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Study on IOT Based Flood Management System

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ABSTRACT :

Floods are a common occurrence around the world, and they are also one of many natural disasters. The flood is the world's third greatest disaster, according to the World Meteorological Organization(WMO). India is the most flood-prone country on the planet. As a result of the lack of foresight in the tactics adopted thus far, flood losses have continued to rise. The most pressing issue in India's present flood management is as a result, it is advocated that IoT-based flood management be addressed. This research work is broken down into five sections. First, we created an IoT-based flood management architecture that includes a predictive analysis. The Internet of Things (IoT) gadgets are linked to the internet.

These devices give real-time information about the water level, water flow rate, and rainfall in the catchment/low-lying area. This information is kept in the Cloud IoT's core. The data is compared to the available historical data using predictive data analytics, and if the data in real time exceeds the historical data value, stakeholders are encouraged to take preventive action. It was discovered that data collecting from IoT flood-based devices is required. The information gathered by the gadgets differs from one device to the next. It cannot be stored on a physical server or data centre since network connectivity will make it difficult to access the data during floods.

To address this, a cloud-based data collecting system is employed, and ThingSpeak is used in our work to gather data, and an application is being developed with three user interfaces: administrator, disaster management, and user. This is a user-friendly design. The administrator examines the flow rate response and oversees the water flow rate of the disposal system. Should the flow rate reach a critical level, the emergency management team will be notified to implement further measures, with simultaneous alerts sent to residents in the area.Furthermore, the data collected by the devices is private, necessitating the use of a realtime data filtration process to formulate flood-related action plans or judgments. For this task, a content- based recommendation system was utilized, and this sort of system won out since it will help to separate the content-based data, which is a flood in this situation. The flood victim re-use operation is used as a research object, and anytime the flood victim updates the state of the flood in the network, this model gathers information depending on the severity of the flood by comparing the rescue proceeds with the data from i IoT devices.

Another challenge with IoT-based flood management is the determination of an action plan based on the analysis of different data during a flood crisis. Individuals will not be able to analyse this data, hence a machine learning technique will be used to address this. Because it is utilized to make sequential decisions in uncertain and complex scenarios using a trial-and-error strategy, it has improved learning to decide.

This maximum utilization is put to the test by flash floods, which occur every year in India, and where rewards are granted based on the intensity of the flood, and the action performed is to remove the water by opening gates positioned at various points. This procedure is repeated until the water level returns to normal. For an IoT-based flood management system, an artificial intelligence technique is being developed. Because the severity of the floods varies from time to time, the data gathered from the devices is sparse and ambiguous.

For this objective, Artificial Neural Network(ANN) was chosen above other Artificial Intelligence (AI) techniques, and it is better suited for processing flood data. For the provided weighting, parameters are required, and the data can be analysed before a judgement is made. Authorities or stakeholders are recommended to act based on the severity of the flood. This approach will continue until the flood situation has been rectified. It is essential to mitigate losses due to floods in India by adopting all the key issues addressed, and the study is limited to the laboratory level; however, if it is tried in cities like Mumbai over time, it will help to make this method more effective, and it is possible to achieve zero losses due to floods.

INTRODUCTION:

Floods represent one of the most frequent and devastating disasters, causing significant losses year-round. While typically associated with the monsoon season, floods can also result from rainfall during non-seasonal periods, exacerbating damages. Various factors, including natural phenomena, human activities, riverbed conditions, lake overflow, and inadequate drainage systems, contribute to water overflow. Despite water being vital for a country's development, India's varying rainfall patterns have led to substantial agricultural, human, and economic losses due to floods.Urban areas, serving as economic centers, face increasing flood-related losses in recent years. Natural disasters like floods result in loss of lives, infrastructure damage, and financial setbacks. Notable flood events, such as the Bharuch, Gujarat flood of 2004 and subsequent floods in cities like Bhopal, Surat, Vishakhapatnam, and Chennai, have incurred significant damages. The automotive industry, for instance, suffered losses amounting to around 8,000 crores due to floods.Specific instances, such as the Saidapet floods which led to the destruction of 2,000 huts, 540 fatalities, and displacement of 18 lakhs, underscore the human toll of such disasters. Furthermore, major natural calamities like the 1999 cyclone in Odisha and the Indian Ocean tsunami of 2004 have resulted in substantial casualties and damages to coastal regions. Extreme precipitation events, as seen in 2007, have caused significant human and livestock losses.The Kashmir flash floods of 2014, triggered by heavy rainfall and landslides, resulted in numerous fatalities and highlighted the vulnerability of mountainous regions. Table 1.1, sourced from data.gov.in, provides insights into the areas and populations affected by floods from 1953 to 2017.1 IoT Based Flood Management System Fluvial Floods. The flood caused due to cloud burst is common in the Uttarakhand state and it causes landslides. These landslides will affect the flow of water causing the formation of lakes. As the water level reaches in this artificial lake this will cause floods and losses will be more. The methods used to prevent flooding include building dams to control the flow of water to avoid flooding, building walls along the river banks, planting trees along the river beds, and so on, but these methods used to deal with flood management are inadequate since, as explained above, the intensity of floods varies from time to time. With recent developments in the field of high computing and solid-state electronics, many technologies have evolved. This work will therefore focus on the design and development of a flood management system based on the IoT.IoT Based Flood Management System 1.2 Background and motivation Urban areas of this country have been the cause of a long-term imbalance in the behaviour of human conventions. The tradition of development that goes against the laws of natural inhibition is followed, while the only thing that is not blamed for the future destruction of such areas is the tradition itself.

The vast amount of structural development in areas where environmental support is needed, such as basins or slide regions, is a normal scenario to observe. The shocks that are repressed

at the moment of realization come back to haunt the same lives with total destruction by the supposedly understood and expected natural disaster. As humans, we cannot foresee the most common human error leaving the entire species in complete turmoil. Several constructions take place in areas with weak sedimentary stability. Places previously identified as low-lying zones, including seasonal lakes, are in the process of land reclamation. These human constructions are based on the idea of human supremacy, which is not ideal as it is wrong in any sense of the world. Places of land reclamation push the seawater back, creating certainty of terrible floods both in the area itself and in the neighbours. There is a considerable amount of such construction dejectedly. Some wellknown examples of these are the Palm Islands of Dubai, which include Palm Jumeirah, Deira Island and Palm Jebel Ali. These have led to the creation of extensive land, which is prone to floods and other geographical calamities. The inner lands of human settlement in the Palm Islands have a treacherous pool of non-filtering water, as the outer islands, which were previously designed to protect the inner islands from flooding damage, also prevent any circulation of water between the inner and outer waters, leaving domestic settlers with a foul-smelling and mostly infected source of water. Such incidents fail to serve the sole purpose of development, which is to improve living conditions and standards. The rapid loss of living conditions paralleled the funds received by NAKHEEL (the company responsible for these constructions) which forced them to withdraw from other projects. There are many such land reclamation projects, some of which have been successful, while others have been problematic for the marine and terrestrial ecological diversity of the area [7][8][9][10]. Mumbai, India, exemplifies a remarkable recovery process. Upon the transfer of land from the Portuguese to the British, the latter found themselves with a small yet economically significant territory. The consolidation of the Bombaim Islands, Colaba Islands, and Old Women's Island through land reclamation spanned 150 years, shaping Mumbai into its current form. This transformation from an archipelago to a bustling metropolis has earned Mumbai its reputation as the "city of dreams." However, the land reclamation efforts inadvertently eliminated low-lying areas, leading to frequent flooding in both the newly reclaimed land and surrounding regions during monsoon seasons.Figure 1.2 shows some pictures of Mumbai flood [11]. The Salt Lake City of Kolkata faces similar problems. Land reclamation has led to previously non-existent seasonal floods in the metropolitan area,

stopping the city's growth and processes for days[12].In the case of Mumbai, alarming and evacuation systems have been set up. It works on the basis of a network connective response. Other urban cities, such as Delhi, Kolkata, Bangalore, etc., have yet to be set up for such tragedies [13][14]. • Motivation India has seen many floods over the years but in the year 2013, the Uttarakhand state witnessed heavy rains, a sudden burst of Glacier Lake and cloud burst causing floods in the region of Kedarnath temple. This caused enormous of the lives and infrastructure in the history of Indian floods. The geographical aspects delayed the rescue operation and due to this, more than 1 Lakh people were stuck near the temple. Many infrastructures near Rambana were destroyed, more than 5748 lives were lost and also more

than 4000 villages were affected. Also, floods occur in Mumbai every year causing losses of lives and infrastructures. This occurs due to the unplanned development and catchment area. These two scenarios gave inspiration on working on a flood management system that helps in minimizing the losses using available latest technologies. "We cannot stop natural disasters but we can arm ourselves with knowledge: so many lives wouldn't have to be lost if there was enough disaster preparedness" Petra Nemcova The above quote shows that disasters are inevitable, but losses due to disasters can be avoided if we systematically use the available flood-related technologies / knowledge. Therefore, this work focuses mainly on preventing losses from floods and, for this purpose, the smart IoT method is widely used in this work to prevent disasters and floods. Also, this work will address the key issues such as real-time flood management, efficient flood data collection, and analysis of this data to make 7 IoT Based Flood Management System Figure 1.3: Rainfall rate (June –September). decisions related to flood management. This will help the different disaster management agencies to prevent losses due to floods. This work can be used in flash flood management, urban flood management, or any other type of flood. 1.3 Major parameters of floods with types The parameters contributing to floods in India are shown below [5]. • Precipitation • Non-seasonal Precipitation • Urban Expansion • Inadequate Management of Drainage Systems • Tropical Storms • Seismic Waves

Artificial Flooding from Dam Construction and •Earth Movements Altering River Flow Directions These significant factors are elaborated upon in the subsequent sections. Precipitation: The intensity of rainfall fluctuates significantly over time. Rainfall patterns vary across regions; for instance, the amount of precipitation in Uttarakhand differed between 2020 and 2015. Both central and state governments often struggle to respond effectively to such variations. Non-monsoon precipitation: Presently, precipitation patterns undergo dynamic shifts due to changing weather conditions, resulting in greater losses than typical rainfall. This includes tropical storms caused by disparities in sea pressure and tornadoes. There are numerous instances of such weather phenomena. Flood Classification: Floods manifest in various forms, categorized based on their origins and characteristics, as outlined below. Riverine Floods: Primarily triggered by heavy rainfall, riverine floods occur when river channels reach their capacity, inundating low-lying areas nearby. These floods, depicted in Figure 1.4, are commonly known as river floods. Pluvial Floods: Also known as flash floods, this type of flooding arises from sudden and intense rainfall or cloud bursts, often catching people unaware. They pose significant danger and typically result in higher losses compared to other floods. In urban areas, clogged drainage systems exacerbate the problem, leading to sewage overflow during heavy rainfall. Urban Flooding: Urban sprawl is a major contributor to this type of flooding. During the rainy season, inadequate drainage systems fail to effectively manage water disposal, resulting in widespread flooding. Urban areas, despite being economic hubs, often struggle to cope with the consequences of unplanned development facilitated by municipal authoritiesCoastal inundations: These inundations predominantly arise from tsunamis and cyclones. Coastal regions are particularly susceptible to this type of flooding. Variations in sea pressure lead to incessant rainfall, resulting in substantial loss of life and infrastructure. Tsunamis stem from underwater earthquakes, causing a sudden surge of

seawater towards coastal areas [18]. Coastal flooding is depicted in Figure 1.6. Glacier-fed deluges: These deluges occur in Himalayan regions where glacial meltwater is obstructed, leading to sudden breaches and flooding in nearby areas. Uttarakhand, India, witnessed such a flood in 2013. This type of flooding is prevalent in glacier-rich regions [19]. Notable flood- prone regions in India: India, the world's fourth-largest country by area, is bordered by the sea in the south and mountains in the north. Geographical and socio-economic disparities vary across the nation. With numerous rivers crisscrossing the country, flooding is often influenced by the geographical distribution of natural features such as rivers, mountains, and seas.

Consequently, floods are frequently exacerbated by persistent rainfall and torrential downpours during monsoon seasons, with the Ganga and Brahmaputra river basins being particularly susceptible to flooding compared to other river basins in India [20][21].

Brahmaputra river basin region: The Brahmaputra basin often experiences flooding due to excessive river water flow, compounded by earthquakes and landslides. Areas like Assam and West Bengal bear the brunt of this river's impact [22].• Ganga river region: Originating from Himalayan glaciers, the Ganga traverses through northern India, including Uttarakhand and Uttar Pradesh. Sand deposition from the Himalayas and the accumulation of mountain debris in the river reduce its flow capacity, leading to floods [22].• Northwest river region: Situated in northwest India, this region faces comparatively fewer floods. However, inadequate drainage and waterlogging contribute to occasional flooding. Leh-Ladakh and Jammu- Kashmir experience cloud bursts, while Rajasthan grapples with flash floods due to heavy rains. In Himachal Pradesh, extensive landslides obstruct water flow, triggering floods [22].• Central region and Deccan region: Encompassing rivers like Kaveri, Krishna, Godavari, and Mahanadi in Gujarat, Andhra Pradesh, Kerala, and Karnataka, these regions witness floods primarily due to heavy rainfall. Coastal floods are prevalent here, induced by cyclones, tidal waves, and sea pressure changes, inundating low-lying coastal areas [22].Urban areas: Urban floods often result from cyclones or low-pressure systems causing heavy rains, leading to the inundation of lakes and rivers. Obstructed waste lines and domestic wastewater pipes exacerbate the problem. Mumbai serves as a prime example, experiencing severe flooding annually during the monsoon season [23]. Over the past thirty years, urbanization has surged in developed and industrialized nations. Particularly in Asia, notably India, urban growth has presented numerous challenges for municipal administrations in terms of city management. The demand for infrastructure and services has increased significantly due to the migration of people from rural to urban areas, often accompanied by inadequate knowledge about waste disposal [24]. Figure 1.7 illustrates the population shift from rural to urban areas between 1960 and 2017 [25]. This data reveals a substantial increase in total population growth, rising from approximately 21 percent in 1960 to around 50 percent in 2017. Urban areas face heightened flood risks due to unplanned infrastructure development during monsoons, cyclones, and low- pressure events, resulting in damage to lives and property [26]. While urban floods are not the primary concern in India's flood-prone regions, they have become increasingly common over the past two decades due to unregulated urbanization, rural-to-urban migration, and urban sprawl. Given that urban areas serve as economic centers, flood-related losses are more pronounced. Factors such as heavy rainfall leading to flash floods, coupled with

underdeveloped drainage systems, exacerbate flooding in urban areas due to geographical and infrastructural constraints [26]. In India, flood management systems have undergone significant evolution over the years. Following the catastrophic floods in Bihar in 1954, the Indian government began prioritizing flood protection and management. Subsequent amendments have been made to flood prevention strategies to mitigate losses. Flood management typically involves four phases, as depicted in Figure 1.8. The mitigation phase involves implementing preventive measures before floods occur to mitigate potential adverse effects such as loss of life and property. These measures are aimed at minimizing the impact of floods and are implemented preemptively. The preparedness phase occurs prior to the onset of disasters or floods and focuses on readiness to handle potential emergencies. This includes activities such as training individuals, raising awareness about the effects of floods, and mobilizing resources to respond effectively.The response phase is activated in the immediate aftermath of a disaster or flood to ensure the protection of people and infrastructure. It involves implementing emergency action plans to minimize losses and relies heavily on the preparedness efforts undertaken beforehand. As the situation stabilizes, efforts shift towards reconstruction and recovery.The recovery phase follows the occurrence of floods and involves rebuilding homes, infrastructure, and communities to return to normalcy. This phase is typically the most time-consuming, lasting anywhere from six months to several years.

Mitigation and preparedness phases are proactive measures taken before floods, while response and recovery phases are reactive measures implemented during and after floods. The management of water resources, including flood prevention structures, is a crucial aspect of flood management governed by Schedule 7 of the Indian Constitution. State governments, with support from the central government, are responsible for implementing flood management initiatives through various schemes and guidelines established by committees. In addressing flood management in India, two primary levels are involved: the central government and the state government. Central government organizations are tasked with disaster management nationwide, implementing preventive and mitigation measures in collaboration with various agencies. This multidisciplinary field necessitates cooperation among numerous entities. Key agencies at the central level include the Ministry of Water Resources (MoWR), responsible for coordinating with other agencies. The Central Water Commission (CWC) is a significant organization under MoWR, overseeing water resource management, infrastructure construction, flood forecasting, and safety assessments of dams.

Additionally, sub-agencies such as the Ganga Flood Control Commission and the Brahmaputra Board play crucial roles. Other bodies like the Indian Meteorological Department (IMD) and National Remote Sensing Center aid in flood forecasting and post-flood management.At the state level, infrastructure projects such as drainage pipeline construction and dam building adhere to central government policies and are managed by the Public Works Department (PWD). States receive guidance from MoWR on infrastructure development to prevent floods, with projects being time-bound and executed by the PWD. The role of emerging technologies in flood management has become increasingly vital over the past two decades. Conventional methods have proven inadequate, particularly in urban areas facing evolving challenges. As a result, there is a growing recognition of the need for innovative solutions to effectively address

modern flood-related issues. Hence, there is a pressing need for innovative approaches to overcome the limitations of traditional flood management methods. Recent advancements in solid-state electronics have simplified and enhanced the functionality of various devices and sensors. This has spurred the development of new technologies discussed below.Artificial Intelligence (AI) operates on the principles of human intelligence, enabling machines to mimic human-like thinking and decision-making processes. Many AI techniques are now applied across various domains, including flood management, where they aid in decision-making processes. Researchers have explored the integration of AI technology into flood management strategies.Cloud computing stands out as a significant emerging technology in the computing field. It offers users access to data processing and storage capabilities over the internet. Data centers play a crucial role in this technology, facilitating real-time storage of flood-related data. Cloud computing is instrumental in storing flood data and facilitating analyses for flood severity assessments and forecasting.Edge computing, on the other hand, is a distributed information technology architecture that enables data processing at various decentralized centers. It finds application in flood management scenarios where localized data processing is required. This approach enhances efficiency in flood management operations. The flood management system in question utilizes IoT technology and is structured with distinct layers, as illustrated in Figure 1.9. These layers are designed to efficiently process flood-related data and make informed decisions. At the foundational layer, physical devices such as sensors, actuators, and controllers are employed. These devices include various types of sensors like temperature, humidity, and motion sensors, as well as actuators such as motors and relays.

Controllers such as Arduino Uno and Raspberry Pi manage these devices.Connectivity is established in the second layer using protocols like Wi-Fi, Internet, and Zigbee, enabling communication between physical devices and controllers. Table 1.2 outlines the wireless IoT protocols utilized for connectivity, each with its own data rate and range specifications.Once devices are interconnected, data collection occurs based on predetermined formats and computing techniques like cloud computing or fog computing. The collected data is stored either in cloud-based databases or centralized physical storage. This data is then refined and abstracted to ensure accuracy.Subsequently, the processed data is utilized for various applications in the topmost application layer. These applications include data analysis, sensor performance evaluation, and power consumption analysis, among others.The primary objective of this thesis is to develop an IoT-based flood management system. The sub- objectives include designing the system architecture, establishing a data collection process, implementing a real-time information filtering system, and proposing techniques based on reinforcement learning and artificial neural networks for flood management.

Literature Review

Introduction This chapter deals with IoT-based flood management available in the literature and the research gap that pretends to be a critical review of the literature. Flood management research has been conducted for the past three decades, but this provides more insight into recent developments in flood mitigation and related losses, the technology used and its limitations. The following critical review provides more detailed answers to unanswered questions related to the flood management, for example:-

- How effective is the available flood management system?
- What technologies are used, and how effective are they?
- Are these methods capable of effective relief for the victims of floods?
- Are these methods available is good for predicting floods and sending early warnings to affected areas/stakeholders? All of these are explained under the following sub sections.
- In recent years, social media platforms like Facebook, Twitter, and Google have emerged as crucial channels for communication, especially during times of crisis such as floods or disasters. Traditional communication methods often prove inadequate in such situations, highlighting the importance of social media in facilitating communication and information dissemination. Social media plays a significant role in flood management through various means:
- Providing timely information about pre and post-disaster/flood situations: Messages and posts on social media platforms serve as valuable sources of information for residents in affected areas, helping them stay informed and take necessary precautions to minimize losses.It provides the location and information about the resource and rescue to the stakeholders.
- It provides information to friends and family of the flood-affected zones.
- In this method sometimes people post false information for the sake of publicity. The network many times may not be available for immediate information posting on social media during post floods. Community: Beginning from World War II, community- based programs are chosen and used in emergencies such as firefighting by a group of volunteers. Communities are groups of individuals that represent people who are in need effectively. After twenty years, the complete uses of these communities have begun and are used to perform the services of small local communities. During the Taiwan floods and the US floods, the use of communities in flood control began. The functions of flood control societies are:-
- Allowing individuals to evacuate during the pre-flood or when the flood alert is released.
- Providing the basics during pre and post-flooding and medical assistance.
- Rescuing people who are stranded in the zones impacted by the storm, and so on. The individuals needed to be qualified to perform this kind of role and are unable to cope
- with the adverse flood situation. Authority assistance is not immediately available during and after flooding. Statistical data analysis: This approach uses past flood/disaster data to predict the major flood-related issues and predict the occurrence of the flood and its effects. Based on the type of data it can be analyzed, using various statistical models

DESIGN AN ARCHITECTURE OF IoT BASED FLOOD MANAGEMENT SYSTEM

To address the challenges posed by changing flood severities and minimize associated losses, we propose a model based on IoT for flood management. This model operates as an integrated system, allowing different service providers to manage various services at both local and national levels. In this chapter, we focus on designing the architecture for IoT-based flood management, considering the impact of floods on society and the environment, as well as the limitations identified from existing methods. This architecture aims to mitigate losses effectively.Additionally, we introduce a predictive analysis framework, chosen over prescriptive and descriptive analysis due to its ability to forecast flood severity based on historical data, thus enabling proactive measures to minimize losses. The following subsections detail the IoT-based flood management architecture and the predictive analysis framework.

- Architecture:

The architecture of IoT-based flood management comprises flood management devices, network infrastructure, cloud IoT flood management core, data analysis components, and management of IoT cloud applications and services.

- IoT Flood Management Devices:

These devices include sensors, actuators, and controllers, each serving specific functions:

- Arduino Uno: This microcontroller is utilized for controlling various sensors and motors. Known for its cost-effectiveness and performance, the Arduino Uno based on ATmega328 is preferred due to its simplicity in programming and low power consumption.
- Water Flow Rate Sensor: Used for measuring fluid flow rates, particularly water, this sensor employs a Hall Effect sensor to detect flow rates based on pressure or force, transmitting signals to the microcontroller.
- Ultrasonic Sensor: Employing sonar technology, this sensor determines object distances and is useful for obstacle detection. It is utilized in our study to gauge wastewater levels for further analysis.
- Wi-Fi Module: Facilitating real-time control of wastewater disposal systems, this module enables data collection from stations and synchronization for stakeholders' access to data.
- GPS Module: Incorporated with all devices, this module sends location data when wastewater levels reach critical levels, aiding stakeholders in flood prevention measures.
- DC Motor: Utilized for valve control in wastewater disposal systems, this motor opens valves when water levels reach critical thresholds.
- IoT Flood Management Network: Given the constraints of flood situations, wireless networks particularly Wi-Fi, are essential for connecting IoT devices. While wired connections are impractical during floods, Bluetooth and Zigbee networks have limited ranges, making Wi-Fi the preferred option for device connectivity.

DEVELOPMENT OF DATA COLLECTION PROCESS IN IoT BASED FLOOD MANAGEMENT SYSTEM

Flood situations vary from time to time and IoT devices such as sensors, actuators, and control systems used to collect data such as flow rate, water level, rain intensity, amount of rainfall, and so on are difficult. The data are collected by two main methods: data storage via data centers, and cloud-based data storage. The data collected in local data centers only works when flood conditions are under control, so it is not useful for proper data collection or processing in severe flood situations. The data generated by the devices is therefore discreet and it is necessary to design a method for collecting the data. Cloud-based data storage is therefore best suited. This chapter explains how the cloud based on IoT is used to collect flood data. The runoff grid is divided into four parts based on geography. India is divided into south, north, northeastern, and northwestern parts. Three sides of India are surrounded by sea and the other part by the hill. The river and rainwater flow/runoff grid are Flood management model In urban areas, floodwater and wastewater treatment systems are critical. In India, urbanization spreads very quickly across the world in many Asian countries. Due to the local government's inability to effectively manage floods, there's a pressing need for an automated disposal and monitoring system. The proposed methodology framework comprises various systems and subsystems, each serving distinct roles in water disposal, particularly during flood events. Water flow sensors are strategically positioned in different locations, linked to various subcomponents/systems including controllers, Wi-Fi modules, GPS modules, and water pumps. These interconnected elements collaborate to discharge water when levels reach critical thresholds.

Comparative analysis and discussion

The flood water disposal device we've engineered operates efficiently with minimal power consumption, ensuring its functionality even under low-power conditions. Data acquisition is facilitated through the reliable ThingSpeak cloud platform, offering robust data storage capabilities. Employing a closed-loop system, we've minimized human error, thereby enhancing system reliability during floods or unforeseen events. Continuous data collection, ranging from seconds to days, enables us to automatically gather data, plot graphs depicting flow rates in specific urban areas where our system is deployed. This meticulous approach to system development ensures effectiveness and efficiency in mitigating losses during urban floods. Collected sensor data and control system feedback are seamlessly transmitted through Thing Speak, with stored cloud data serving as valuable resources for future analysis and flood water disposal management.

Conclusion and Future Scope

To save flood victims efficiently and effectively, a recommendation framework is proposed. The following are the core features:

- The recommendation system follows a systematic process in the rescue of flood victims and providing aid in-time.
- We are following step by step process along with a specially designed framework so it makes this system more efficient and reliable.
- The quality of rescue operation carried out using this system is effective as per the flood victim is considered. It is because it responds to the flood victim rescue based on the severity flood/higher weight age given to the victim needs to be based on floods (As per the mathematical model incorporated in this work and performance analysis).

The proposed model used to reduce urban flood losses and to monitoring in real time are more important. Another important thing is that the data can be stored and used to understand the regular flow rate of the flood waters so that preparation can be done for a redesign of the flood water disposal system. This is achieved through the design and development of a cloud-based IoT data storage system. So the designed framework collects the data from the IoT devices through Thing Speak is the open IoT platform with MATLAB analytics and it is processed to determine the severity of the floods from the data. The application is developed and has three user interfaces, the administrator, the flood management and the user. This design is very easy to use. The administrator monitors the water flow rate of the disposal system and studies the flow response. If the flow rate reaches the critical level indicated, the emergency management team will be well aware of further measures and the notifications will be sent simultaneously to the people living in this area.on mobiles phones.

REFRENCES :

1. Mohit Prakash Mohanty, Sahil Mudgil, and Subhankar Karmakar. "Flood management in India: a focussed review on the current status and future challenges". In: International Journal of Disaster Risk Reduction 49 (2020), p. 101660.
2. PK Sharma et al. "Technical Note Flood management using remote sensing technology: the Punjab (India) experience". In: International Journal of Remote Sensing 17.17 (1996), pp. 3511–3521.
3. AD Kaushik and Vinod K Sharma. "Flood management in India". In: Indian Journal of Public Administration 58.1 (2012), pp. 119–136.
4. https : / / data . gov . in / resources / year - wise - statement - showing - flood - damage - india - uttar - pradesh - madhya - pradesh - and - bihar - 1953. [Online; accessed on 20-November-2020].
5. Azazkhan I Pathan and PG Agnihotri. "Use of Computing Techniques for Flood Management in a Coastal Region of South Gujarat–A Case Study of Navsari District". In: International Conference on Intelligent Computing & Optimization. Springer. 2019, pp. 108–117.
6. Joy Sanyal and Xi Xi Lu. "Application of remote sensing in flood management with special reference to monsoon Asia: a review". In: Natural Hazards 33.2 (2004), pp. 283–301.
7. Kamal El Kadi Abderrezzak, André Paquier, and Emmanuel Mignot. "Modelling flash flood propagation in urban areas using a two-dimensional numerical model". In: Natural Hazards 50.3 (2009), pp. 433–460.
8. Mohammad Karamouz, Zahra Zahmatkesh, and Talal Saad. "Cloud computing in urban flood disaster management". In: World Environmental and Water Resources Congress 2013: Showcasing the Future. 2013, pp. 2747– 2757.
9. M Monirul Qader Mirza, Ajaya Dixit, and Ainun Nishat. Flood problem and management in South Asia. Springer, 2003.
10. Shubha Avinash. "Flood related disasters: Concerned to urban flooding in Bangalore, India". In: Int. J. Res. Eng.
11. Technol 3 (2016), pp. 76–83. 97
12. http://frontline.thehindu.com/dispatches/article31832626.ece. [Online; accessed on 15-June-2020].
13. Azimah Abdul Ghapar, Salman Yussof, and Asmidar Abu Bakar. "Internet of Things (IoT) architecture for flood data management". In: Int. J. Future Gener. Commun. Netw 11.1 (2018), pp. 55–62.
14. Dola Sheeba Rani, GN Jayalakshmi, and Vishwanath P Baligar. "Low cost IoT based flood monitoring system using machine learning and neural networks: flood alerting and rainfall prediction". In: 2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA). IEEE. 2020, pp. 261– 267.
15. Omvir Singh and Manish Kumar. "Flood occurrences, damages, and management challenges in India: a geographical perspective". In: Arabian Journal of Geosciences 10.5 (2017), p. 102.
16. https://data.gov.in/resources/sub-divisional-monthly-rainfall1901-2017. [Online; accessed on 20-November- 2020].
17. M Anbarasan et al. "Detection of flood disaster system based on IoT, big data and convolutional deep neural network". In: Computer Communications 150 (2020), pp. 150–157.
18. Vujica Yevjevich. "Floods and society". In: Coping with floods. Springer, 1994, pp. 3–9.
19. Jamal Al Qundus et al. "Wireless sensor network for AI-based flood disaster detection". In: Annals of Operations Research (2020), pp. 1–23.
20. Mohammed Khalaf et al. "IoT-enabled flood severity prediction via ensemble machine learning models". In: IEEE Access 8 (2020), pp. 70375–70386.
21. Umara Zafar et al. "Exploring IoT applications for disaster management: identifying key factors and proposing future directions". In: Recent trends and advances in wireless and IoT-enabled networks. Springer, 2019, pp. 291–309
22. S van Ackere et al. "A review of the Internet of Floods: near real-time detection of a flood event and its impact." In: Water 11.11 (2019).
23. NN Bhattachaiyya and AK Bora. "Floods of the Brahmaputra river in India". In: Water international 22.4 (1997), pp. 222–229. 98 IoT Based Flood Management System
24. Swapnil Bande and Virendra V Shete. "Smart flood disaster prediction system using IoT & neural networks". In: 2017 International Conference On Smart Technologies For Smart Nation (SmartTechCon). Ieee. 2017, pp. 189–194.

25. Hamadi Lirathni et al. “A Real-Time Flash-Floods Alerting System Based on WSN and IBM Bluemix Cloud Platform”. In: International conference on the Sciences of Electronics, Technologies of Information and Telecommunications. Springer. 2018, pp. 390–399.
26. George Suciu, Andrei Scheianu, and Marius Vochin. “Disaster early warning using time-critical iot on elastic cloud workbench”. In: 2017 IEEE International Black Sea Conference on Communications and Networking (BlackSeaCom). IEEE. 2017, pp. 1–5.