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FLOOD FORECASTING AND WARNING SYSTEM USING IOT

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ABSTRACT: Natural disasters occur annually as well as unpredictably, causing the nation to suffer insecurity, interruption, and economic loss. It is estimated that floods cause more economic damage and loss of life and property than any other natural hazard. The main objective of this project is to provide an early warning to flood victims at a place that is highly susceptible to flooding. Through the use of the Internet of Things technology, the victim could get accurate data on the flood in real time. It develops a real-time flood monitoring and early warning system for flood-prone areas using wireless sensor nodes. The system is based on NodeMCU technology integrated with Blynk. During a flood or heavy rain, the wireless sensor node can provide an early warning by detecting water levels and rain intensity. Sensor nodes are placed at flood areas and are equipped with ultrasonic sensors and rain sensors controlled by NodeMCUs as microcontrollers. Buzzers and LEDs are activated and alert the victim when the flood has reached a certain level of hazard. The Blynk application receives sensor data via wireless connection from the sensors. The victim will get to know the status of flood and rain by viewing the interface and receiving a push notification. This is available in the Blynk application via IOS or Android smartphones.[11]

Index Terms **– NodeMCU, IOT, Flood, Warning system, Blynk application, Led's, Buzzer.**

I. INTRODUCTION

Floods are one of the many natural disasters that occur in various locations and on varying scales all over the world each year and wreak extensive damage to human lives, property, and the environment. Despite the fact that flood disasters are a result of natural events, human activities and inactions have increased their frequency and severity [1]. Floods create serious danger not just to people's physical safety but also to the economy, the environment, and the psychological well-being of those who are impacted. Floods are caused by a modest alteration in a region's climate and natural cycles, such as excessive rainfall and overflow water [2]. On Earth, floods are the second most common natural disaster. Floods have caused enormous devastation. Before the flood occurs, the disaster management authorities must take a variety of steps to lower risks and get ready for an emergency response. The most cutting-edge technologies must be used to predict disasters as early as possible so that effective response strategies can be created before the disaster. Floods are difficult to forecast because they are unexpected and dependent on a number of climatic and environmental conditions. As we move closer to automated disaster prediction and forecasting, it is crucial to increase the use of cutting-edge technologies [3]. As flood information is sent to government officers, victims of the flood are delayed in receiving the information, So by using IOT technology we send push notifications to victims directly [10].

II LITERATURE SURVEY

1.Flood Detector Emergency Warning System: On Floods so far, Several literature studies have been conducted in order to gain the understanding and the knowledge to implement an advance flood monitoring system. L. Siew Khaun et al. developed a system that can detect water depth over a standard level determined by the sensor. The project was then placed in an area that is always prone to flooding. This project had the ability to use the flashlight as a warning and also inform the control room. In this project Radiofrequency transmitter and receiver were used for information communication [4].

2. A River Water Level Monitoring System Using Android-Based Wireless Sensor Networks for a Flood Early Warning System: In this project, the water level monitoring was done using the android smart and ultrasonic sensors. A mobile application would be developed to provide information about flooding in this project. This system had an error rate of 1.121% [5].

3. Flood Detector System using Arduino Uno: This project used the same ultrasonic sensor for monitoring floodwater levels but had no GUI application d and no control room was there. This project was developed using Arduino Uno and GSM [6].

4.Flood Monitoring System with SMS Alert using Arduino and GSM: The Flood Monitoring System project is entirely based on the GSM sim900A or GSM sim900D module, which will be interfaced Using the most popular microcontroller, ATmega328, which is the same microcontroller as Arduino UNO. To keep track of the water level, a water level sensor will also be connected to this microcontroller. In this project, they design a application in computer. The computer will then be connected with the Arduino Uno using a USB cable, and the Arduino Uno will be interfaced with the GSM module to receive flood monitoring messages. The messages received will be given to the computer application to display the water level and the area from where this message is sent

[7].

5. Flood disasters are among the world's most damaging types of disaster and occur frequently in the world, which cause great personal injuries and property damages. In order to improve flood risk management and decision-making, a spatial decision support system architecture based on remote sensing, geographical information systems, hydrologic models, numerical weather prediction, information technology, and decision theory is proposed [8].

6. Flooding occurs almost every wet season in West Java. This area, however, only receives flood warnings based on water level observations, not prediction. As a result of this situation, there is insufficient time to prepare for flood events since the interval between alert notification and event is too short. The purpose of this paper is to describe the Decision Support System used in the existing Flood Early Warning Early Action System (FEWEAS), which was enriched with features from other references which were adapted to the conditions in the Citarum river basin. One of the DSS, FEWEAS, which provides information on integrated weather and flood potential, was provided with the required warning. The DSS considered the threshold from the hourly interval forecasts of rainfall and water levels for the next three days. The flood warning was located at water level station in Citarum river basin [9].

III PROPOSED SYSTEM

The Proposed system consists of Rain Sensor, Ultrasonic Sensor, Power Source, NodeMCU ESP8266, Buzzer and LEDs and finally Blank App. This Wireless Sensor Node is Kept in desired location Like dam, Bridge. etc. and Blynk App is downloaded by victims near the flooding area. The Schematic Diagram of the proposed flood forecasting and Monitoring System is shown in fig3.1.

The proposed system will help in predicting the flood with the factors of water level change and rain fall intensity. The wireless sensor node consists of rain sensor which is used to measure the rain intensity. When there is no rain fall the intensity is “0” and if rain fall starts the intensity starts increasing and the speed the rain fall the intensity increases. The intensity is sent to NodeMCU which checks the value which is defined in code. the checked value with threshold. if more than threshold then there will be a alert to victims as flood is predicted.

Even when the water level changes based on given threshold values it checks and send alerts. The warning is in three stages Safe level, Warning Level, Critical Level. The alert can of 2 types one way is send notification to victims and other one way is buzzer sound.

For Sending Notifications The victims should have Blynk App in Mobile phone. The LEDs are also displayed according to the water level, green, yellow, red. The connections of devices are done using jumper wires. The code is Written is Arduino ide and dumped into NodeMCU. The sending of information from NodeMCU to Blynk app is with the help of Esp 8266. The ESP8266 is Wi-Fi module which is in built in NodeMCU.

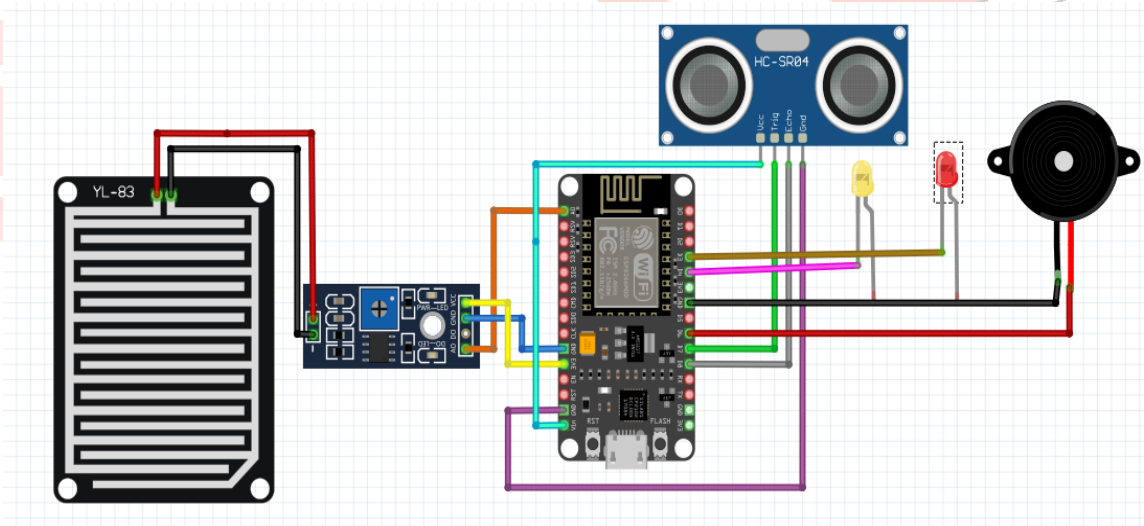

Fig – 3.1 Circuit Diagram of Proposed System

IV. RESULTS AND DISCUSSION

4.1 Results

The prototype works accordingly, an experiment was conducted to test the measurement of water detected by wireless sensor node. Buzzer and LED started to trigger when the water level reached 40 until it reaches critical level (62) in the gauge, a notification sent to victim through Blynk and email. Rain sensor detects the rain intensity and sends an alert when rain heavily started.

There are two interface tabs mode displays on the screen of the smartphone. It displayed the water level and rain intensity to alert victims in a high prone area of flood. The distance of the water is also displayed on the widgets which used gauge as the indicator and also the show the value in labeled value widget. This history graph can be used to track the flood level in real time condition. There will be two stages which are level 1, level 2 to give alarm to the people. The data sensed by the sensor was displayed on the Blynk's interface reflecting the level indicator as well as the distance. Once the data being received, LED started to trigger when level 1 of flood level detected. Then, at level 2 white LED turn on, as well as the buzzer. Once the water level reached 40, 62 in gauge , the system will send the alert warning and critical notification to the user via email and Blynk push notification.

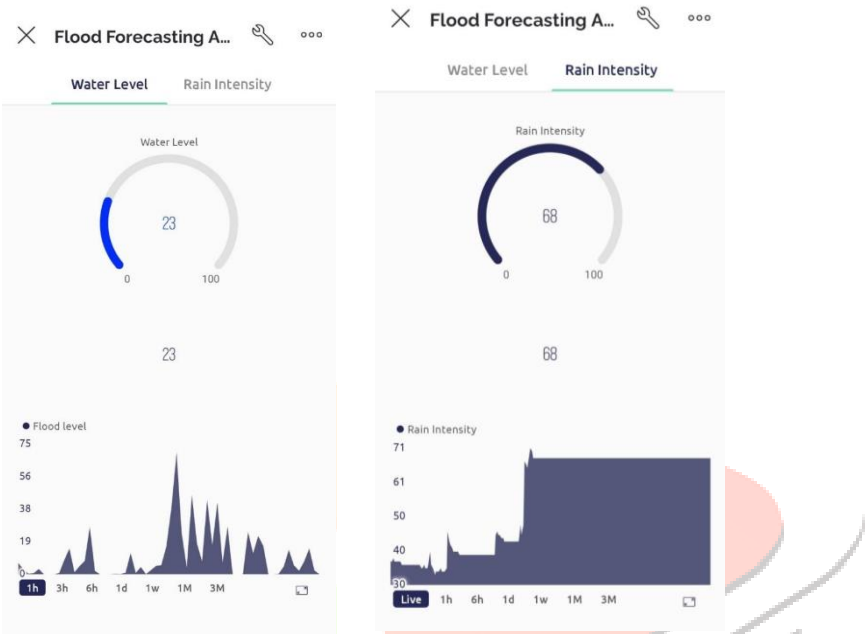

FIG- 4.1: Interface of Water Level and Rain Intensity

The level of rain intensity which is in Blue colour shows that the rain just started to fall. This indicates that the people who live nearby should alert as they know their place will get a very disastrous disaster if the rain started heavily. The user receives a "Rain Warning!!" warning in order to alert them.

The victims who frequently experience flooding in their neighborhood must take the rain intensity into consideration because it as reached a certain point. The reason for this is because as the rain began to pour steadily, there was a great likelihood that a flood might happen at that location at any time. "Rain is falling heavily!" is the message that the system sends.

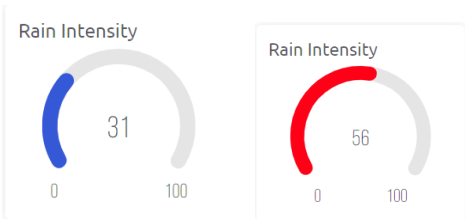

FIG- 4.2: Low & High Rain Intensity

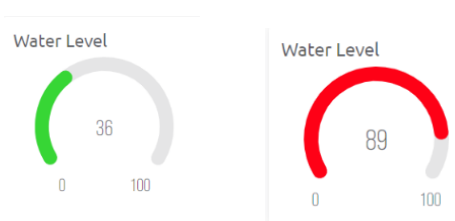

FIG 4.3: Medium & Critical levels of water

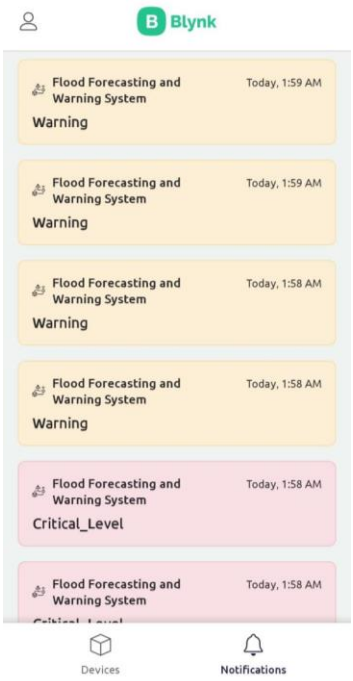

FIG- 4.4: Notifications in Blynk app

IV CONCLUSION

This project is built on creating a smart flood monitoring system with NodeMCU and Blynk application utilizing ultrasonic sensors. Flexibility, efficiency, and cheap cost are provided by the outcomes. A suitable platform for monitoring flash floods and issuing early warnings is a wireless sensor node based on the Blynk platform. In order to detect and give precise sensing data for monitoring and alerting purposes, ultrasonic sensors and a rain sensor connected with NodeMCU are able to work. Hence, the system shows that it may be utilized for flooding area detection, monitoring, and community warning.

This prototype is only uses a small scale of sensor detection within 20cm. If the system is placed at the riverside to detect flood, it must detect the flood for around 1 to 2 meters in the real world. Also, this prototype needs to have better water-resistant features so that when it starts to rain, the sensor node won't be harmed. The system must be installed correctly before it can be placed on any surface to prevent collapse when the water level rises. Hence, if further work could be done on the system, it may save the lives of a great number of victims.

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