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Centralized flood Indication System

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ABSTRACT— *Today floods are a factor every person is afraid of, especially whenever it rains in a low lying area. To solve this problem, it is essential to bring the location of flood and flood levels to the concerned authorities. The existing project based on solving this problem concentrates only about a particular location and only a text message is sent to the authorities. In this project, "Centralized flood Indication system", nodes capable of detecting the presence of flood, flood levels, rain, temperature and humidity are placed in various places prone to floods whenever it rains. These nodes update the data to a cloud. This data is made available to everyone in a mobile application and also a link in google maps to the location of flood is sent to specific people via message willing to know the information so that they (Government officials and common people) can view the location of flood and its level to take actions accordingly. In this project we use water sensor to detect the presence and level of flood and rain, Arduino and Node MCU to control and process the data, a Wi-Fi module to connect with a common network to update the data to a common cloud and a GSM module to send a text message regarding flood and its location to specific people. Here a node is placed in the water source to analyze the water level.*

Keywords— Floods, Cloud, Nodes, Arduino, Node MCU, Wi-Fi module, GSM module.

1, INTRODUCTION

Overflow of water on the land thus submerging it is called flood. It is one of the most frequent types of natural disaster. Flooding are of many types. River flooding, coastal flooding, flash flooding and urban flooding are some of those. Also many factors can cause floods. There are weather events such as heavy rainfall and then there are the human-driven elements, including how we manage our waterways, drainage and the alterations we make to land. Rainfall more than the expected amount in a particular area can cause the drainage system to overflow, thus causing flood. A dam collapse or dam burst can cause sudden and uncontrolled release of impounded water. In this project, we are dealing with the detection of flood and flood level in areas that are highly prone to floods. We use nodes which has to be placed at the potential sources of flood and at areas which has the history of floods. Each node has a number of water sensors according to the location. These sensors are placed at

different levels of height so that they can detect flood and its level. Later, the node processes this information for appropriate representation.

2, EXISTING SYSTEM

Flood disaster indicator of water level monitoring system by Wan Haszerila Wan Hassan, AimanZakwanJidin, SitiAsmaChe Aziz, Norain Rahim is the paper we are taking as the existing system. This paper was published in the year 2019.This system alerts people with the use of Short Message Service (SMS) via Global System for Mobile Communications (GSM). The paper presents a simple and portable early warning system using Arduino board. The Arduino is used to control the whole system and GSM shields to send the data. The model determines the water level using float switch sensors, then it analyzes the collected data and determine**s** the type of danger present. The detected level is translated into an alert message and sent to the user. The GSM network is used to connect the overall system units via SMS.

2.1 Disadvantages of the existing system

The existing system deals with only a particular place where it is placed. As a result, we don't have the facility to analyze flood level in various places. It also relies on the GSM module. If the GSM module fails, then the system cannot produce the output. There is no centralized network in the existing system. Lack of IOT based network to connect various nodes at various places results in several disadvantages. This system is also not designed for the public to access and know the flood information. It involves with only sending SMS to specific people regarding flood at a particular area. The SMS from the GSM module will not reach the required person if he/she is out of the network coverage hence resulting in loss of essential information. So this system is not reliable in critical situations. The existing system does not have a user interface feature. It sends the raw data to the required person. There are high chances that the person can misunderstand the information sent. There is no measure to reduce the power consumption in the existing system. There is no display of live data to people present in the location. This will restrict people working to reduce flood there from knowing factual information to take appropriate actions. The existing system can detect only floods and cannot measure any other quantities in the surrounding needed for forecasting and prediction of weather.

3, PROPOSED SYSTEM

The proposed system unlike the existing system, does not deal with a particular place. The proposed system deals with placing various nodes at various places which are prone to have floods. Each node has a sensor (Water level sensor) which can detect flood and its

level, a DHT11 sensor to measure temperature and humidity, a microcontroller which can control the sensor and process the data and a Wi-Fi module to update the data in a cloud. One node is placed in the water source which can be the cause of flooding. For example, one node is placed in the dam for measuring water levels to alert well before the flooding. Several water sensors are connected and kept in appropriate levels to detect whether it is flood or just stagnant water. Like this, each node detects and uploads data in a common cloud space. Each node also has a GSM module to send alert message along with location of alert to specified people. Periodical measurement is done and updated. The collected data is presented in a mobile application. The data is also integrated with google maps and is shown in a map. By doing this, everyone can be aware of the location which is flooded. Rain alert, flood alert and suggestion of flood-less areas is done in the mobile app. This helps them take appropriate actions. In the prototype of the project, we have implemented this idea with two nodes.

3.1 Working principle of a single node

The water level sensors are placed at various levels of height in places prone to flooding. These sensors are connected to the secondary micro-controller. The main micro controller is connected with GSM module, Wi-Fi module and Bluetooth module and a LCD display. The GSM module sends information on flood location to specific phone number. The Wi-Fi module updates the sensor collected data to the cloud. The Bluetooth module is used here to receive data from the secondary micro-controller. Figure 3.1 shows the components inside a single node.

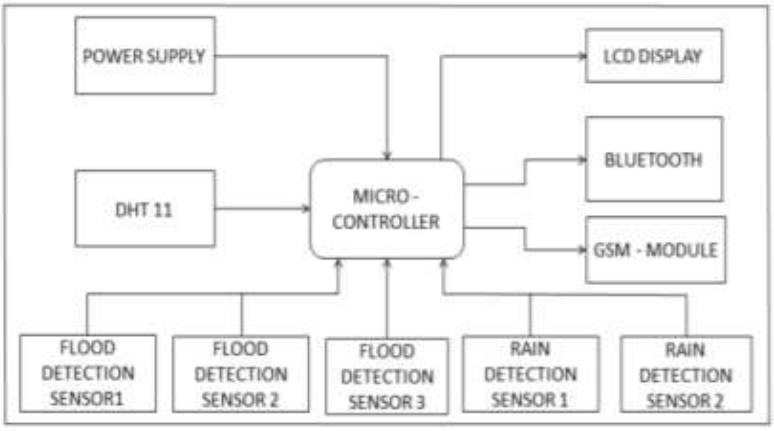

Figure 3.1 Components inside a single node

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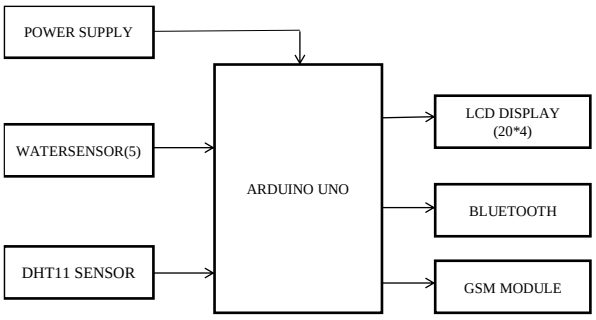
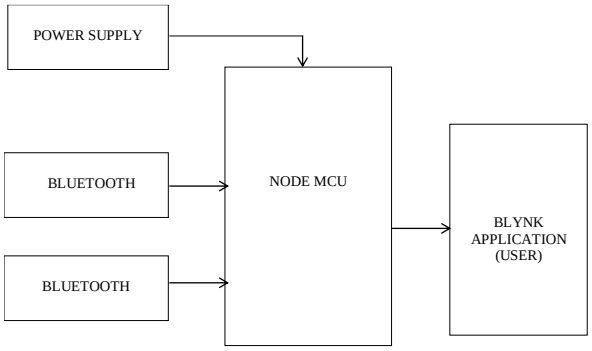
The LCD display is used to display the flood level, temperature and humidity level in the place where it is physically needed. Whenever floods occurs and water raises up, the sensors at various heights start sensing the flood and the secondary micro-controller connected to the sensors processes the information collected by the sensors to calculate the depth of the flood in that particular place. This data is given to the main micro-controller though the Bluetooth module. This information along with the location data is shared to the cloud through the Wi-Fi module by the main micro-controller. This is the method of operation of a single node.

3.2 Block diagram of the entire system





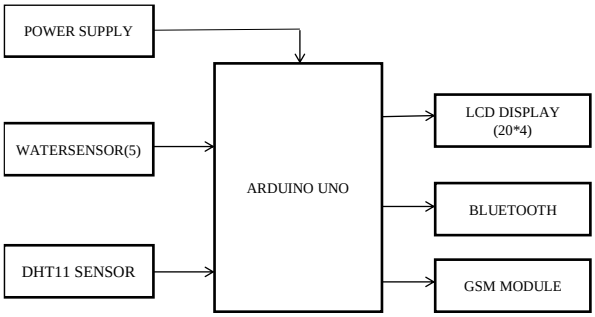


Figure 3.2 Block diagram of the entire system

Figure 3.2 shows the block diagram of the entire system**.** The block diagram of the proposed system consists of 3 circuits each connected with the Bluetooth module. The first circuit is the secondary circuit of first node. The second circuit is the main circuit and the third circuit is the secondary circuit of the second node.

3.3 Working principle of the entire system

The proposed system deals with placing various nodes at various places prone to floods. In the prototype of our project we implemented the system by using two nodes as shown in the block diagram. As discussed earlier, the whole system is divided into main circuit and secondary circuit. The reason behind dividing this, is to occupy more sensors and other modules with a single node. Since the number of analog and digital pins in a microcontroller is not sufficient to hold the number of sensors we have, we decided to have two microcontrollers which transmit data with each other through the Bluetooth module. The secondary circuit has the Arduino UNO microcontroller. The various water level sensors connected to the microcontroller senses the presence of water. From the input got from various sensors placed at various heights, the microcontroller identifies the depth of the flood level. Detection of rain is also done through the water level sensor. Now the flood level data is put in google maps through google my maps and the URL is sent to the specific mobile number through the GSM module in the secondary circuit. The DHT11 sensor measures the temperature and humidity at the particular place where the node is placed. All the data collected by the sensors is displayed in the 20*4 LCD display and is sent to the main circuit though the Bluetooth module. The main circuit receives the data from the secondary circuit with the help of one of its Bluetooth modules. The main circuit contains the Node MCU which has inbuilt Wi-Fi module. The data coming to the main circuit is put in the blynk application though the inbuilt Wi-Fi module. This is the working

of the first node. The second node in our prototype is the replica of the secondary circuit of the first node. In our prototype, we used the first node's main circuit as the main circuit for the second node. We did this, instead of constructing another main circuit for the second node due to scalability issues with the application and also due to budget constraints. The second node collects information as how the first node's secondary circuit does and shares the data to the main circuit though the Bluetooth module attached with it. It also displays the data in the 20*4 LCD display.

3.4 Advantages of the proposed system

The proposed system has several advantages compared to the existing system as well as the traditional ways of handling floods especially in India. In the system proposed, there is a centralized system for monitoring and reporting floods. It is not seen in the existing system as it uses only a GSM module to notify only specific people. The traditional ways of flood handling in India also lacks a centralized real time system giving factual information as provided by the proposed system. The proposed system is a fail-proof system as we have GSM as a backup module to transmit essential flood information in case there is a network failure in the particular place where the node is placed. Also we are using two micro-controllers in a single node. So even if one of the micro-controllers fail, the other micro-controller can still share the data available with it through the modules it has. They can also display the real time information with the LCD display. Our project not only focuses on flood but also collects information on rain, temperature and humidity. Knowing this information from a particular place is very helpful in predicting the weather pattern in that particular place. The nodes we implement here can not only be kept in places for detecting floods but also can be kept in places where it is needed to identify presence of water, water level, temperature and humidity. So the proposed system acts as a universal system and can be implemented anywhere needed. The system also uses LCD display to present data to people physically present in the location. The data presented there helps them in deciding according to the live condition prevailing. The live location of the flood is sent to the essential people thus helping them take actions accordingly. Providing the location information really helps the government officials take the necessary steps. It also helps the floating population to know where it is flooded so that they can reroute the travel path accordingly instead of taking the flooded path. This feature isn't available in the existing system. The proposed system has a very well built user interface provided through the blynk application. It is possible for a user to see the places having flood and the flood level as a bar. The temperature and humidity information is also displayed as a bar thus enabling users to easily understand the real time situation. In the existing system, there is no proper user interface as provided by the proposed system. The advantages of using Blynk as an

IOT tool over others is numerous. Blynk IOT platform offers a full suite of software allowing to prototype, deploy, and remotely manage connected electronic devices at any scale: from small IOT projects to millions of commercial connected products. Over 500,000 developers and business clients in 136 countries use Blynk spanning industries from Smart Home and Agriculture to HVAC and Asset Tracking. Out of the two microcontrollers we are using, one is the Node MCU. The advantages of using it saves the overall system cost. It has a inbuilt Wi-Fi module, so we no need to go for external Wi-Fi modules as in other microcontrollers. The board size of Node MCU is small compared to most of the other micro-controllers with external Wi-Fi support. This increases portability of the entire system. Also the power consumption of the board is very low. The operating voltage range of ESP8266 is 3V to 3.6V, the board comes with a LDO voltage regulator to keep the voltage steady at 3.3V.

4, RESULTS AND DISCUSSION

In the system proposed, the initial step is to place various nodes at various places which have history of flood. In the prototype we have built two nodes to represent two different places. When it starts flooding, the water level sensors placed at different levels start sensing. The water level is indicated in a graphical representation in the blynk application. The below image shows the hardware image which are connected with the water level sensors and DHT11 sensor. Figure 4.1 shows the hardware image of the entire system.

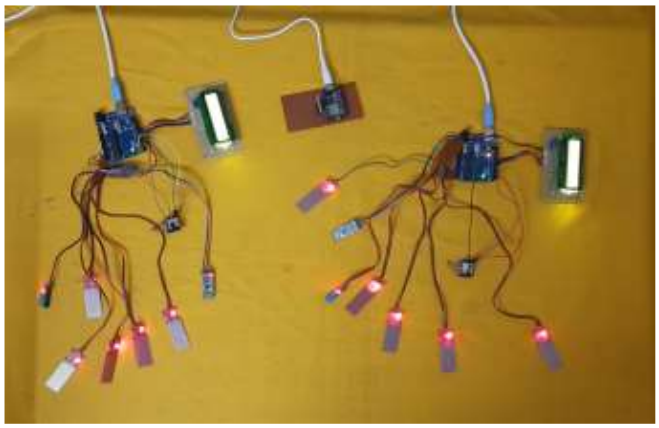


Figure 4.1 Hardware Image

Also the DHT11 sensor measures the temperature and humidity and updates in the blynk application through the main circuit. All the water level sensors and DHT11 sensor data is

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updated by the Arduino of the secondary circuit to the main circuit though the Bluetooth module attached with it. Figure 4.2 shows the output of water level and alerting notification shown by the blynk application. Figure 4.3 shows the output of Rain level using the rain water level sensor and it also gives the alert notification in blynk application.

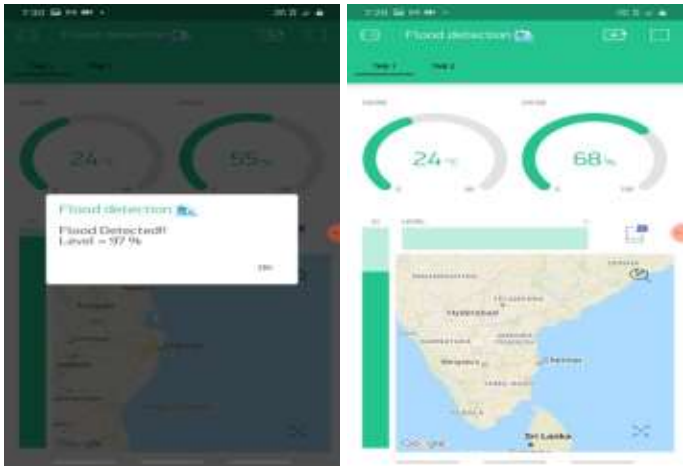

Figure 4.2 Flood Level and Alert Notification

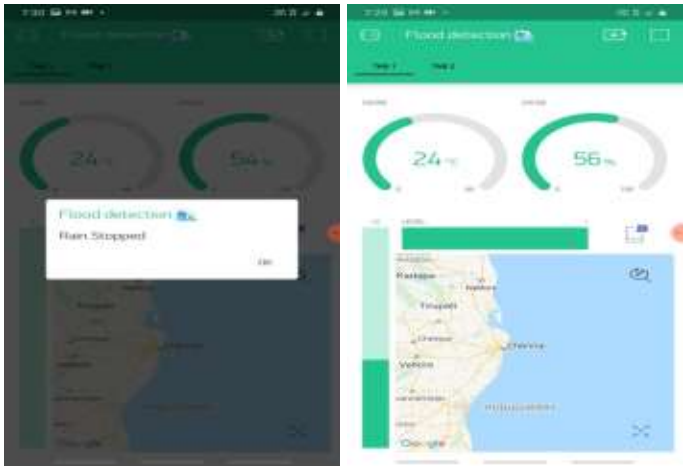

Figure 4.3 Rain Level and Alert Notification

Figure 4.4 shows the output of Temperature and humidity using DHT 11 sensor are shown by the blynk application.

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Figure 4.4 Temperature and Humidity

The node also sends the location information of flood through the GSM module as a URL. So the message sent by the GSM module as soon as the flood is detected is shown in figure 4.5.

Figure 4.5 URL of map location sent by GSM

When the URL sent by the GSM module is opened, it shows the google map location of the node. It is shown in figure 4.6.

Figure 4.6 Location of Flood as Sensed by the Node

So as discussed earlier, it is seen that the outputs are produced in the blynk application as well as the location of flood is shown in the google maps. It helps both the government officials as well as the common people to be aware of the conditions prevailing. Figure 4.7 shows the LCD display of the system.

Figure 4.7 LCD Display

Unlike the traditional ways, one doesn't need to rely on non-factual news and rumors spreading all around as soon as it starts raining or it starts flooding. Since we also provide information on the live temperature and humidity present in the area, it will be easy for officials in concerned departments to predict the weather pattern. This system can be kept not only in flood areas but also in places which need the real time monitoring of water level, temperature and humidity. The user interface provided, the graphical representation

of data and the location data provide easy understanding of the situation prevailing. These features provided are not seen in the existing system. The existing system can only detect flood and send a SMS to the required person. There is no features for measuring other parameters and the collected data cannot be seen by more than one or two persons. Thus it is seen that the proposed system is built such that the existing system's disadvantages are eliminated and more helpful features are added.

V. CONCLUSION

Flood is becoming one of the major problems in India. Overflow of water from water resources, breakage of the drainage system, improper construction of the drainage system, construction of building in river, natural water flow paths are some of the major reasons for flooding. Though there are some basic precautionary measures provided by the existing system, there is no centralized solution understandable and accessible by everyone. The proposed system deals with eliminating all the cons of the existing system thus providing a centralized solution with the help of Internet of things (IOT) and Global system for mobile communication (GSM) network as a tool. It also provides some extra features to measure other parameters of the surroundings. In the future, it is feasible for the proposed system to be scalable as there are provisions to add more and more nodes in the similar way and to increase the size of the network. It is also possible to add extra features such as the measurement rain level by the addition of rain gauge with each node etc., The SMS feature provided by the proposed system can also be scalable by using broadcast feature to send alert message along with location to more people at the same time with the help of broadcast SMS servers. Thus we conclude that the proposed system eliminates the disadvantages of the existing system thus providing more reliable, understandable and easily accessible features paving the way in solving the existing problem imposed by the floods especially in India. In the future, the features discussed above as well as the features in need will be analyzed and be implemented.

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