Detection of Natural Disaster using IOT

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Abstract—A **Natural disasters can cause significant damageto life and property. Effective management of natural disasters is crucial to minimize their impact on society. The use of the Internet of Things (IoT) in natural disaster management can provide real-time data to help identify areas that are at risk, and respond quickly to disaster events. This paper proposes a framework for natural disaster management using IoT, which includes the collection of data through various IoT devices.Thefocus can be on using a network of sensors and other IoT devices to collect and transmit data to a central control center. The data collected could include information on weather conditions, water levels, seismic activity, and other relevant parameters. The control center can then analyze this data to provide insights and alerts to the relevant authorities and emergency responders, temperature and humidity sensors can be installed in forests to detect any sudden changes that could lead to a forest fire, water level sensors can be used to monitor river levels and predict potential flooding. The data collected from these sensors can be transmitted in real-time to the control center, where it can be analyzed and used to take appropriate action.In the event of a natural disaster, the control center can use the data collected to provide early warnings to thepopulation and emergency responders. This can help tominimize the impact of the disaster on life and property.**

Keywords – Natural Disaster management, ESP32 wroom ,GSM, Module, Alert System,Earthquake, Flood, Fire Detection.

I. INTRODUCTION

Natural disasters, such as floods, earthquakes, and wildfires, can have a devastating impact on life and property. Effective management of natural disasters is crucial to minimize their impact on society. The use of the Internet of Things (IoT) in natural disaster management can provide real-time data to help identify areas that are at risk and respond quickly to disaster events., Overall, the use of IoT in natural disaster management has the potential to significantly improve disaster response times and reduce theloss of life and property,. The field of natural disaster management has evolved significantly in recent years, and there are now many technologies and approaches that can be used to mitigate the effects of natural disasters. One such technology is the Internet of Things (IoT), which has the potential to revolutionize natural disaster management by providing real-time data and insights to help emergency responders and decision-makers. The use of IoT in natural disaster management involves the deployment of sensors, devices, and other IoT technologies to collect and transmit data in real-time. This data can be analyzed to provide insights into natural disasters, such as their location, intensity, and impact, and can be used to inform emergency responders.

The management of natural disasters involves a range of activities, including preparedness, response, recovery, and mitigation. Preparedness involves planning and preparing for potential disasters.Response involves taking immediate action to address the impact of a disaster, such as by providing emergency medical care, rescuing people from dangerous situations, and restoring critical infrastructure.Recovery involves rebuilding and restoring affected areas inthe aftermath of a disaster, such as by repairing damaged infrastructure, providing aid and support to affected communities, and helping businesses and households to recover from financial losses. Mitigation involves taking steps to reduce the impact of future disasters, such as by implementing building codes and regulations, developing early warning systems, and improving infrastructure and transportation networks.. Effective natural disaster management requires a collaborative and coordinated effort from a range of stakeholders, including government agencies, emergency responders, non-profit organizations, businesses, and the public. Communication and coordination are critical to ensure that response efforts are targeted, effective, and efficient. Overall, natural disaster management is an important field that requires ongoing innovation and collaboration to ensure that communities are prepared for potential disasters and can respond quickly and effectively when they occur.Early warning systems can provide advance notice of potential disasters, allowing emergency responders and the public to take action to minimize their impact. For example, early warning systems for floods may involve monitoring water levels in rivers andissuing alerts when water levels reach a certain threshold. Similarly, early warning systems for earthquakes may involve seismic sensors that detect tremors and issue alertsto emergency responders. Finally, it is worth noting that natural disaster management is an ongoing process that requires ongoing monitoring and evaluation. By continuously monitoring response efforts and identifying areas for improvement, disaster management agencies can improve their response times and reduce the impact of future disasters.

II. LITERATURE REVIEW:

The existing literature on natural disaster management is extensive and covers a wide range of topics. Studies have examined the effectiveness of early warning systems, the role of technology in disaster management, and the impact of natural disasters on communities and economies. Additionally, there has been a growing body of research on the importance of community involvement in disaster management and the challenges of achieving effective coordination and collaboration across stakeholders. Following research material were useful as mentioned below.

Sandeep et al. worked on a IoT big data and HPC based smart flood management [1].In this research, they used big data and Iot, high performance computing for development of Flood detection.In this author Venita Babu[2] The vibration sensor like

accelerometer, gyroscope helps to provide attentive signal to registered authority with the help of GSM module . IOT approach is done to fasten the information about the system and helps to analyze the results in a more effective way. ESP wi-fi module act as a gateway to transmit the data to ThingSpeak cloud server.P.Dutta[3]In this alarm detector system, Boolean sensing range is created and analyzationis done on how an inner and outer circle identify seismogenic zone.[4]An IoT-based natural disaster monitoring system for smart cities" by M. Al-Fuqaha, M. Guizani, M. Mohammadi, and M. Aledhari. This paper proposes an IoT-based natural disaster monitoring system for smart cities that utilizes various sensors, such as temperature, humidity, and gas sensors, to detect natural disasters and generate alerts.[5]Shafique et al. (2019) proposed an IoT-based framework for real-time disaster management. The proposed framework consists of three layers, namely, the sensing layer, communication layer, and application layer. The framework uses various sensors such as temperature, humidity, and air quality sensors to collect real-time data. The data is transmitted using communication technologies such as Wi-Fi and cellular networks. The application layer processes the data and provides real-time alerts to the relevant authorities.[6]Wang et al. (2019) proposed a design of an IoT-based natural disaster monitoring system. The system integrates various sensors such as temperature, humidity, and rainfall sensors to collect real-time data. The data is transmitted using LoRaWAN, a low-power wide-area network protocol. The proposed system has been tested in a real-world scenario and demonstrated the ability to collect and transmit data in a low-power and cost-effective manner.[7]Yildiz et al. (2019) conducted a survey on IoT- based disaster management systems. The authors identifiedthe requirements, challenges, and solutions of IoT-based disaster management systems. The authors discussed various issues such as the heterogeneity of sensors, the scalability of the systems, the security and privacyconcerns, and the interoperability of the systems.[8] Zhu et al. (2020) proposed an IoT-based natural disaster prediction and management system. The proposed system uses various sensors such as temperature, humidity, and airquality sensors.[9]The study conducted by N. R. Parate and P. R. Deshmukh (2019) proposed an IoT-based flood detection and monitoring system. The system utilized sensors to detect changes in water levels and transmit data to a cloud-based platform for analysis. The authors noted that their system could provide valuable data for flood forecasting and early warning systems, as well as aid in post-disaster relief efforts.[10]This paper proposes a disaster management system using IoT that can detect and alert authorities about natural disasters such as floods, landslides, and earthquakes. The system uses various sensors such as temperature, humidity, and pressure sensors to detect and monitor environmental conditions. It also includes a GPS module to track the location of the disaster and send real-time alerts to the authorities.

III. METHODOLOGY

There are several key steps that must be taken in order to ensure the successful implementation of our work. The model will be able to detect 3 major types of natural disasternamely Earthquake, Flood, Forest Fire and will be able to send alert to management team.The sensors used for detection of above disasters are vibration sensor,water contact sensor,Fire sensor.Data transmission is done by Gsm module to the thingspeak cloud, where we can monitorthe data continously.As we are sending data to cloud it is capable for storing huge data sent by the sensors and availablity of cloud storage is huge.Develop a system for generating alerts in real-time to relevant stakeholders, such as government agencies, emergency responders.Main function of the system will be done by Esp32 which will be having all the code and contact details, Alert messages according to the type of disaster.Esp will envoke the GSM module whenever the disaster like situation will happen and GSM module sends an alert to respective emergency responder team to take appropriate action
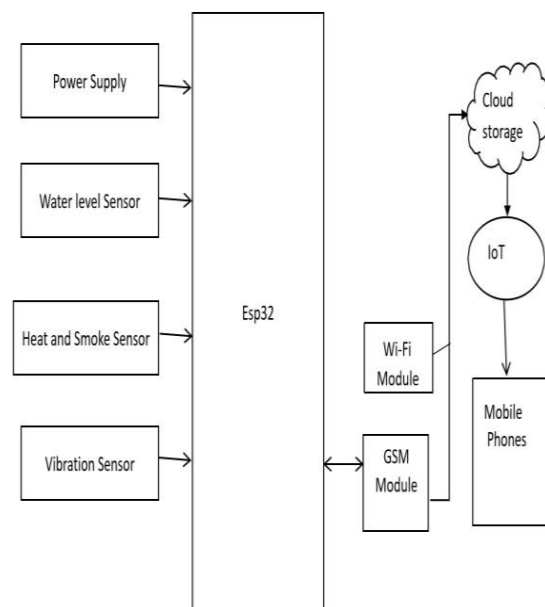

Fig.1. Block Diagram

IV. RESULT ANALYSIS

After the sesnors sensing the data and sending it to cloud platform, it gives different alert messages for different disaster, we have

tested the model which is working fine and gets data as well as alerts as expected.Messages for different diasater are as follows:

Type 1 : Earthquake is detected, the model will send the data to thingspeak cloud, Emergency team will receive this messaage "Emergency Alert! Earthquake Detected"

Type 2 : Flood is detected, the model will send the data to thingspeak cloud, Emergency team will receive this messaage "Emergency Alert! Flood Detected" .

Type 3 : Forest fire is detected, the model will send the data tothingspeak cloud, Emergency team will receive this messaage "Emergency Alert! Fire Detected
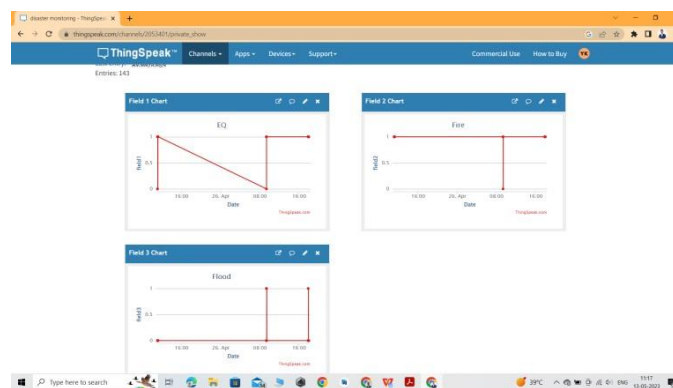

Fig.2. Output

Fig 3. Thingspeak Cloud Data

V. CONCLUSION

The IoT-based natural disaster detection system model presented above offers an effective solution for mitigating the impact of natural disasters. By leveraging the power of IoT, cloud computing, and analytics, this system can detect natural disasters in real-time, generate alerts, and notify relevant stakeholders. The system has the potential to save lives, minimize damage to property and infrastructure, and improve disaster management and response efforts. However, the successful implementation of this model requires careful planning, selection of appropriate sensors, development of robust analytics and algorithms, and extensive testing and validation. With proper implementation, this system can become an invaluable tool for disaster management and prevention.

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