MONITORING AND WARNING OF FLOODING CONDITIONS USING IOT BASED SYSTEMS

Dr. SUBODH KUMAR PANDA[1], GUTHULA SATYA VIJAY KRISHNA[2], KESANAKURTHI BHAVANA[3]

[1]Professor, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

[23]UG Students, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

ABSTRACT

Flooding is one of the most devastating natural calamities that needs to be addressed. It has significant impacts on the economy and has caused many deaths. A major reason for these fatalities is the absence of early warnings.

This project introduces an innovative method for flood detection and measurement using affordable components and IoT technology. The study utilizes devices like the NodeMCU, Ultrasonic sensors, and others to detect and measure floodwater depths accurately.

The flood detection system integrates an SR04 sensor with a NodeMCU ESP8266 microcontroller to continuously measure distances to the water surface using ultrasonic waves. The microcontroller processes sensor data, converting it into Wi-Fi-compatible format through the Arduino IDE. This enables the establishment of connections to the local Wi-Fi network and the BLYNK IoT Cloud Platform for data transmission.

Once connected, the microcontroller sends processed sensor data to the BLYNK Cloud Platform at regular intervals. Users can access custom dashboards on BLYNK to visualize real-time river level data from any internet-enabled location. They can track the river levels graphically, enabling quick and easy interpretation of the data for effective flood monitoring.

INTRODUCTION

Floods are among the most destructive and unpredictable natural disasters, capable of causingsubstantial damage to communities worldwide and posing significant threats to both life and infrastructure. The lack of timely warnings exacerbates its impact, resulting in substantial loss of life and economic disruption annually.

In response to this critical issue, our project endeavors to introduce a revolutionary solution: a sophisticated flood warning system powered by the Internet of Things (IoT). To issue early warnings before floods occur.The IoT is a network of interconnected devices that can communicate and exchange data seamlessly over the internet.

In our case, we use IoT to monitor water levels in rivers and streams. When water levels rise to potentially dangerous levels, our system automatically triggers alerts to the relevant authorities, including emergency responders and local government agencies. These alerts provide crucial lead time for communities to prepare evacuation plans, secure property, and take other necessary precautions to minimize the impact of the impending flood.

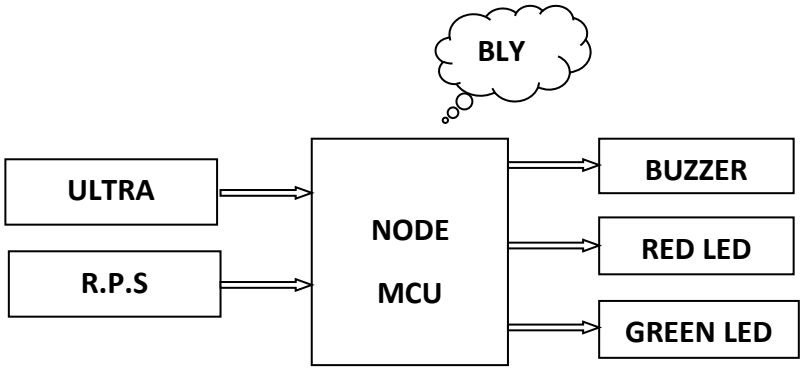

Figure.1 Block Diagram

LITERATURE SURVEY

1.Title: "IoT-Based Flood Monitoring System: A Review of Sensor Technologies and Deployment Strategies"

This study provides a comprehensive review of sensor technologies utilized in IoT-based flood monitoring systems, along with an analysis of various deployment strategies to optimize sensor placement and data collection efficiency.

2. Title: "Real-Time Flood Prediction and Early Warning Using IoT Sensors: A Case Study"

Through a detailed case study, this research demonstrates the effectiveness of real-time flood prediction and early warning systems implemented with IoT sensors, showcasing their practical application in mitigating flood risks in vulnerable regions.

3. Title: "Integration of IoT and Machine Learning for Flood Forecasting and Alert Generation". This paper explores the synergies between IoT sensor data and machine learning algorithms to improve the accuracy and timeliness of flood forecasting models, enhancing early warning systems for at-risk communities.

4. Title: "Design and Implementation of an IoT-Based Flood Monitoring and Warning System in Urban Areas"

Focusing on urban environments, this research presents the design and implementation of an IoT-based flood monitoring and warning system, addressing the unique challenges of urban flooding and providing insights into effective urban flood management strategies.

5. Title: "Sensing the Surge: Smart Sensor Networks for Coastal Flooding Prediction"Investigating coastal flooding scenarios, this study proposes the deployment of smart sensor networks to monitor sea-level rise and predict coastal surges, offering valuable insights into coastal flood risk management and resilience planning.

PROPOSED SYSTEM

In the proposed system ultrasonic sensor is positioned near the river to monitor water levels.It sends out ultrasonic waves and measures the time taken for them to reflect back from the water's surface.This time measurement is then converted into a distance, which corresponds to the water level. The NodeMCU microcontroller processes this data and sends it to the BLYNK IoT Cloud Platform. Users can access the BLYNK platform to track the river levels graphically from any location with internet access

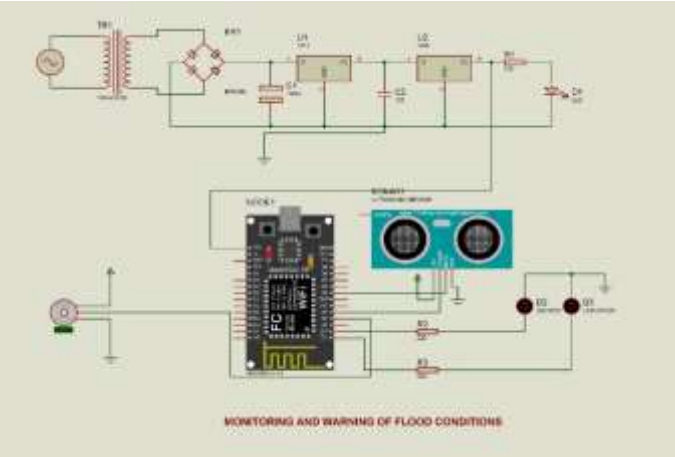

Figure.2 Schematic Diagram

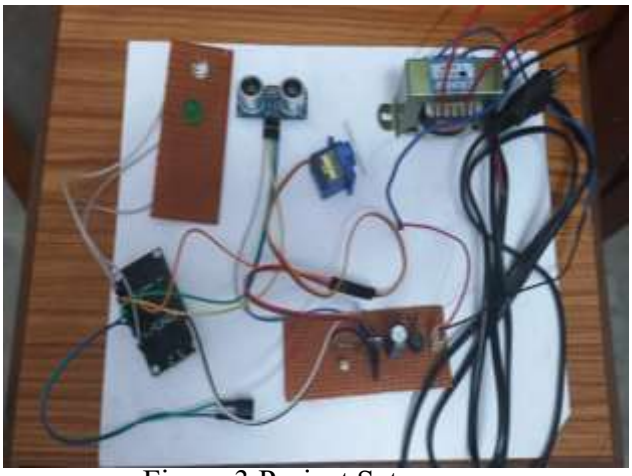
Figure.3 Project Setup

RESULTS

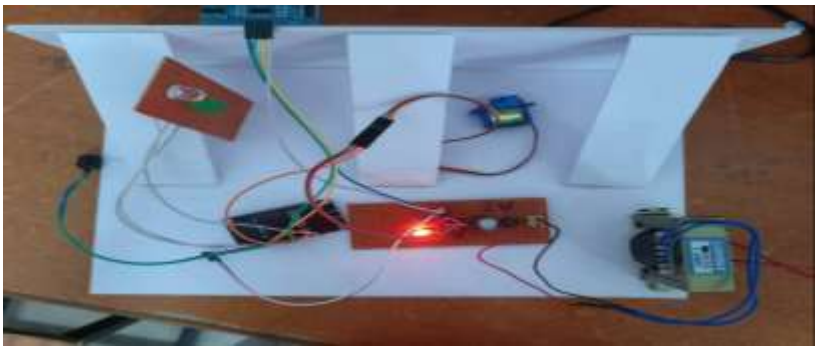

Figure.4 Working Figure.

5 Blynk outpu

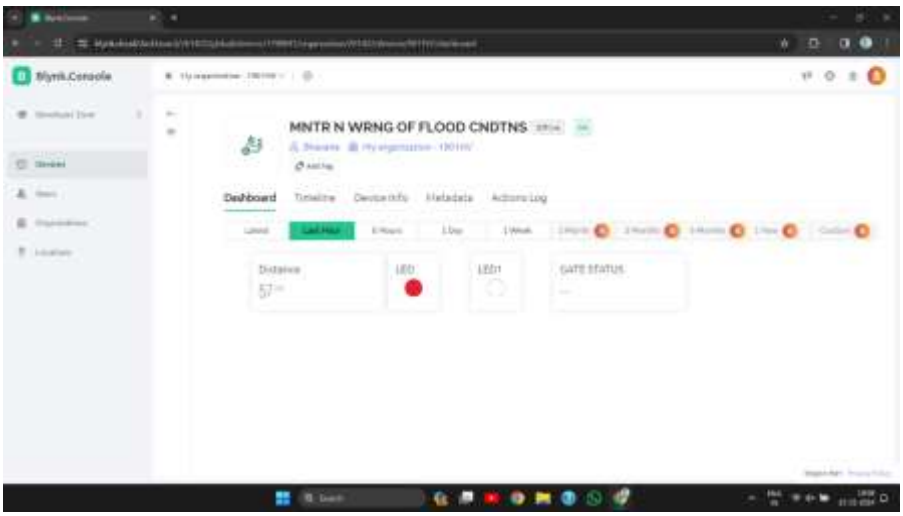

Figure.6 Flooding warning in Blynk app

APPLICATIONS

Early Warning Systems: Implementing your system in flood-prone areas can help in the early detection of rising water levels, enabling authorities to issue timely warnings to residents and emergency responders..

Disaster Management: Integrating your system with local disaster management agencies can facilitate better coordination and response during flooding events, including evacuation planning and resource allocation.

Agricultural Management: Farmers can use your system to monitor water levels in irrigation canals and fields, optimizing water usage and crop yield while mitigating the risks of waterlogging and crop damage during floods.

Remote Monitoring: Your IoT-based solution allows for remote monitoring of water levels via the BLYNK platform, making it suitable for applications in remote or inaccessible areas where manual monitoring is challenging.

Water Quality Monitoring: In addition to measuring water levels, your system can incorporate sensors to monitor water quality parameters such as pH, turbidity, and dissolved oxygen levels. This information can help identify pollution sources, track environmental changes, and support water quality management efforts.

ADVANTAGES

Cost-Effectiveness: Using affordable components like the NodeMCU ESP8266 microcontroller and HC-SR04 ultrasonic sensors makes the project cost-effective compared to traditional flood monitoring systems.

Real-Time Monitoring: The integration with the BLYNK IoT Cloud Platform allows users to monitor river levels graphically in real-time from any location with internet access. This provides timely information for decision-making and response during flooding events.

Accessibility: With internet connectivity, your project enables users to access flood data remotely, enhancing accessibility and facilitating quick responses to changing conditions.

Customization: The BLYNK platform allows users to create custom dashboards tailored to their specific monitoring needs. This flexibility enables users to visualize data in a way that is most meaningful to them.

Early Warning System: By issuing warnings to authorities when river levels exceed predefined thresholds, your project helps in alerting communities about potential flooding risks, enabling timely preventive measures and emergency responses.

CONCLUSION

In conclusion, the project presents a innovative approach to flood detection and monitoring using affordable components and IoT technology. By leveraging ultrasonic sensors, the NodeMCU ESP8266 microcontroller, and the BLYNK IoT Cloud Platform, the system offers real-time monitoring of river levels, enabling timely response to potential flood risks. The project's cost-effectiveness, accessibility, and user-friendly interface make it a valuable tool for communities facing flood-related challenges. With the ability to issue warnings to authorities and provide graphical visualization of flood data, the system enhances flood preparedness, response, and resilience.

FUTURE SCOPE

Improved accuracy: Enhancing the precision and reliability of flood detection and measurement through advanced sensor technology and calibration techniques.

Integration with public safety systems: Collaborating with public safety agencies to integrate flood monitoring data into existing emergency response systems and enhance disaster preparedness and response capabilities.

Artificial intelligence: Leveraging AI algorithms to analyze big data sets, predict flood events, and optimize response strategies based on historical data and real-time environmental variables.

Remote Sensing Technologies: Exploring the use of satellite imagery, UAVs, and GIS technologies for remote flood monitoring, mapping, and assessment to complement ground-based sensor networks.

REFERENCES

1."Anderson, R., & Birkinshaw, S. (2019). A Review of Flood Early Warning Systems. Procedia Engineering, 212, 144-151."

2. "Bischiniotis, K., Nikolopoulos, V., &Ferentinou, M. (2018). A Review on Early Warning Systems for Urban Flood Risk Management. Water, 10(11), 1602."

3. "Pandey, B., & Pandey, K. M. (2020). A Review of Flood Detection and Monitoring Systems Using Internet of Things (IoT) Based Technologies. In Proceedings of the 4th International Conference on Communication, Devices and Computing (pp. 1-7).

4. "Yildirim, O., & Acar, B. (2017). Design and Implementation of a Real-Time Flood Monitoring and Early-Warning System. International Journal of Distributed Sensor Networks, 13(10), 1550147717738851."

5. "Mahdavi, M., & Kerle, N. (2018). Remote Sensing for Urban Flood Management: Bridging the Gap Between Research and Practice. Remote Sensing, 10(12), 1873.