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Drainage Overflow Detection And Control During Flood

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Abstract: Flooding is one of the major disasters occurring in various parts of the world. Due to the high density of buildings, flash floods are prevalent in cities. In such scenarios, there is a possibility of a drainage overflow. Therefore, implementation of an intelligent analysis of drainage leakage detection during flood using sensors are necessitated for the field of research in Disaster management.

Floods in india hence became the huge obstacle in achieving economic growth in the country. Unplanned urbanization also has a huge impact on drainage and garbage disposal system. Overflow of drainage water onto the grounds are day to day problems that one living in the cities usually face. Hence to decrease all these effects onto the human life, we come up with this proposed system.

Keywords: Sensors, microcontroller, Blynk cloud, Barriers.

I. INTRODUCTION

Flooding is one of the major disasters occurring in various parts of the world. Due to the high density of buildings, flash floods are prevalent in cities. In such scenarios, there is a possibility of a drainage overflow. Therefore, implementation of an intelligent analysis of drainage leakage detection during flood using sensors are necessitated for the field of research in Disaster management. [1]

Most of the cities in India adopted underground drainage system which are usually monitored by the municipal corporation to maintain cleanliness of the city. Due to the poor maintenance of the sewage system, the sewage water is overflowed on the streets and sometimes mixes into the drinking water which damages the health conditions of the people.

The condition of drainage getting blocked during the rainy season is usual and it further gets worser when this happens during flood. Leakage of sewage water into the flood water is most common problem faced by the flood prone areas. Hence to overcome this issue we are proposing the model called Drainage Overflow Monitoring System. This proposed system will detect the sewage water mixture into the flood water and the sensor sends information immediately to the nearest managing station as SMS via transmitter. [2]

The aim of this project is to develop a certain IoT based system which is efficient enough to predict the drainage conditions and alert the officers immediately when the drainage water is found overflow became a flood. To develop the short time hydraulic pressure barrier system would be immediate control system, so that preventive measures for the locality people's property damage and inundation of the area is taken care of.[3]

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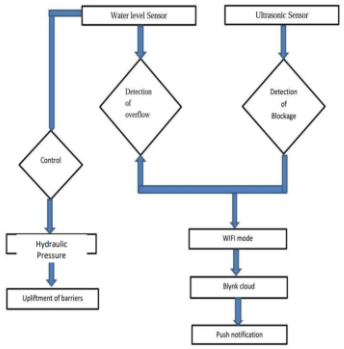

Figure 1: Block Diagram

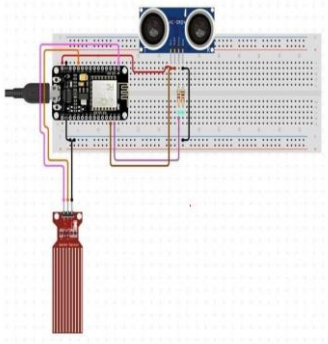

Figure 2: software circuit simulation.

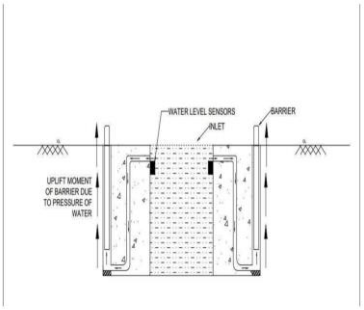

Figure 3: 2D Diagram

Figure 4: 3D Diagram

Figure 5: Ultrasonic sensor

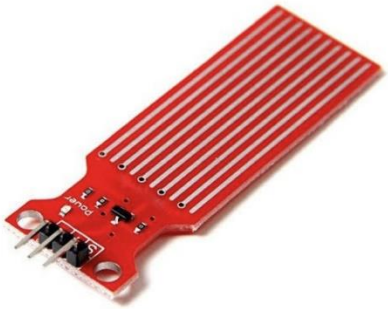

Figure 6: Water Level **sensor**

water level sensors at the top edge of the drainage, senses the overflow of the water and sends the signals to the respective authority members through the push notification via blynk application. As the result of this, an immediate action is hence necessary until the authority member arrive for the recovery. The immediate action involves upliftment of the installed barriers to protect the flow of water to the ground level. This is achieved through the hydraulic pressure created inside the compartment constructed as per the 2D diagram (fig 3.2) which specifies the physical components of the proposed system. Adding to this, we have also implemented the water level sensors into the tip of the barrier edge to sense if the water exceeds that height too. India is highly vulnerable to floods. Out of the total geographical area of 329 million hectares (mha), more than 40 mha is flood prone. Floods are a recurrent phenomenon, which cause huge loss of lives and damage to livelihood systems, property, infrastructure and public utilities. It is a cause for concern that flood related damages show an increasing trend. The average annual flood damage in the last 10 years period from 1996 to 2005 was Rs. 4745 crore as compared to Rs. 1805 crore, the corresponding average for the previous 53 years. This can be attributed to many reasons including a steep increase in population, rapid urbanization growing developmental and economic activities in flood plains coupled with global warming.

Floods in India is a huge obstacle to achieving economic growth in the country. Each year huge amounts of investments in agriculture, aquaculture, and other sectors go into vain due to this natural calamity. The major causes of flood in India are incessant rainfalls, cyclones, and inadequate drainage systems.

Unplanned urbanization has worsened the drainage and garbage disposal systems, leading to the decreased carrying capacity of rivers and floods. Urban areas are densely populated and people living in vulnerable areas suffer due to flooding, sometimes resulting in loss of life. It is not only the event of flooding but the secondary effect of exposure to infection also has its toll in terms of human suffering, loss of livelihood and, in extreme cases, loss of life.

The proposed system detects the overflow or leakage of the drainage water to the flood water and alerts the neighboring managing office. This can be further carried forward by alerting the locality people via transmitters to bring the situation into their notice. The previous systems are proposed for flood monitoring and alerting. This system is very beneficial for flood prone areas. The proposed multifunctional system improves community preparedness for extreme weather events

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such as floods, in terms of both warning and increasing understanding of risks, appropriate flood responses and hydraulic pressure real time barrier. This minimizes safety and infrastructure threats. As part of the warning, the system provides a prediction of the scale, timing, location and likely damages of the impending flood.

II. LITERATURE REVIEW

Debasis Parinda, 2021 [2]: proposed a Sewage Monitoring and Maintenance Alert using IoT. Sewage management is an important aspect of municipal infrastructure and undoubtedly, it affects our daily hygiene. Poor sewage/drainage management can cause urban floods which is most common in crowded cities. This problem can be addressed by using Smart Sewage Management Device based on IoT and Sensor Technology. Here, A smart device that can sense when the drainage system gets blocked and if the water overflows because of this blockage, we will send a notification to the municipal authority for the necessary action. Moreover, usingthe Android application, the status of the drainage system can be monitored in real-time. This project is very similar to a normal water level indicator project that we have build earlier, but instead of water, we will be sensing sewage overflow and monitor it online using IoT.

K Subramanya Chari et.al 2020 [1]: proposed an IoT-based Flood Monitoring and Alerting System using Raspberry Pi. The loss of properties and living population is getting enhanced by every year due to the dynamic alterations in weather conditions which results in heavy floods. Therefore, implementation of an intelligent analysis of flood risk is necessitated for the field of research in Disaster management. This article implements an intelligent IoT-based flood monitoring and alerting system using Raspberry Pi model, where water sensors and rain sensors are utilized to alert the authorities regarding the heaviness of rain and monitoring of water level in a lake or river. This system alerts the people in nearby villages since it utilizes IoT system for notifying the village people.

Ryan Hanson, 2020 [4]: The water supply shortage has increased in recent years due to overpopulation, climate change and obsolete water facilities, where deteriorated pipes cause most of the water leaks. The problem is not the size of the leak, but the time it takes to detect it. This paper presents the implementation of a system installed in the hydraulic facilities of a residence, to detect water leaks. The system consists of a water sensor installed by a water reservoir of interest, a microprocessor to interpret the data and evaluate whether it is a water leak or not, an SMS alert message, and an electrical actuator to shut off the main water supply to avoid leakage.

Girisrinivaas Ranga Rao, 2017 [3]: In the proposed idea of Drainage Overflow Monitoring System using IoT (DOMS), the device would track the amount of water and gas in the sewage system and the calculated values will be recorded in the cloud storage unit and the state of the sewage system will be submitted as SMS to the corporate office utilizing the GSM module.

Qinggong Ma, 2017 [7]: The Survey has analyzed the security architecture and security requirement of IOT technology. The paper describes the demand of urban waterlogging prevention management system with the help of IOT. The basic model urban water logging prevention has described in this article.

U.S. De, G. P. Singh, 2013 [8]: People are migrating from rural to urban area due to unemployment and other reasons. The population count is increasing day by day and due to that cities are facing many new challenges. Flooding condition is one of the big challenges increased due to uncontrolled growth of mega cities. The article describe the population count and death rate due to flooding in four mega cities in India.

"Real-Time Urban Flood Detection and Alerting System Using Social Media and Remote Sensing Data" by M. A. Hossain, M. A. Habib, and F. K. Chowdhury (2017).

"An intelligent drainage system for urban flood management" by N. Li, H. Li, and Z. Li (2018).

"Smart Stormwater Management: A Review of Green Infrastructure Technologies for Urban Drainage Systems" by S. P. Davis, M. R. Grace, and S. A. Rizak (2019).

"A Novel Method for Real-Time Urban Drainage System Monitoring and Overflow Prediction" by W. Chen, Y. Huang, and C. Guan (2017).

"A Multi-Sensor Data Fusion Framework for Real-Time Detection of Drainage Overflow" by M. M. Rahman, T. D. Truong, and A. H. M. Kamruzzaman (2019).

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Review of Urban Drainage Overflow Control Strategies" by Dan Li and Chris Sweetapple. This paper provides an overview of the different strategies used to control urban drainage overflow, including gray infrastructure (e.g., pipes and storage tanks) and green infrastructure (e.g., rain gardens and bioswales). It also discusses the advantages and limitations of each strategy.

"Real-time control of urban drainage systems: A review" by Ana Deletic and Angus Simpson. This paper reviews the use of real-time control in urban drainage systems to reduce the risk of overflow. It discusses the different types of control strategies, such as rule-based and model-based control, and provides examples of their implementation in different cities.

III. SUMMARY

The proposed system should detect the overflow or leakage of drainage water during flood and to control at the end of the model, the system should work in time critically while transmitting the alert signal to the managing office.

In addition, it should also immediately react to the overflow detection until the officers reach the spot for any further actions. It should be able to lift up the barriers through the hydraulic pressure technique and block the leakage to the ground level. If incase the leaked water level reaches the barrier tip, again it should be able to detect using sensors and immediate messages needs to be sent.

IV. CONCLUSION

In conclusion, the system we developed can accurately detect drainage overflow and alert the concerned authorities. The use of ultrasonic sensors and an Arduino microcontroller makes the system efficient and cost-effective. The system can be further improved by adding more sensors to cover a larger area and by integrating it with a database to store the data for future analysis.

The system can also be used in other applications such as flood detection and water level monitoring. The proposed Multifunctional System improves community preparedness for extreme weather events such as floods, in terms of both warning and increasing understanding of risks, appropriate flood responses and hydraulic pressure real time barrier.

This minimizes safety and infrastructure threats. As a part of the warning, the system provides a prediction of the scale, timing, location and likely damages of the impending floods.

The current increase in the number and degree of extreme weather events such as floods make this technology important for climate change adaption.

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[9] Review of Urban Drainage Overflow Control Strategies" by Dan Li and Chris Sweetapple. This paper provides an overview of the different strategies used to control urban drainage overflow, including gray infrastructure (e.g., pipes and storage tanks) and green infrastructure (e.g., rain gardens and bioswales). It also discusses the advantages and limitations of each strategy.

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