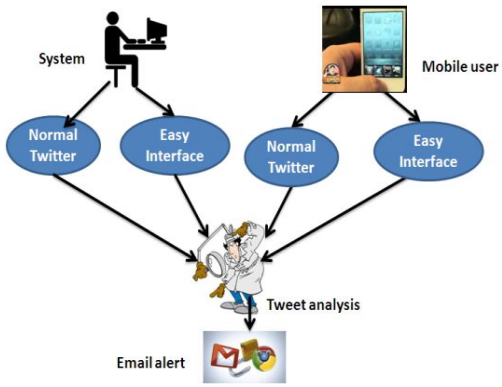

Fig -2: Disaster Alert System

Disaster related keywords and location keywords are used to identify the tweets which act to identify the location so that emergency support can be given to the needed people via SMS or E-mail. Disaster related keywords are inbuilt in the system and location keywords are identified by the tweets posted by the users, the tweets are classified and analysed by the threshold value. As the threshold value increases an emergency alert is sent via SMS or E-mail to the registered tweets as well as to the nearest rescue team.

5. ALGORITHM FOR REDUCING THE SIZE OF INDEXES

5.1 STEMMING ALGORITHM

Pre-processing is the initial process in Text mining. Stemming is a process of removing suffixes and prefixes from words to arrive at the base word. It is important step in Natural Language Processing and Information Retrieval tasks. Stemming algorithm are used to transform the words in texts into their grammatical forms. There are several techniques available in stemming. Manual Stemmers lack in accuracy to overcome this automatic stemmers are used The stemming algorithm is used to improve retrieval effectiveness and reduce the size of indexing files.

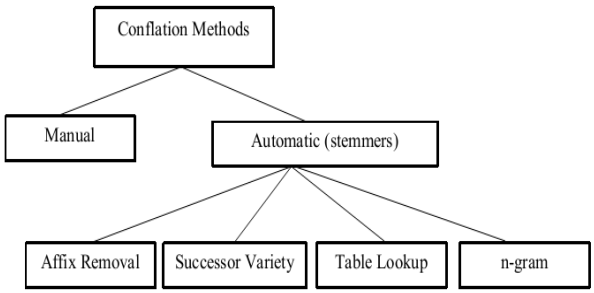

Fig -3: Types of Stemming Algorithm

5.1.1 AFFIX REMOVAL

Affix removal algorithm removes the prefixes and/or suffixes from terms leaving the stem, eg in the word " disagreement", one prefix "dis" and one suffix "ent" is present. If the root word is found after stripping suffix/prefix or both then the system will store the root word. Table 1 shows the affix removal.

Table –I: Example of Affix Removal

Word	Length of original word	Prefix	Suffix	Result	Space occupied for result in memory
Unhelpful	9	Un	Ful	Help	4
Dangerous	9	...	ous	Danger	6
uncomfortable	13	Un	able	Comfort	7
Antibody	8	Anti	...	Body	4
uninteresting	13	Un	Ing	interest	8

5.1.2 SUCCESSOR VARIETY

Successor Variety stemmers use the frequencies of letter sequences in the text as the basis for stemming. It determines word and morpheme boundaries based on the distribution of phonemes in a large body of utterances. The successor variety of a string is the number of different characters that follow it in words in some body of text. The successor variety of substrings of a term will decrease as more characters are added until a segment boundary is reached.

Test Word: READABLE

Corpus: ABLE, APE, BEATABLE, FIXABLE, READ, READABLE, REAFING, READS, RED, ROPE, RIPE.

Table -2: Example of Successor Variety

Prefix	Successor Variety	Letters
R	3	E,I,O
RE	2	A,D
REA	1	D
READ	3	A,I,S
READA	1	B
READAB	1	L
READABL	1	E
READABLE	1	(Blank)

5.1.3 TABLE LOOKUP

Table lookup store a table of all index terms and their stems, so terms from queries and indexes could be stemmed very fast.

5.1.4 N-GRAM STEMMERS

Association measures are calculated between pairs of terms based on shared unique diagrams. Similarity measures are determined for all pairs of terms in the database, forming a similarity matrix, once such a similarity matrix is available; terms are clustered using a single link clustering method.

Eg,

Statistics => st ta st ti is st ti ic ca al

Unique diagrams = at c sic is st ta ti

Statistical => st ta at ti is st ti ic ca al

Unique diagrams = al at ca ic is st ta ti

5.2 STOPWORDS REMOVAL

Many of the most frequently used words in English are useless in Information and Retrieval and text mining these words are called stop words. There are many followings comes under stop word category such as Prepositions, conjunctions, articles and so on. These words have extremely high term frequency in English. Typically there are about 400 to 500 words, for an application an additional domain specific stopwords list may be constructed. Stop word removal improves efficiency and effectiveness and reduce the indexing file size.

6. TECHNIQUES FOR ANALYZING THE POSTS

6.1 SUPPORT VECTOR MACHINE (SVM)

SVM Analyse Data and recognize patterns used for classification and regression analysis. A support vector machine is a algorithm for the classification of both linear and nonlinear data. It transforms the original data into a higher dimension, from where it can find a hyper plane for data separation using essential training tuples called support vectors. SVM classifies [15] positive (rumourous) tweets and negative (non-rumourous) tweets. Regression describes the relationship that predicts the value.

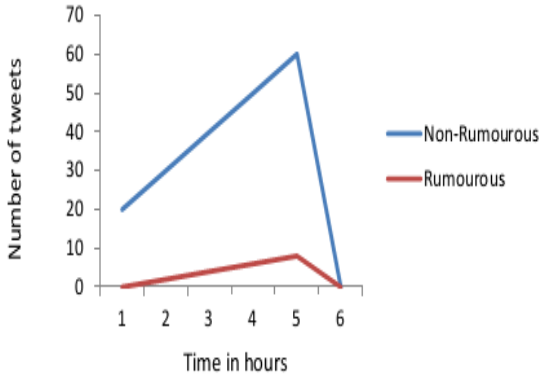

Chart -1: Estimation of non-rumourous vs rumourous tweets

The tweets are been posted by the users the tweets can be rumour or non-rumour, it is analysed within few hours and the value is predicted.

6.2 NATURAL LANGUAGE PROCESSING (NLP)

Natural Language processing (NLP) is a field of computer science, artificial intelligence and computational linguistics concerned with the interactions between computers and human (natural) languages. As such, NLP is related to the area of human-computer interaction. It is concerned with grammar (Clauses, Phrases, Words) in any natural language. NLP is concerned with Named Entity Recognition (NER), Information Retrieval (IR), and Information Extraction (IE).

6.2.1 NAMED ENTITY RECOGNITION (NER)

In NER given a stream of text, determines which items in the text map to proper names, such as people or places, and what the type of each such name is (e.g. person, location, organization).

6.2.2 INFORMATION RETRIEVAL (IR)

IR is concerned with storing, searching and retrieving information. It is a separate field within computer science, but IR relies on some NLP methods. Some current research and applications seek to bridge the gap between IR and NLP.

6.2.3 INFORMATION EXTRACTION (IE)

This is concerned in general with the extraction of semantic information from text. The semantic words in this project represent the location words.

6.3 MAP REDUCE

Map reduce process large data sets with a parallel and distributed algorithm on a cluster. The input and output are stored in Distributed File System (DFS). The information are stored in multiple servers the map reduce is useful for extracting the output. In this input is specified by the user and the map reduce function is suitable for semi structured or unstructured data, it is useful for processing and generating large data sets. The output is the key, value, pairs. The map function performs filtering and sorting function and reduce function performs summary operation.

7. COMPOSITION OF MODULES

This system consists of four main modules: 1.Application Creation 2.Server 3.Extracting the Keyword using Particle Filter 4.Automatic Alert to Rescue Team.

7.1 APPLICATION CREATION

In this module an application is created to tweet with friends. For creating an Application, Advanced Java Concepts like JSP and Servlets is used. While creating the application, assign the design fields like Username, Password, Phone and other information. Once the created the user is allowed to enter the data. Also the server will store the data and allow the user to enter in to the chat application. The User will enter the tweets through this application.

7.2 SERVER

Server is used to verify the user information and allow the User to Tweet with their friends. Also the Server will analyse the contents user. So that the server will extract the Keywords. Also the Server will be retrieving the user information like Access time and location which is used to find the User's location and can provide the any necessary help to them.

7.3 EXTRACTING THE KEYWORD USING PARTICLE FILTER

The Server will analyse the Tweets between the Users and the extract the Keywords using Particle Filter. The Particle Filter will the extracts the Keywords and filter the other words using the Stemming Algorithm. By using the Stemming algorithm filter the unwanted words in the chat so that it is useful to calculate the extracted words counts. So that an automatic SMS alert to the Rescue Team is generated.

7.4 AUTOMATIC ALERT TO RESCUE TEAM

In this module SMS alert and Email to the rescue team is sent once the Maximum Peak of the extracted Keyword is attained. To generate an SMS alert will include the Java Archive file called "JSMS " and will get the Rescue team's information in via Coding. So that the SMS will be generated. For Email Alert it is generated by the email using Email Coding and it will be send to the Rescue Team via Internet. For sending an SMS will connect the Nokia PC suite configured mobile via Data cable with Server. This Nokia PC suite configured mobile will transmit the SMS to the rescue team.

8. RESULTS

Proposed Efficiency: Many people suffer from disasters which are occurred due to natural or man-made disasters. In this paper Disaster alert and management system is developed using the social network. A tweet is posted through system and mobile users about the disaster happening and it is integrated through easy interface, these tweets are been analysed by the disaster related keywords and location keywords, and an emergency alert is sent as SMS or Email to the people and to the nearest rescue team.

FUTURE ENHANCEMENT: In addition, some related future works needed to be followed: 1). Further analysis the performance of the disaster response service. 2). Searching for the value-added application domain of Mobile Community Networking Service. 3). Take experiments with practical disaster crisis to validate in the real world.

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