
A Study on IOT based Disaster Management

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ABSTRACT:

In the developed as well as in the developing countries there comes a boon in the advancement of technology. This advancement has led to many natural and man-made disasters. As with increasing human activities and exploiting natural resources drastic changes have been seen in the climatic conditions and this change directly and indirectly lead to disasters. So to overcome these natural or man-made disasters we have to deal with them by using advance and new technology and among the new technology IOT is the promising one[1]. We can deal with these disasters in any circumstances with IOT. The old one in which we contact with cellular phones which can be disconnected with any disaster like in earthquake and landslides, tsunami, all the connections are lost and wires are disconnected so in IOT [1] we are able to communicate wirelessly. By using some smart sensors and proper communicating network frequent aids is possible in post disaster management and help the victims in the hour of need. In this paper discuss issues regarding IOT and challenge using IOT in post disaster condition and an attempt to develop an algorithm to provide communication in case of failure of our existing network.

Keywords: *Internet of Things, Disaster Management, smart sensor, Man-made and Natural disaster*

I INTRODUCTION

As per the consequences of the disaster we lost both lives and assets and in fact some of the disasters have long term effect. There were several cases from the past which shows that Disasters effects are long term like Bhopal Gas Tragedy, Nuclear Bomb on Hiroshima and Nagasaki, Aral Sea (man-made disaster) and many more natural disasters.

After effects can be seen in many generations after most of the disaster. So if we are able to provide First aid treatment and able to control the mishap as soon as possible then the aftermath casualty can be controlled to a great extent. As the post disaster time was very crucial because we can't stop any disaster after a time but we can control its consequences. So it's a topic to think about that if we are able to locate the actual location of the accident site and also able to show the clear road from the accident site to nearby hospital or to the accident site to fire brigade and ambulance service as soon as possible then the loss can be minimized. There are basically four phases of disaster mitigation (Pre Disaster Mitigation efforts), Preparedness (Training, Education and management planning), Response (Establish recovery centre and immediate response to stake holder), Recovery (Post Disaster Recovery Plan)[5]. And in this paper we are working on the third and the fourth phase that is response and recovery so that casualty can be minimized to the maximum possible extent. As we have many examples from our history records even the recent earthquake in Nepal also have weak

post disaster management technique and hence results in loss of more no. of lives. The major challenge that we face during any disaster is communication and the second is the inability to reach to the accident site due to traffic congestion. These two problems can be solved if we are able to provide a backup in case of emergency. This backup will help to communicate in case our existing communication network fails like cellular phones as there are maximum chances of their failure in emergency. In such cases where cellular phones and other networks fails we can still communicate if we are able to provide information through IOT and traffic congestion can also be overruled if we are able to locate a clear path in the emergency condition with the help of Google Map.

II IOT

Internet of thing is not a new term it was first coined by the cofounder and executive director of the Auto-ID center named Kelvin Ashton at MIT [Wikipedia 2017].The Internet of Things is considered then as the mere extension of Radio Frequency Identification where "RFID is kind of the amoeba of the wireless computing world" (Kevin Ashton). But the phrase "Internet of Things" from the machine point of view can be seen as changing with the time as machines learned to do what a human instruct it to do in the nineteenth century,; and as the time passes by and with the advancement in this field they learned to think with in-built sensors and other components embedded in the machines they start acting smartly now we are going in an era where they are learning to perceive – they actually sense and respond. Internet of thing can be defined as connecting things with internet. It basically involves a communicating network and sensors. It is an automatic, digital way of communicating in this modern era where it diminishes human intervention. There is no need of man to man or man to machine interaction it is an automatic system in which data is collected by the sensors installed at the particular location, person wherever needed and that data is processed in the form of information through internet to the particular sender. We can also define it in four dimensions as shown in the below figure 1.1

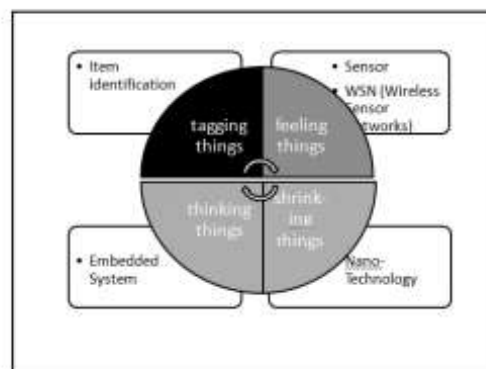


Fig 1.1: Four Dimensions for IOT

In other words it is integration of four technologies [7] as MEMS (microelectronic mechanical system), micro services, wireless network and internet as shown in figure 1.2

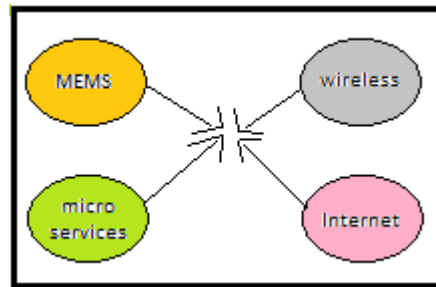


Fig 1.2: Convergence of four technologies

There are some technologies which help in the development of the IOT such as machine-to-machine interfaces and protocols of electronic Communication, Microcontrollers, Wireless Communication, RFID Technology, Sensors, Actuators, Energy Harvesting Technology, Location Technology, Software and there are some other technologies which add value to IOT such as Geo-Tagging/Geo-Caching, Biometrics, Robotics, Augmented reality , Mirror Worlds, Telepresence and Adjustable autonomy, Life Recorders And Personal Black Boxes Software Tangible User Interface, Clean Technologies[6].

III Major Challenges

To adopt IOT in our day today life or in any particular or crucial condition analytical problems are more prominent than technical problems [8].

Security and Privacy Issues: In creating an environment where we can manage disaster condition through IOT wide spread coverage is required and we face a major challenge regarding security and privacy issues.

Addressability: There are some other points also which needs to be taken into consideration like providing address to each things connecting in the disaster prone area. And with IPv6 this seems to be quite possible.

Recycling and Disposing of Waste: As we know that use of IOT requires many modern electronic components and these components are glutted of rare earth metals, heavy metals and synthetic chemicals and recycling these metals is yet another big challenge. In fact it increases the replacement of the switches and outlets to ten-fold and this results in increase in the quantity of waste which needs to be properly disposed.

Environmental effect: The rays from everyone's phones gave a noticeable impact on environment. So, this is another big challenge in IOT adoption that how we can decrease its negative effect on environment.

Energy Requirement: With the advancement in the electronics the energy requirement per instruction is also reduced to a great extent so we can look forward towards IOT to solve our major challenges of life among which disaster is the biggest one as sometime the loss is beyond imagination.

IV Related Work

Now coming so far in the development in the field of science and technology we are able to reduce the size of wireless module to the maximum possible extent, increase the capacity of

flash memory and for our idea the use of smart phones by the consumer is increased like a boon due to their low price and extended features. Many researchers come a step ahead and suggested how we can use IOT in our daily life, discuss the major challenges in this field. Some of the researchers also suggested many alternatives in disaster condition like.

In [1] Gosavi et.al presents a model to fight in disaster condition. He came with an idea of using Google Map for locating the exact location and providing the safest possible route and also locates the safe sites where rescuer can go in case of emergency. He suggested to install an application, a third party server named disaster management server is creating which is updated by the local weather office and in case of any emergency prior warning signal is sent to each registered user automatically. The warning can be audio or in text form as with audio signal even the blind people can also able to make himself safe by following the audio instruction. As in case if anyone is unable to reach the safe site then by tracking its location the rescue team can reach their and able to save him. The server is basically designed for android app.

In [4] Gutierrez et.al done a case study of using IOT in post disaster rescue and recovery operations. He presented an algorithm for ad-hoc network which will work in case of any emergency. When there is failure of cellular network for a defined period of time then the phones will switch to disaster mode in which the disaster app which needs to be preinstalled will be initiated. In the disaster mode phone will automatically goes in power saving mode as phone is the only source through which the rescuer can be able to track your location so phone needs to be on for the longest possible time. And in case if the cellular network is regained then the disaster mode will automatically ceased and everything back to its normal condition.

In [3] Matthew focuses on how to improve transportation mode in case of emergency as it plays a key role in dealing with emergency condition. He divided its work in to parts that is in the first he tried to estimate the actual performance of the transportation facility in post disaster condition based on the history records and in the second phase his main focus is on decision making and operations performed after a disaster

V Basic Concept

In the disaster management plan we are putting forward the idea of IOT. In the disaster management we have to deal both pre disaster and post disaster. In the pre disaster management we have to apply sensors in the disaster prone area and the information regarding any change is updated on the server so that prior warning can be sent to each individuals in the that area so that they can move to safe area before disaster as natural disaster are impossible to stop. They can be just minimized to some extent only if we are able to restore our natural resources and stop exploiting them or if we are able to provide proper disaster management plan.

For disaster management through IOT following things are needed:

RFID for identification, NFC (Near Field Communication), GPS for navigation and location, sensor for sensing seismic wave detection, temperature sensor, accelerometer for sensing movement, Internet, mobile network, embedded servers and many other. Among all wi-fi, mobile computing and network sensor are very important for IOT based environment.

In IOT based disaster management each individual, sensors and other things need to properly addressed and connected through internet for which we have to provide a proper wi-fi and internet facility.

In the post management we have to continuous monitor the cellular network and if in case network fails for more than the pre decided time then it switch to disaster mode and a warning or alarming signal is sent to each individual connected in that area. For post disaster management plan each individuals are provided with safe route through Google map.

VI Conclusion and Future Scope

A study on how we can use IOT in case of disaster and post disaster condition is done. A brief idea of how IOT is growing in the modern what are the challenges that needs to be solved and how far we came to use IOT means what are the advancement done yet to deal in an environment which is IOT based. In this study we also present a brief overview on what actually IOT is. So based on our study we are able to present a flow chart in which we have explained our idea of using IOT in case of any mishap. A working model is the extended work regarding this study. Although this work will takes time as practically it will be possible only if we are able to provide internet facility everywhere even in the remote places and disaster prone places as IOT is whole internet based any device to device connectivity is only possible in that case only. So a working model is possible in a fully smart environment where everything is done smartly or automatically.

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