Role of Internet of Things (IoT)

In Promoting Sustainable
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Theme - V

Challenges in Implementing IoT in India

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Future Oriented Internet of Things for India's Sustainable Development in 2047

6. ROLE OF INTERNET OF THINGS IN DISASTER MANAGEMENT

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Abstract

Disaster management aims to mitigate the potential damage from the disasters, ensure immediate and suitable assistance to the victims, and attain effective and rapid recovery. These objectives require a planned and effective rescue operation post such disasters. Different types of information about the impact of the disasters are, hence, required for planning an effective and immediate relief operation. In order to aid professionals in disaster management, efficient procedures and technologies are developed and adopted. The IoT technology available today is quite mature and has the potential to be very useful in disaster situations. Even though the IoT approach was defined many years ago, only recently its technologies have been enhanced and acquired grater clarity and scope. In disaster operations, the IoT is a target theme in the fields of computer science, Electronic Engineering and Environmental Engineering, especially useful in disaster mitigation, rescue, response and recovery. The main positive impact is the facilitated communication between professionals, more robust data and monitoring of data for environmental management, first aid, people tracking, distribution of supplies and medicines, among other purposes. This paper intends to analyze the use of the Internet of Things (IoT) in disaster management.

Keywords – Disaster, Mitigation, Rescue, Technology

Introduction

Disasters occur frequently throughout the world. Disasters are both human made and natural. Human-made disasters result from human errors, and natural disasters result from physical phenomena. Natural disasters comprises of earthquake, floods, Tsunami, droughts, volcanic eruptions, cyclone, forest fires and landslides. Events such as chemical leaks, nuclear leaks, road accidents, structural damage and terrorist attacks can be listed under man-made disasters According to Wikipedia ".A disaster is a serious problem occurring over a short or long period of time that causes widespread human, material, economic or environmental loss which exceeds the ability of the affected community or society to cope using its own resources". All of these disasters are more frequently happening in this century due to urbanization and globalization. A disaster can be defined as an occurrence causing widespread destruction and distress. The paper, further, proposes an Internet of Things (IoT) solution for an efficient disaster management. The proposed solution is validated using the tasktechnology fit approach, thereby analysing the strategic value derived by using the proposed solution for disaster management operations.

Disaster Management

Disaster management does not avert or eliminate the threats; instead, it focuses on creating plans to decrease the effect of disasters. Failure to create a plan could lead to damage to assets, human mortality, and lost revenue. Events covered by disaster management include acts of terrorism, fire, human caused disaster natural disasters, public disorder, and communication failures. Disaster management is a collective term encompassing all aspects of planning for and responding to emergencies and disasters, including both pre- and post-event activities. It refers to the management of both the risk and the consequences of an event.

Internet of Things (IoT)

The term 'Internet of Things' (IoT) was coined by Kevin Ashton in 1998 in his talk for AutoID Centre at the Massachusetts Institute of Technology (MIT). However, it was formally introduced by the International Telecommunication Union (ITU) in the ITU Internet report in 2005. Semantically, IoT refers to a world-wide network of interconnected objects having unique identity and communicating using standard protocols. The 'things' in such a network refers to any virtual or real entity such as human beings, inanimate objects, intelligent software agents or even virtual data.

IoT in Disaster Management

IoT-based disaster management for different kind of disasters with a comparison between some solutions that are available in the market. Adoption of new techniques could reduce the chances of losing human lives as well as damage to large-scale infrastructures due to both natural and human-made disasters. The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet.. The power of real-time information availability together with real-time analytic associated with IoT can be a game-changer in planning for prevention and response to disasters. IoT, which allows seamless interconnection among heterogeneous devices with diverse functionality, is a viable solution for disaster management.

The Internet of Things (IoT) has changes the approach to safety systems by connecting sensors and providing real time data to people. In terms of communication evolution of the Internet, IoT has become the benchmark. Over billions of devices, this language in today's state has taken management by using sensors supporting their working efficiency. IoT technologies can't stop disasters from happening, but

can be very useful for disaster preparedness, such as prediction and early warning systems. In this way IoT can compensate for a poor infrastructure that puts developing and emerging countries in a particularly vulnerable position.

By connecting these sensor devices which generate a huge amount of information that was processed for further cognitive knowledge, there has been a sharp inclination of usage or adaptation of new technologies since the past few years. As IoT is best suited for automation, it can do the same with data collection and monitoring when it comes to natural disasters and emergency planning. By deploying the proper devices and applications, experts can monitor magma flow, seismic activity, water levels, and much more. Hence, they can send out disaster warnings in advance. The Internet of Things or IoT has catapulted the world into an era of high efficiency and automation. By introducing it in emergency planning, governments can achieve better management plans and minimize the losses incurred. IoT in disaster management helps countries take a proactive approach. Hence, they can run evacuations and bring people and animals to safety before the disaster even hits. In the context of disaster management, IoT has the potential to become one of the enabling technologies. The key application areas include:

1. Disaster risk minimization and prevention: Monitoring disaster possibilities through satellite communication and geographic information system (GIS), designing early warning systems, use of social media for awareness creation.

2. Emergency response: Real-time communication for timely relief and response measures.

3. Disaster recovery: Online missing person search and fund management systems.

The dynamic nature of the requirements and environment during a relief operation emphasizes upon the ability to make efficient and precise decisions in minimal time. The IoT technology, having the potential for communicating instantaneous information updates, can be a key player for realizing dynamic work flow adaptations. The increasing natural and maninduced disasters such as earthquakes, floods, hurricanes, overcrowding, or pandemic viruses endanger human lives. Hence, designing infrastructures to handle those possible crises has become an ever-increasing need. IoT systems can monitor and react to progressive disasters, people's movements and their behavioural patterns. From aerial robotics to big data analytic, technology presents the opportunity to expedite and magnify the impact of humanitarian relief efforts through greater efficiency and responsiveness; reaching more people, sooner, more cost-effectively, and saving more lives. The role of technology in disaster management in various stages.

1. Preparation

The first stage of the disaster management includes making proper arrangements, planning and other measures for meeting unforeseen emergencies. Through the use of IoT devices, strategic reserves of food, water, clothing, medical equipment, and other vital supplies can be monitored to ensure acceptable levels.

2. Response

The second stage of the disaster management includes the various actions taken during an emergency. Widely deployed IoT technology within a city's infrastructure, in forest areas, or anywhere else, for that matter, can be re-tasked to identify emergency conditions, people who are trapped, or the status of things like the power grid.

3. Recovery

Recovery is a long term process; it measured in months and years. IoT devices can help in search and rescues operations, as well as monitor post-disaster conditions and levels of vital resource stockpiles. IoT can continue to be used to disseminate information to the public while normal communications are still being repaired.

4. Mitigation

The final stages includes the actions that reduce the likelihood of another disaster occurring. IoT devices and sensors can collect near-real-time data on things like water levels, volcanic activity, and barometric readings. Sensors can detect fire, cloudbursts, volcanic activities, earthquakes, etc.

Technology plays an important function in every step of the cycle. Technology has the potential to transform disaster management, especially if one can successfully integrate emerging technology with existing infrastructure. When powerful ideas and sophisticated machinery come together, they create new advances in disaster management. Disaster management aims to mitigate the potential damage from the disasters, ensure immediate and suitable assistance to the victims, and attain effective and rapid recovery. The advent of cloud computing technology with broadband has enabled the emergence of a sophisticated system known as the Internet of Things (IoT). IoT - based sensors can help detect potentially dangerous situations, earth movements, detect forest fires by measuring carbon dioxide levels, moisture and temperature. They can also enable monitoring of river levels to detect flooding. IoT has given an excellent chance to create powerful systems and applications, which can be used for monitoring the natural resources and human made resources. This continuous monitoring helps in predicting and detecting emergency events which are a threat to human life.

Benefits of IoT in Disaster Management

The following are the key benefits of the application of IoT in disaster management:

➤ Agencies gain a clear picture of operations with real-time visibility of data.

➤ Agencies can extract current and historic data from multiple sources; transform it into rapidly accessible, actionable intelligence for faster and better-informed decisions.

➤ It helps in creating a single, federated information hub.

➤ Agencies can build an information backbone that all parties – including government agencies, NGOs, infrastructure operators, and the community – can contribute to and work from.

➤ It increases collaboration and interoperability - It allows all stakeholders to work together more effectively by creating consistent and shareable work flows, processes forms, and plans that address disasters and emergencies of all kinds.

➤ Agencies gain by leveraging cutting-edge technology – through the harnessing of the power of Big Data, cloud computing, mobile technology, and sophisticated yet intuitive analytic to streamline and optimize all emergency management process.

The speedy development of Internet of Things (IoT) technology makes it doable for connecting varied good objects along through the net and providing additional information ability strategies for application purpose. Recent analysis shows additional potential applications of IoT in data intensive industrial sectors akin to health care services. However, the range of the objects in IoT causes the

heterogeneousness drawback of the info format in iot platform. Meanwhile, the utilization of IoT technology in applications has spurred the rise of period information that makes the knowledge storage and accessing harder and difficult

Conclusion

The occurrence of disasters is out of our control; hence, a plan must be in place to deal with it properly. Disasters are unexpected; it cannot be predicted but can be prepared for it. In this current world we live in, most governments have been taking advantage of technological advancements to facilitate disaster management and reduce their risks. One advancement that's been integrated into many sectors globally through the years is the Internet of Things (IoT). The IoT can be described as an extension of the internet and other network connections to different sensors and devices. The Internet of Things (IoT) technology available today is very useful in disaster situations. Various types of information required for planning an efficient and immediate relief operations. IoT based solution provide real time information about disasters, so it facilitates efficient and immediate decision about relief operations. During a crisis, IoT technology can help by continually updating which evacuation routes are no longer available and what transit options are up and running, for safer, faster mass people movement.

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