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FLOOD AVOIDANCE USING IOT

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Abstract - Flood is a common problem not only in India but worldwide and most of the water bodies are easily accessible to common people. At times it may happen that the weather conditions may change suddenly and the water bodies may become violent, resulting in a flood which can lead to loss of lives as well as livestock. Therefore, a rapid flood detection system that can reach a wide area such as the internet is necessary to minimize the effects of disasters. So, this paper proposes a flood detection system with the help of the Internet of Things (IoT). IoT is a smart technology that has the capability to send data in real-time. The system is powered using Arduino and has 3 sensors to detect 5 different parameters. Firstly, to measure temperature and humidity we have DHT-11 Digital Temperature and Humidity Sensor. Then we have the Water Flow sensor to check the flow of water. And lastly, to measure the distance and water level we have HC-SR04-Ultrasonic Range Finder and Distance Sensor. Finally, the collected information is transmitted to LCD to display the information. The system continuously keeps checking any changes in the weather condition and updates the live data over IoT. In case the parameters reach a dangerous level the system immediately alerts the people.

Keywords: Flood detection, IoT, real time, Sensors, DHT-11, HC-SR04

I. INTRODUCTION:

Floods are among the most frequent disasters and natural hazards in the world, affecting human lives and causing severe economic and social damage. It is understood that flood risks will not decrease in the future and with the emergence of climate change, flood intensity and frequency will threaten many regions of the world [1,2,8]. To minimize the extent of the wreck caused by a flood, warning systems to inform the people of the disaster should be implemented in high-risk areas. This system is going to be ready to cut the damages of the flood. The system should be designed to be ready to detect the rising levels of water so appropriate warnings to the authorities and therefore the public are often sent. In our approach, the flood detection system components will consist of micro-controllers, sensors, Arduino Uno, and a WiFi module. As we all know The Arduino Uno is an open-source micro-controller board supported by the Microchip ATmega328P micro-controller [5]. Micro-controllers are practical, affordable, and versatile solutions to several challenges of circuit design and modern control systems. In our proposed work we have used the C programming

language to program the board. So, the basics of micro-controller programming include 3 simple steps:

Firstly, we write the code on our computer, Secondly, we compile the code using an Arduino Compiler and finally we upload the compiled version of the program to our micro-controller. For doing this we connect the Arduino using the USB cable to our computer. Then we choose the correct serial port for the board under the Arduino menu and upload the code. And then the micro-controller is ready to be used. The second most important sensor we have used is the Ultrasonic sensor. Ultrasonic sensors are generally used for distance measurement purposes. They work on the principle of sonar. The sensor is quite small as well as easy to use and offers excellent non-contact range detection between 2 cm to 400 cm (that is about an inch to 13 feet) with an accuracy of 3mm. Since it operates on 5 volts, it is often hooked on to an Arduino or the other 5V logic micro-controllers. In our proposed work this sensor also finds the level of water [6]. Nowadays, the technology which has been used for flood detection system is much more error-free than the devices of the last decade. The following section describes the proposed method intimately.

II. PROPOSED APPROACH:

The main aim of our approach is to detect the rising water level in a river at a reasonable distance from the rail and alert the authorities and warn them to take appropriate action whenever a flood disaster happens.

To recognize a flood the system detects several natural factors, that include humidity, temperature, water level, and flow level. To fetch knowledge of mentioned natural factors the system consists of various sensors that collect knowledge for individual parameters. For detection changes in humidity and temperature the system options a DHT11 Digital Temperature humidity device. It is an advanced device module that consists of resistive humidity and temperature detection elements. The water level is sometimes underneath scrutiny by a floating device, that works by gap and motility circuits (dry contacts) as water levels rise and fall. It unremarkably rests within the closed position, which means the circuit is skimpy and no electricity is passing through the wires nonetheless. Once the water level drops below a pre-established purpose, the circuit concludes itself associate deg-reed sends electricity through the finished circuit to trigger an alarm. The flow device on the system keeps a detailed watch on the flow of water. The water flow device contains a plastic valve body, a water rotor, and a hall-effect device. once water passes through the rotor, the

rotor rolls. Its speed changes with a special rate of flow. The system additionally involves an HC-SR04 ultrasonic range finder distance sensor. All the sensors are anchored to Arduino UNO, which processes and saves knowledge.

III. METHODOLOGY:

The methodology discusses the approaches used to collect the data input. This will specialize in the system that uses the electronic-based components for this approach. Fig.1 below describes flow of the process of our approach.

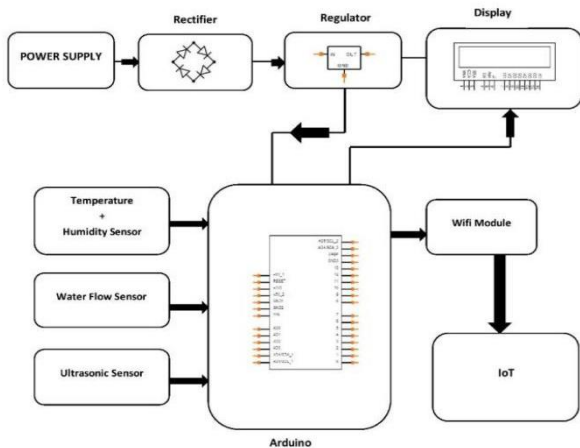


Figure 1: Flow Chart

Hardware Components:

1. Arduino Uno: is a micro-controller board that is open-source hardware based on the ATmega328P (data sheet). It is used along with the Wi-Fi module which is used to provide IoT connectivity through the local Wi-Fi connection.

Features[12]:

- Micro-controller: ATmega328P
- Operating Voltage: 5V
- Input Voltage: 7-12V
- Output Voltage: 6-20V
- Digital I/O Pins: 14

2. WiFi Module: The Arduino Uno WiFi is in fact an Arduino Uno with an integrated WiFi module. This board is actually based on the ATmega328P with an ESP8266WiFi Module integrated [7].

Features:

- 3V3: 3.3 V Power Pin.
- GND: Ground Pin.
- RST: Active Low Reset Pin.
- EN: Active High Enable Pin.
- TX: Serial Transmit Pin of UART.
- RX: Serial Receive Pin of UART.

3. DHT 11 Temperature & Humidity Sensor: The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. This sensor uses a capacitive humidity

sensor with a thermistor to evaluate the neighboring air and spits out a digital signal on the info pin where no analog input pins are needed [13]. It is fairly simple to use but requires mindful timing to grab data. You can get new data from it once every 2 seconds, so when using the library from Adafruit, sensor readings are often up to 2 seconds old [9].

It is used to check the temperature and humidity, to check whether there is heavy rainfall or no rainfall in that particular area so that it will give us the indications that whether there are chances of any flood or not.

Specifications:

- 3 to 5V power and I/O
- Max current use during conversion:2.5mA
- Humidity: 20%-80% with 5% accuracy
- Temperature 0-50 °C with +-2 °C accuracy
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

4. Water Flow Sensor: This consists of:

- a copper body
- a water rotor
- a hall-effect sensor

When water goes through the rotor, rotor rolls, its speed changes with different rate of flow. And the hall-effect sensor gives the corresponding pulse signal. It is used to exhibit the flow of water [11]. For supply, the voltage required is 5V to 18V of DC.

5. HC SR04 Ultrasonic Range Finder and Distance sensor: It works on the principle of SONAR. To measure distances using ultrasonic waves to determine the distance of an object from the sensor.

HC-SR04 Sensor Features:

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <math><15^\circ</math>
- Operating Current: <math><15\text{mA}</math>
- Operating Frequency: 40Hz

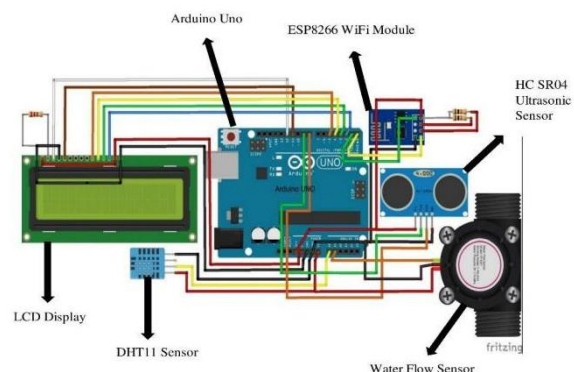


Figure 2: Circuit Diagram

In Fig.2 the Arduino controller is used along with the WiFi module which is used to provide IoT connectivity

through the local WiFi connection. Also, the collected data can be accessed from anywhere quite easily using IoT [10]. The result is displayed on the LCD, which is connected to the Arduino. And the system is run using the power supply.

IV. EXPERIMENTAL RESULT:

The proposed method in this paper retrieves the information from the sensor at any point in time. Finally, the developed early flood detection and warning system utilizes an ultrasonic sensor to detect water level, functions perfectly according to the specification provided to the authorities.

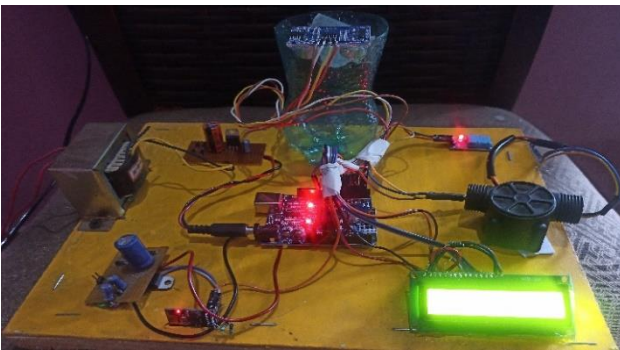


Figure 3: Hardware Implementation

In Fig.3 we have shown how all the hardware components are connected and implemented in real world. All the mentioned hardware components are present here.



Figure 3.1: Humidity(H) and Temperature(T) display

Fig.3.1 displays the Humidity in percentage and temperature in degree Celsius. Both the parameters are measured with the help of DHT11 Temperature and Humidity Sensor.



Figure 3.2: Distance Measurement

Fig.3.2 displays the distance of the water from the sensor. This is achieved by the help of HC SR04 Ultrasonic sensor, which uses ultrasonic waves to determine the distance.

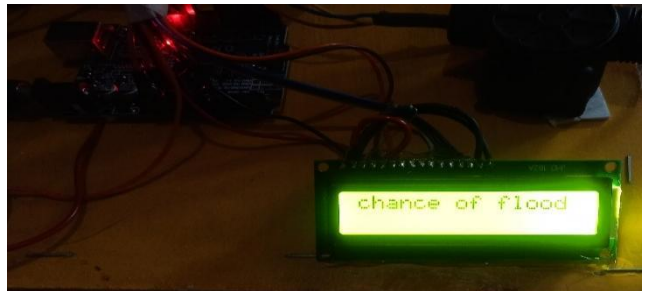


Figure 3.3: Message Display

Fig.3.3 displays the alert message, "chance of flood". This message is displayed on the LCD screen when the distance measured is less than or equal to 4cm.

V. CONCLUSION:

Flood Detection System tries to help all kinds of people to be aware of the damages that could harm them. Be it related to farming, industries, or even normal residents; this system is trying to alert everyone. Since this natural phenomenon is uncalled for, we have to take precautions for our betterment. This proposed approach aims at monitoring the water level in a particular water body. In the future, it may be amplified to monitor multiple locations at the same time and the web page must be able to display the knowledge supported by the choice done by the authority.

VI. FUTURE SCOPE:

We can give solar power to this system, which will help in the conservation of power, and it will also be useful in remote areas. On large scale, we can connect multiple sides with a common server. We can also perform field tests to observe the communication process between



authorities and commoners. If implemented on a large scale, then we can add a feature that alerts the authorities directly through SMS.

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