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IOT USE CASES IN DISASTER MANAGEMENT

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Abstract: Disaster management seeks to minimize targets to minimize the viable harm done by the disasters, to provide some immediate and sufficient assistance to the victims, and to achieve wonderful and quick recovery. Such aims include a deliberate and high-quality rescue operation that brings up disasters like these. Different types of information affect the disaster and thus are required to prepare an effective and immediate relief activity. These days the handy IoT technology is very mature and is conceivable to be quite useful in situations of catastrophe. For instance, sensors sent in the fields gather information about nature. Correspondingly, informal organizations like Twitter and Facebook can help to gather information from individuals in the calamity zone. This paper analyses the requirements for planning use cases for such herbal disasters and proposes an IoT primarily based use cases i.e., early warning systems, geographic information systems, flood monitoring & forecasting to cater to the recognized requirements. In this paper, we provide some of the aware use cases to support disaster management using the internet of things.

Index Terms - Internet of Thing (IOT), Disaster Management, Early Warning System (EWS), Geographic Information System (GIS), Flood Monitoring and Forecasting.

I. INTRODUCTION

The Internet of Things, or IoT, refers to the world's billions of hardware devices now connected to the web, all of which store and exchan ge information. Thanks to the adventure of supercheap computer chips and the omnipresence of wireless network, everything can be converted into part of the Internet of Things, from anything as small as a pill to anything as large as an aircraft. Connecting and attaching sensors to all of these various items brings a degree of artificial intelligence to devices that would otherwise be dumb, allowing them to exchange data in real-time without involving a human being.

The Internet of Things is making the world structure around us smarter and more open, integrating the physical and digital worlds. Disasters cannot be (described a possible future event) but the least that one can do is to be prepared for it. Relief operations after the disaster are much different and challenging when compared to helping distributions done by the government under (usual / commonly and regular/healthy) facts or conditions (that surround someone). Further, training by testing out (in a way that's close to the real thing) disaster situations is almost impossible due to the scale and importance of natural disasters. Technology has its limits but has the possible ability to aid in relief operations planning, management, and analysis of long-term disaster management.

The IoT technology available today is sort of mature and has the possible ability to be very useful in disaster situations. Disaster management planning depends heavily on the topology, (related to the Earth's weather) conditions, (home/place where something lives), etc. of the area as well as on the available useful things/valuable supplies of the machinery. Duhamel et al. (2016) proposed the experience-based thinking of operations research and management science to improve the toughness in the relief operations the hit/effect of the distribution of the relief useful things/valuable supplies on the population. Manpower sent out and used during disaster management may be trained but they must be given very important information in time for proper and fast/on time use. This must reduce much-needed response time for relief operations. Appropriately-timed dispatch of relief supplies from distribution centres to hospitals in coordination with the schedule of the medical teams is also a critical activity in disaster management [1].

II. LITERATURE REVIEW

This segment presents a diagram of the current writing significant to the examination introduced right now. The job of the innovation in calamity the executives that have been inspected to examine IoT can help the workforce associated with alleviation tasks post any cataclysmic event. We further give a short conversation of the IoT that has been received for approving the result of this examination.

There is generous writing accessible concerning the field learns about the crisis alleviation activities. The strategy received by these investigations incorporates the perceptions of preparing works out, direct understanding of genuine episodes, leading meetings, and recursive refinement of starting models recognized moves identified with casualties, specialists, and IT in creating keen frameworks for guaranteed alleviation reaction. The examination centered after structuring an answer for recognizing and observing patients in a crisis. The creators planned the structure worldview to address the distinguished difficulties and broke down various models to propose rules for

the acknowledgment of such frameworks. Casualty related difficulties call for clinical gear conveying over remote medium, e.g., remote bio-checking framework. The difficulties concerning the specialists prompted the improvement of a constant video model for furnishing situational mindfulness with the utilization of camcorder, GPS, and computerized compass. IT-related difficulties show that the gadgets created for overseeing crisis reactions ought to likewise be utilized for day by day errands, else the specialists may neglect to use them successfully.

2.1. INTERNET OF THINGS

The term 'Internet of Things' (IoT) was authored by Kevin Ashton in 1998 in his discussion for the Auto-ID Centre at the Massachusetts Institute of Technology (MIT). In any case, it was officially presented by the International Telecommunication Union (ITU) in the ITU Internet report in 2005 (ITU 2005). Semantically, IoT alludes to an overall system of interconnected items having novel character and imparting utilizing standard conventions (INFSO 2008). The 'things' in such a system alludes to any virtual or genuine element, for example, people, lifeless things, shrewd programming operators, or even virtual information. The worldview of IoT can be visualized related to powerful information assortment procedures and the capacity to share such information. The innovation can acknowledge complex choice emotionally supportive networks by conveying the necessary administrations in a progressively exact, sorted out, and smart way.
The European Commission in its examination guide has imagined the IoT as a basic segment of things to come Internet (European Commission 2008) allude to IoT as an extra of the Internet to stretch out the inclusion to the physical substances that can just help low-power calculations, be that as it may, discusses that the IoT is the help given by the Internet as some other existing web administrations. From the very beginning of the conceptualization of IoT in 2005, the advancement of keen articles having detecting, correspondence, and impelling abilities have seen a quickened development. Such a system empowered savvy objects to have various applications in the territories of condition checking, medical service, transportation, and co-ordinations (Broll et al. 2009), informal communities (Sinha and Kumar 2016), keen structures (Darianian and Michael 2008) and so forth. The uses of this new worldview fundamentally depend upon the information assembled by the disseminated shrewd items and the correspondence foundation for the transmission of information. With regards to fiasco the board, IoT can get one of the empowering innovations. The key application regions include:

1.Catastrophe hazard minimization and avoidance: Monitoring fiasco prospects through satellite correspondence and geographic data framework (GIS), planning early admonition frameworks, utilization of web-based life for mindfulness creation.

2.Crisis reaction: Real-time correspondence for convenient help and reaction measures.

3.Calamity recuperation: Online missing individual pursuit and store the executive frameworks.

III. METHODOLOGY

3.1. IOT USE CASES

The modern world of smart devices and apps is very exciting; and technology has captured the attention of the broadest human population for the first time, regardless of age or gender [4].

3.1.1. EARLY WARNING SYSTEM(EWS)

Early Warning is the arrangement of timely and viable data by means of recognized information foundations, that permits people presented to the peril to make a move to maintain a strategic distance from or lessen their hazard and get ready for viable reaction". As indicated by the United Nations' International Strategy for Disaster Reduction (ISDR) (UN2006), it coordinates four principal components:

- Hazard Knowledge
- Observing and Prediction
- Dispersal Information
- Reaction Capability

An Early Warning System (EWS) can be defined as a collection of capabilities needed to produce and disseminate timely and relevant alert information about possible severe events or disasters (e.g. floods, drought, fire, earthquake and tsunami) that threaten the lives of people.[5]

CHARACTERISTICS OF EARLY WARNING SYSTEM

- Effective early warning systems require technological foundations and good risk awareness.
- But they must be firmly people-centered-with consistent communications and processes of distribution.
- Public awareness and education are critical; other organizations need to be active, in addition.

Figure 1: EARLY WARNING SYSTEM

3.1.2. GEOGRAPHIC INFORMATION SYSTEM

The Remote Sensing and Geographical Information System (GIS) is the rapid techniques for collecting, analysing and disseminating information when a disaster occurs which are necessary for successful response, relief and recovery. Remote Sensing and GIS offers a powerful tool for creating maps, integrating information, visualizing scenarios, solving complicated issues and designing effective disaster management solutions.GIS can be a valuable tool in disaster planning due to the abundance of knowledge GIS provides and the ease with which it can be viewed on a screen [6]. GIS is the most comprehensive information system built to model, evaluate spatial data and show vulnerability in the community.

GIS is useful for danger zone mapping and avoidance of citizens can easily be achieved using the maps during emergency conditions. Geographic data in real time can improve the distribution of the response resources. GIS technologies are very useful in disaster risk analysis and in human hazard adaptation. It also offers emergency management decision-support network.

a. Floods:

GIS is able to create maps showing flood-prone areas along with impacted communities of homes, infrastructure and special needs GIS maps with elevations of terrain can be used to locate escape paths, shelters, and staging areas above local flood level.

b. Landslides:

Landslides form one of the main hazards that contribute to property and life losses. Landslide analysis is a dynamic process that requires many variables and needs to be systematically studied in order to identify the landslide prone areas. Computer based tool namely Geographic Information System (GIS) is found to be more useful in landslide hazard mapping Landslide threat zonation helps identify strategic points and geographically sensitive landslide-prone areas.[7]

3.1.3. FLOOD MONITORING AND FORECASTING

A standard flood warning system involves a variety of items including automatic sensors that are positioned in the designated area in or next to rivers and reservoirs. Data is then processed and forwarded to a base station or personal computer immediately. Appropriate warnings are then sent to the authorities or populations of those potentially impacted by flooding.

Flood is an imminent natural phenomenon and can also cause significant harm to property and lives. The figure 2, flowchart [8] describes that using an ultrasonic sensor that is connected to the Node MCU controller to transform the analog signal of the sensor into a functional digital distance value. The user can use SMS-based service to obtain real time information on monitoring flooded roads. If the water level is detected above the threshold value between 80 cm-149cm then the flood incident warning mail is sent to the rescue team and notification is sent to both the rescue team and the users.

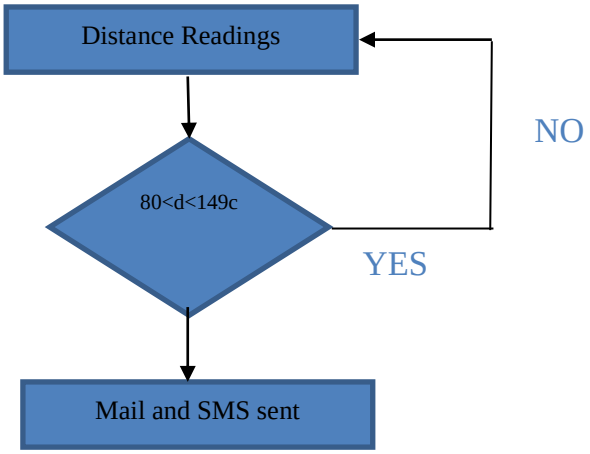

Figure.2: Operational Flow Diagram of the Ultrasonic HC-SR04 Sensor

Hundreds of people die from the earthquake, and also from tsunamis. The alarm systems will reduce losses by warning people. The potential damage can be reduced and lives can be saved if people in the region vulnerable to earthquake- tsunami are able to survive the strike already.

This flood warning system is essentially useful to get a forecast idea of flood to allow the sensing of the incoming water level;
rain fall, Flow Level for flood detection is done by using sensors. In this way, the sensors will sense the water level and other parameter, and the appropriate messages will be sent to the controller, then the further action will be taken on that signal.
The following program goals have been kept in mind-

1. The program should be easy and user friendly.
2. Communication is genuine and not rumour-based.
3. Communication is in a language which is convenient for us to understand.
4. The quality of the message is straight forward and easy to understand.

IV. RESULTS AND CONCLUSION

The main goal of this paper is to understand the role of the IoT in catering for the mission requirements of the disaster management staff. Within this paper a solution based on IoT is proposed to promote the activities of disaster management. This paper combines the various aspects of collecting information and sharing information to prepare for the mission requirements of immediate relief operations. The purpose of this paper is to provide reliable, real-time information.This information is sent to the end-user according to their specifications. This research recognized the key requirements in the
initial stages for bringing out the instant relief operations.
Managing natural disasters is not a yet another-step process. Effective measures at each point of the disaster recovery process ensure better preparedness, enhanced and accurate early alerts, reduced risk or mitigation of the effects of the catastrophe during the cycle's subsequent recursion.
Using Wireless Sensor Network, any mechanical or geo-physical sensor can be easily interfaced to protect our livelihood as well as the prosperity of the country. This paper dealt with a NODE proto-model for Flood Early Warning, in particular in heavy rainfall and hilly areas of great importance. Embedded flood monitoring system in this paper is planned and implemented using IOT and flow sensor. The result of the performance can be obtained and checked by crosschecking it as an alarm with the aid of buzzer to show the level of danger when the water rises.

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