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A PROPOSAL FOR EMERGENCY EVENTS GOVERNANCE USING MULTIPLE SENSORS AND 3W MODEL

S. Dhanalakshmi[*1], Associate Professor,[*1]dhanalakshmisnr@gmail.comD.Shanmugavel[*2], Asst.Professor,[*2]shanmugavel_2007@yahoo.co.in

P.Preethika[#1] , J. Priyanka[#2] , M.Saranya[#3]
#1,#2,#3 UG Scholars
[#1]Preethika110595@gmail.com ,[#2]jpriyankacse@gmail.com , [#3]saranyamurali25@gmail.com
[*,#]*Department of Computer Science and Engineering, Sri Muthukumaran Institute of Technology, Chikkarayapuram,Chennai-600069 India*

ABSTRACT :

Now-a-days, no countries, no communities and no person are immune to emergency events. These events cause a huge loss of money, properties and lives due to non- planning on the part of government and management agencies. Therefore steps are required to be taken towards the prevention of these situations by predetermining the cause of events and providing quick response measures once the event occurs. In this paper, in order to detect and report the real time emergency event, the 3W (What, Where and When) model is proposed. Firstly, the data from multiple sensors are collected. Secondly, the special and temporal information from the GIS and RTC is extracted. Finally, the extracted information is stored in SQL database and it gives the alert to base station (Management team) via Wireless sensor network. The proposed model has a remarkable advantage without any complication.

Index Terms- event detection, sensor fusion, 3W model, SQL database, base station.

I.INTRODUCTION

A . Motivation and purpose

The past decade has witnessed the tremendous technical advances in Sensor Networks, Internet/Web of Things, Cloud Computing, Mobile/Embedded Computing, Spatial/Temporal Data Processing, and Big Data, and these technologies have provided new opportunities and solutions to emergency management. Data processing/analysis in emergency management is a typical big data scenario. Numerous sensors and monitoring devices continuously sample the states of the physical world, while the web data processing techniques make the Internet a big data repository which can reflect the states of the cyber world and the human world. The efficient processing of these data imposes a challenge to the data management community. It is important to develop advanced data management and data processing mechanisms to support disaster detection, disaster response and control, rescue resource planning and scheduling, and emergency commanding. Emergency management aims to develop strategies and establish operations to decrease the potential impact of unexpected events (i.e., human or natural disasters). By quick response and rescue, it saves human lives from the secondary disasters and

enhances the stability of communities after disasters. Emergency management involves four stages: Planning and Mitigation, Preparedness, Response and Recovery. Geospatial applications (including GIS) have been extensively used in each stage of emergency management. Decision-makers can utilize the geospatial information to develop planning and mitigation strategies. GIS models and simulation capabilities are used to exercise response and recovery plans during non-disaster times. They help the decision-makers understand near real-time possibilities during an event. Recent evolution of the Internet has permitted an unprecedented increase in content created by non-

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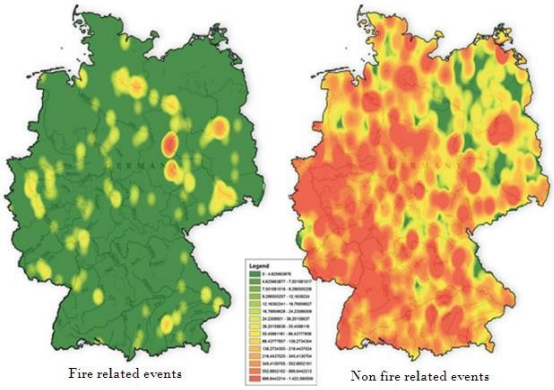
specialist users thanks to a reduction in technical barriers.



Sensor fusion is a combination of sensory data derived from a set of heterogeneous or homogeneous sensors such as fire, earthquake, flood sensor nodes. There are two types of emergency events. One from natural disaster and other from manmade disaster.

B . Significance in contributions

The major contribution of this paper are summarised as follows.

(a) This paper proposes a 3W model for describing the emergency events. The proposed 3W model includes What, Where and When elements to detect and analyse the situation.

(b) This proposed model is based on sensor fusion , which uses the multiple sensors to detect the real time of an event using GIS(Geographical Information Search) and RTC(Real Time Clock)

In this paper, in order to describe the real time emergency event based on sensor fusion, the 3W (**W**hat, **W**here, **W**hen) model is proposed. The 3W model provides three basic elements of an emergency events, which is summarised as follows.

(1)**What:** The most important element of the proposed 3W model is to detect what happened in the environment. When an event occurs , sensors discriminates the event pattern. Here we use three kinds of sensors (i) Fire detecting sensor

(ii) Earthquake sensor

(iii) Flood monitoring sensor

(2)**Where**: Besides detecting what happened in the environment, it is needed to reveal the location information of the emergency event. For this we use Geographical Information Search. It is used for capturing, storing, checking and displaying the data related to the location on earth's surface

(3)**When:** This is the basic factor of the emergency event.It is important to detect the temporal information based on Real Time Clock, we fetch the exact time of an event. Though your sensor loses the connection with controller, it displays the actual time.

II.RELATED WORK

The early related work in this emerging research field has addressed the use of GPS to generate map mashups to support collaborative real-time mapping , and give the overview of harvesting geospatial content. Social media reacted to the smaller (4.3 magnitude) and much more localized earthquake of Morgan Hill, CA in March, 2009. Recently, the work of harvesting spatial information from the web has seen some activity in recent years. For example, it has been demonstrated that general purpose Points of Interest (POI) can be automatically derived from users' map annotations and vague geographic regions (e.g., Midlands, or Middle West) delineated. Besides the texture content, geo referenced pictures from the photo-sharing website have been processed in terms of their density to show where the most famous landmarks are for a given location. The Geospatial Exploratory Data Mining Web Agent that retrieves geographic information from web pages (related to outdoor activities) has also recently been discussed**.**

Event detection based on prior user queries is reported. Fung et al 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. a user specifies an event (or a topic) of interest using several keywords as a query. The response to the query is a combination of streams 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.Later, Yang aimed at discover event evolution graphs from news corpora. The proposed event evolution graph is used to present the underlying structure of the events. The proposed

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method uses the event timestamp, event content similarity, temporal proximity, and web pages distribution proximity to model the event evolution relationships. Recently, Jo studied the method to discover the evolution of events over time in a time-stamp document collection. He tried to capture the topology of topic evolution that is inherent in a given corpus. He claimed that the topology of the topic evolution discovered by his method is very rich and carries concrete information on how the corpus has evolved over time.

III.PROBLEM ANALYSIS

There are few existing systems which helps to identify the current position of the event using GPS system and viewed in an electronic map. GPS provides the fastest and more accurate method for finding location. The disadvantages of the system are that they require large data sets both in process points as well as history. These data sets provide a technical challenge to manage and process in real time. The training data may result in the system making fault as the data may include the fault or such a large range of operation that the fault is indiscernible with the normal operation of the sensor system. The further disadvantage of these systems is that they do not inherently provide a diagnostic methodology to identify the location of the event. Though the technology has improved we could not find the accurate location of an event due to lack of communication and improper response of the management team.

IV. PROPOSED SYSTEM ARCHITECTURE

In this section, the detail of the proposed architecture is given. In this first aspect, the basic framework of the proposed model is illustrated.

The overview of the system

Sensor fusion may be the potential solution for solving the description of emergency events. The proposed 3W model aims at collecting and analysing the information from multiple sensors. The sensors can be seen as a receiver. It is a set of hierarchical data model including three different layers. The different layers are the propose method are illustrated in the figure.

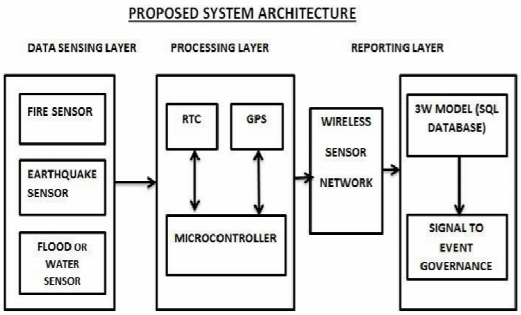

Fig 1.1 System overview

DATA SENSING LAYER

In this layer, the different multiple sensors represents the pattern of emergency event. We use three sensors here, fire sensor detects the fire pattern of an event and used as a compact device for protection against fire. The module makes use of IR sensor and comparator to detect fire upto range of 5 to 10 meters.

Earthquake sensor provides early warning by detecting and earthquake sound wave before the earthquakes destructive shear wave strikes a area. It is capable of detecting large earthquakes that occur hundreds of miles away and can detect moderate to minor earthquakes for many miles around a local area.

Flood or water sensor monitors the water level in water leakage areas at residential area.

PROCESSING LAYER

It consist of two components controlled by a microcontroller. The first one is RTC (real time clock), a computer clock in the form of integrated circuit that keeps track of the current time. The second one is GIS that keeps track of current location of an event. Therefore it gives the accurate special and temporal information. The collected digital signals are converted into analog signals through a convertor.

REPORTING LAYER

The generated data are converted into signals via wireless sensor network. These information is

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(i)Generating the "What" element
In this section, the method for generating what element of the 3w model is given. For example, the

storedin SQL databasebasedon 3W model.

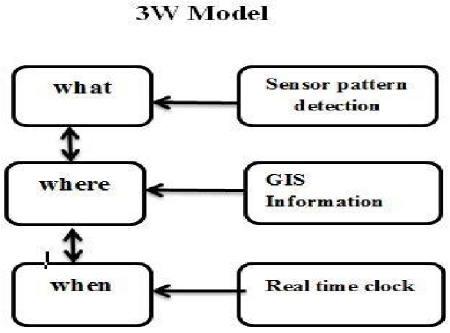

Fig 1.2 3W Model

information multiple sensors are used to discover

the pattern of the event

(ii)Generating the "Where" element
Besides detecting what happened in the environment, it is needed to reveal the spatial information of an emergency event. This is extracted from GIS.

(iii)Generating the "When" element
The temporal information is another basic factor of an emergency event. Similar to spatial information, the temporal information extracted from the Real Time Clock

Thus the information generated from these elements is used to store in the SQL Database. Therefore this collected data is converted into signal to give alert to the event management team for initial rescue operations

V. CONCLUSION

Wireless sensor networks (WSNs) have attracted significant attention over the past few years. As technology emerges over the decades, WSN has come to the spotlight for its unattained potential and significance. We observe that these wireless sensor network architectures serves us a lot in predetermining the causes of the natural as well as man-made disasters and providing rescue and preventive measures if somehow any area is struck by these disasters. Hence these structures help in protecting many precious human as well as animal lives that would have been destined to perish from the effects caused by these disasters. WSNs not only contributes in saving human lives but also plays an important role in conserving our unique flora and fauna consisting of many plants and biological microorganisms, which are important for the survival of humans, by alerting us from the dangers of forest fires. Finally we conclude by stressing on the need to survey the state of the research and classified the different schemes.

The proposed method is evaluated with extensive case study based on real urban emergency events. The proposed method provides the GIS based information, spatial and temporal information and the event detection information. The proposed 3W model includes What, Where and When elements to detect and analyze the emergency event. Case study on real data set shows that the proposed model has good performance and high efficiency in the analysis and detection of emergency events.

In future work, we will be extending our 3W model into 5W (what, where, when, who, why) model and high level sensors such as air pollution monitoring, bomb explosion and climatic changes monitoring can be used.

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