Disaster Information Management System

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Abstract—For management of different kinds of disaster situations government needs an efficient technique to discover, collect, organize real time disaster information for preparing crises management and disaster recovery plan. In this kind of situations Data management becomes very crucial for government of any country. The proposed system can help for discover, collect, organize, search real time disaster situation information and help the person who gets affected by disaster. The proposed system can give important guidelines for recovering from disaster situation. The system implemented Disaster Situation Browser that runs on mobile devices of users who wants to recover from Disaster situations. Data mining and information retrieval techniques help impacted communities for understanding disaster situations and methods used by communities for recovering from these situations. Information extraction can integrates input data from various information sources. Information summarization technique can generates summarized view of information with different levels of granularities. The proposed system model supports dynamically generating query form as well as information dashboard based on user feedback. By analyzing various techniques of information management the Disaster information management system is implemented most sufficient one for managing disaster situation information.

Keywords— Data mining, Disaster information management, dynamic query form, Information Extraction, Information summarisation, user recommendation.

I. INTRODUCTION

Disasters are as old as human history but the dramatic increase and the damage caused by them in the recent past years have become a cause of national and international concern. ‘Disaster’ is defined as a crisis situation causing wide spread damage which exceeds ability to recover. Thus, by definition, there cannot be a perfect ideal system that detect or prevents damage, because then it would not be a disaster. It has to suffocate our ability to recover. Only then it can be called as ‘disaster’. The disasters often differ in quality of damage caused or in quality of the type of medical consequences. Disaster management is the discipline of dealing with and avoiding both natural and manmade disaster. It is the discipline of dealing with and avoiding risks. This discipline involves preparedness, Response and Recovery in order to lessen the impact of disasters [3]. Though some safety measures, these disasters could be avoided to some extent.

Disaster Management Cycle includes the following stages/phases:

1) Disaster Phase: This is the phase during which the event takes place. This damage/loss may be that of human life, loss of property, loss of environment or loss of health.

2) Response Phase: This is the period which is immediately followed by the occurrence of the disaster. In this situation, all individuals respond to the disaster, but in their own ways.

3) Recovery Phase: This is the phase when victim actually realize the impact of disaster. It is the phase when all medical help has arrived and people have settled from the advertises of the event.

4) Risk Reduction Phase: During this phase, measures are taken so that in case of next disaster the extent or impact is lessened. This process of making the impact less severe is called “Mitigation”.

5) Preparedness Phase: This phase basically involves development of awareness among the population on general aspects of disaster. This includes education on warning signs of disaster, methods of safe and successful evacuation and first aid measures.

For better disaster planning and recovery there should be need of both public and private sector participants work together to deliver right information...
to right people at right time. Research is also necessary for collect, manage, present, and find, disaster information. In the United States, the Federal Emergency Management Agency (FEMA) has recognized the importance of the private sector participants as a partner in addressing regional disasters. The State of Florida Division of Emergency Management has created a Business and Industry Emergency Situation Support Function designed to facilitate logistical as well as relief missions in affected areas through information sharing and collaboration among group of people.

The efficiency of sharing and management of information plays vital role in the business recovery in a disaster [2]. Users are eager to find valuable information to help them understand the live disaster situation and recovery status. Deep study of the hurricane disaster information management domain has revealed two interesting yet crucial information management issues that may present similar challenges in other disaster management domains.

The consequence is that the efficiency of communication degrades once critical networks are disrupted by the disaster and people may not have alternative paths to transfer information from one resource to another. For example, once power is disabled and uninterruptable power supplies fail after a hurricane, computational and networking equipment will get fail unless preventive measures are taken. However, using a fuel-consuming generator is not always possible. Another issue is the large volume of disaster situation information.

Reading and assimilating situational information are very time consuming and may involve redundant large volume of information. For multiparty coordination in disaster situation, the technique that is capable of extracting relevant information from recent updates, delivering that information without any irrelevance are needed.

II. RELATED WORK

Depending upon task and scale of participating agencies the approaches and tools that are used for information sharing becomes vary. A Disaster Management Information System developed by the Department of Homeland Security is available to county emergency management offices and participating agencies to provide an effective reports/document sharing software system. WebEOC[6] and E-Teams [7] used by Emergency Management departments located in urban areas, can access multiple resources for commercial purposes.

The RESCUE Disaster Portal is a web based portal for emergency management as well as for disseminating disaster information to the public. The National Emergency Management Network allows local government to share resources and information about disaster needs with group of people. The Puerto Rico Disaster Decision Support Tool is an Internet-based tool for disaster planners, responders, and related officials at the municipal, zone, and state level for access to a variety of georeferenced information from different locations.

GeoVISTA [8], facilitate the information distribution process in disasters situations. GeoVISTA monitors tweets to form situation alerts on a map-based user interface according to the geo-location associated with the various tweets. Such a system applies geographic information sciences to scientific, social, technical and environmental problems by analyzing geospatial wide spread data. The primary goal of these systems is message routing, resource tracking, and document management for the purpose to support situation awareness, demonstrate limited capabilities for automated information aggregation, support data analysis and mining.

III. DESIGN CHALLENGES

Following are the key design challenges for disaster information management System. Effective method for capturing status information: participants can update status information through many channels, including email, mailing lists, web pages, press release and conference calls. It becomes desirable to capture status information as it becomes available. Users should be able to update status information via unstructured documents such as plain text, Adobe PDFs, and documents. It is necessary to identify the useful information in the documents.

Summarization of information: There is need to form summarized view to support understand situation from reports. Multidocument summarization provides user with tool to effectively extract important information of current disaster situation [1]. Information delivery using intelligent method: Data collected from different data sources. During disaster situation users don’t have time to find the information as they want. Structured information can help people for making decision. A tabular interface can help people to filter useful information by adaptively changing query conditions and user feedbacks [1].

User recommendation technique: Users should be able to update status information via unstructured documents such as plain text, Adobe PDFs, and documents. It is necessary to identify the useful
information in the documents. Finding the recipient to which a certain type of information conveyed can improve efficiency of communication. User recommendation technique can automatically and interactively generate recipient for different kinds of information [Fig. 1].

To address the fourth challenge, for community discovery, we adopt spatial clustering techniques to track assets like facilities, or equipment, which are important to participants. For user recommendation, we use transactional recommendation history combined with textual content to explore the implicit relationship among users. The geo-location of such participants can be organized into dynamic communities and these communities can be informed about events or activities relevant to their spatial footprints [3,4].

Web-based prototype information Network that is able to link participating companies into a community network, provide businesses with effective and timely disaster recovery information, and facilitate collaboration and information exchange with other businesses and government agencies. Disaster situation browser system can run on android mobile devices [Fig. 3]. Both systems can help people to discover, collect, organize, search, and disseminate real-time disaster information.

IV. PROPOSED METHODOLOGY

Entity and Relation Extraction from Reports:
By using method of entity and relation extraction system need to extract information in the form of entity, triple, time, status which reveal the status information of entity with respect to time [9]. In this methodology information on one event is described in one sentence.

**Entity Extraction:** The system can perform sentence segmentation for each report,

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P(Y/X) = \frac{1}{ZX} \exp \left( \sum_{k} f_k (yi−1, y_i, X) + \sum_{l} g_l (yi−1, y_i, X) \right)
\]

where \( ZX \) is the normalization constant, \( f_k (yi−1, y_i, X) \) is an arbitrary feature function over the entire observation sequence and the states at positions \( i \) and \( i − 1 \), while \( g_l (yi−1, y_i, X) \) is a feature function of the states at position \( i \) and the observation sequence; and \( \lambda_k \) and \( \mu_l \) are the weights learned for the feature functions \( f_k \) and \( g_l \). The system can use local lexicons and POS tags, and dictionary composed of existing entity names present in database [5].

**Relation Extraction:** To generate triple by connecting entity with time expression with status label the system can train a multi category machine to classify each pair to proper category.

Dynamic Console and query form: when the disaster happens the large volume of information comes from different data sources. At that time it becomes necessary for system to provide a condensed view of information to user for quickly explore recent news and updates [Fig. 1,2]. For that system uses Content Recommendation Engine [1,10].

**V. PROPOSED SYSTEM**

Information is collected from different data sources. Depending upon the behaviour of data sources they are categorised in two types: Static data sources and Dynamic data sources. Static data source include historical data information. Dynamic data source includes situation reports, ongoing operations, goal and objective of operations, recovery efforts, reports crawled from web sites, real time traffic status of vehicles etc.
The people those get affected by disaster can use disaster situation browser system for recovery from the disaster situations. The persons who have operational and functional responsibilities can also depend on disaster situation browser system. They relying on mobile phones for maintaining communication, update status and situation information. Consumers too fill convenient for sharing information about themself and what is going on live. System consists of presenting the system to emergency managers, business community persons and other stakeholders for feedback and performing community exercises. The system is used not only to share the valuable information but also to pursue complex tasks like business planning and decision making [1].

VI. CONCLUSION

The Disaster Information Management system is going to address four key design challenges which will occur in disaster situations. The system systematically integrates the data collected from different data sources. The data collected from different sources are present in unstructured format. Disaster information management System organize that data in structured format. The structured data is shown to the end user in compressed format so that it becomes easier for obtaining real time disaster situation information. Disaster information management system gives important guidelines to the person who gets affected by disaster. Disaster information management system help to both private and public sector participants for recovering from disaster situations and it helps to prepare an action plan for recovering from the situations. The disaster situation browser system help community people to automatically crawl related information from public resource include news portals, blogs, and social media. The system evaluation results show the efficiency of proposed approaches.

REFERENCES


