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IOT Based Flood Detection and Alert System

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Abstract: *Flood is a naturally occurring phenomenon that has gained international attention due to its destructive influence on civilization. Flooding episodes are not going to change, but their impact on mankind can be significantly minimized. The goal of this project is to provide warnings to flood-prone communities. Our project comprises of a water monitoring system that serves as a prototype for flood detection. Flood warnings are used to identify and anticipate potentially dangerous flood occurrences so that the nearby areas can be warned ahead of time. Sensors, GSM, and Wi-Fi modules will be useful in providing flood information. The warning system in this suggested design would use sensors to monitor dams for flood status, and the information will be delivered via the Wi-Fi module. Flood occurrences are effectively observed in real time, giving people plenty of time to prepare for floods that are expected. This approach may be used to drastically minimize the number of people killed or injured in the case of catastrophic flood.*

Keywords: Flood monitoring, Sensors, GSM and Wi-Fi module

I. INTRODUCTION

Natural disasters occur all throughout the world, affecting human lives and the economy of the country. Because agriculture is so important to a country's economy and progress, farmers must be attentive in order to preserve their crops from flooding. Current world innovation assumes a basic part in identifying and staying away from flood-related fiascos in an opportune manner. With the utilization of this Arduino project, we might turn away cataclysmic events brought about by floods, which is introduced as an answer for the issue.

The suggested model is widely used in the dam to monitor water levels, flow changes, humidity, and temperature variations. The measured values are updated on a regular basis on the web server, which is particularly important for sending flood notifications to authorities and citizens in a timely manner [1].

Temperature and humidity, float and ultrasonic sensors are among the four Arduino suitable sensors utilized in the project. An Arduino, Wi-Fi module, GSM module, LCD display, a buzzer, and an IOT far off are completely included. The major goal of this project is to keep a careful eye on numerous natural elements in order to prevent flood damage. Because the system is Wi-Fi enabled, it captures data that can be accessed from anywhere via the Internet of Things. The possibility of a SMS-based cautioning was proposed since cell phones have turned into an inescapable type of contact among individuals everywhere. The outcome is communicated as a caution to a GSM-empowered cell phone through Short Message Service (SMS).

II. OBJECTIVE

The primary goal of this project is to plan flood detection that will distinguish and transfer the data about the flood consequently to client and to safeguard the harm brought about by the flood [2].

1. Design the prototype and code of the project.
2. To recognize the current level of the flood using ultrasonic sensor.
3. The collected data is updated on the internet to keep track on the current flood level via Wi-Fi module.
4. To notify the people near the flood areas when it arrives at the extreme level, it'll forward the SMS alert via GSM.

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III. Literature Review

3.1. Flood Monitoring and Alert Management System Based on IoT

The technique enjoys a ton of benefits with regards to safeguarding people and creatures' lives. This strategy is broadly used to screen water levels and stream vacillations in waterways, and it might likewise be utilized to quantify water levels at dams and repositories. The measured values are updated on a regular basis on the web server, which is extremely beneficial for sending flood notifications to the appropriate authorities and individuals in a timely manner. This is made up of wireless sensor nodes known as motes, which are put along riverbeds to monitor water conditions. A GSM module is attached to each Node. They used Raspberry Pi. The prepared data is sent via GPRS from the associated node to the alert management system. Spreadsheet on Google Created an application program interface (API) that is utilized as a data logger [3].

3.2. A Smart Flood Detection System using WSN:

The utilization of WSN based flood monitoring system has been proposed. The scattered sensor hubs assemble water level information from the river; using a low-rate distant individual area organization, collect precipitation, wind speed, and gaseous tension data from the chosen location. The data from the sensors is sent to the dispersed alert centre using an Arduino microcontroller and XBee transceivers. A Raspberry Pi microprocessor and an XBee Transceiver are utilized at the distributed alert centre to create flood alerts based on sensor data. Flood checking information from the beyond twenty years has been used to foresee the time length of the flood, and this information has been kept in a database. In the Raspberry Pi microcomputer, an intelligent NFC is built that leverages sensor data to communicate flood alarms [5].

3.3. Real-Time Flood Monitoring and Alert System at a Low-Cost:

To recognize possible floods and send continuous alerts to the surrounding area, the suggested system uses affordable Arduino Uno and other low-cost devices. The model/field test results showed that the framework is equipped for limiting the horrendous impacts of flooding [4].

IV. Hardware Specification

4.1. Arduino Uno R3

Each Arduino board contains a microcontroller. The primary IC of each Arduino board is somewhat different. For this project, an Arduino UNO R3 kind of microcontroller was utilized. Arduino might be considered open source hardware.
The ATmega 328p microcontroller is used in the Arduino UNO. It's the Arduino's brain, and it's an Atmel Pico power 8bit AVR with great performance. A microcontroller based on RISC that can execute complicated instructions in a single clock cycle. The ATmega 328P is the most significant component of the Arduino Uno R3. EEPROM, SRAM, and FLASH are examples of memory.

Figure: Arduino Uno R3

4.2. Temperature and Humidity Sensor (Dht11):

The DHT11 is a reasonable sensor for estimating temperature and humidity as indicated by climate. DHT11 can essentially associate with any microcontroller, like Arduino, Raspberry Pi, etc, to identify humidity and temperature progressively.

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The DHT11 sensor is presented as both a sensor and a module. It estimates relative humidity. A thermistor is utilized in this sensor to gauge the encompassing air.

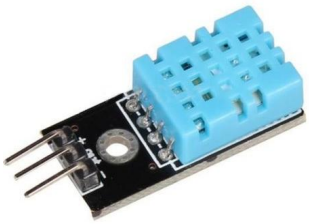

Figure: DHT 11

4.3. Ultrasonic Sensor (HC-SR04 Sensor)

The ultrasonic sensor, similar to bats, utilizes SONAR to quantify the distance between two materials. It furnishes extraordinary location with high accuracy and solid readings in an easy to understand bundling going from 2 cm to 400 cm. Daylight or dim materials meaningfully affect the capacity, while delicate materials like texture can be difficult to acoustically identify. It has an ultrasonic Tx and Rx module. [6].

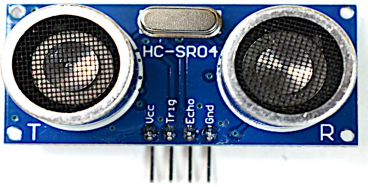

Figure: Ultrasonic Sensor (HC-SR04 Sensor)

4.4. Flow Sensor

A flow sensor is a gadget that measures the straight, nonlinear, mass, or flow rate of a fluid. It is additionally informed that the cost with respect to the establishment be determined solely after these stages have been finished.

Flow sensors use both mechanical and electrical subsystems to sense changes in the physical properties of a fluid and compute its flow. Measuring these physical properties is dependent on the fluid's physical properties. Because gaseous, liquid, and non-Newtonian fluids behave so differently, the methods we employ to quantify their flow must differ as well.

Figure: Water Flow Sensor

4.5. Water Float Sensor

The float sensor monitors the amount of liquid in a container/dam. When the float ball rises or lowers with the liquid to the switch level, the magnetic force of the magnet within the float ball causes the reed switch to turn ON. The reed switch will turn off when the float ball moves away from it.

Figure: Float Sensor

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4.6. ESP8266 Wi-Fi Module

An ESP8266 Wi-Fi module is a microprocessor that is primarily used to construct end-point IOT. It's referred to as a stand-alone wireless transceiver, and it's affordable. It is used to link many systems to the internet with the help of arduino. Assuming the ESP8266 Wi-Fi is designed as a captive to a microcontroller have, it very well might be utilized as a Wi-Fi connector for any microcontroller that upholds UART. To connect with the ESP8266 Wi-Fi module, the microcontroller requires a series of AT commands.

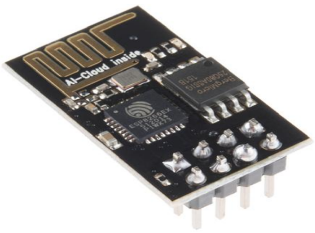

Fig: ESP8266 Wi-Fi Module

4.7. GSM

SIM800A Modem is worked with Dual Band GSM based SIM800A modem from SIMCOM. SIM800A can look through these two groups consequently. The recurrence groups can likewise be set by AT Commands. SIM800A is an ultra reduced and remote module. The Modem is coming point of interaction, which permits you associate PC as well as microcontroller with RS232 Chip (IC MAX232).

It is appropriate for SMS, Voice and etc. The locally available Regulated Power supply permits you to supply associate wide reach unregulated power. Utilizing this modem, you can settle on sound decisions, SMS, Read SMS, go to the approaching calls and so forth. This is a finished GSM module in a SMT type and made with an extremely strong single-chip, permitting you to profit from little aspects [2].

Figure: GSM

4.8. LCD Display

A 20x4 LCD is used to display the sensors information using the liquid crystal Library in Arduino IDE. It is extremely essential module and is generally utilized by all sensors in the system to display content. These modules are liked more than 7 portions and other multi fragment LEDs. LCDs are conservative; effectively programmable; have no restriction of showing exceptional and even custom characters (dissimilar to in 7 portions) etc. 20x4 means 20 characters and 4 lines in the LCD Display screen.

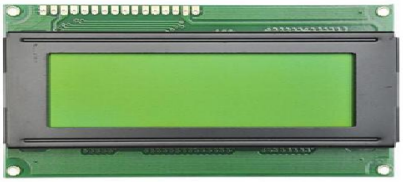

Figure: 20x4 LCD Display

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V. METHODOLOGY

To determine the situation near the dam, the system uses four sensors: temperature and humidity sensors, water flow sensors, ultrasonic sensors, and float sensors. Some of these sensors are used to gather data in real time. A HC-SR 04 Sensor which is used to find a distance between water and dam from the top. It works on SONAR concept and calculates the distance using Ultrasonic waves.

The DHT11 (also known as temperature and humidity sensor) are used to monitor temperature and humidity around the dam. [1]. Water flow senor keeps the focus on the flow rate of the dam. Flow sensor is also known as Hall Effect sensor because it works according to Hall's Effect. AS water passes through plastic valve, rotor rolls and the speed varies on water flow.

When water level rises continuously during rain or any other phenomenon, float sensor are used as a triggering device. If floating magnet touches to the Read Switch Contact, circuit completes and Alarm gets activated and also SMS is issued to the authority or the user via GSM whose phone number is noted. The Arduino UNO is connected to all the sensors of the system. The system also contains Wi-Fi module through which we can access the data of sensors via Internet of Things (IOT).

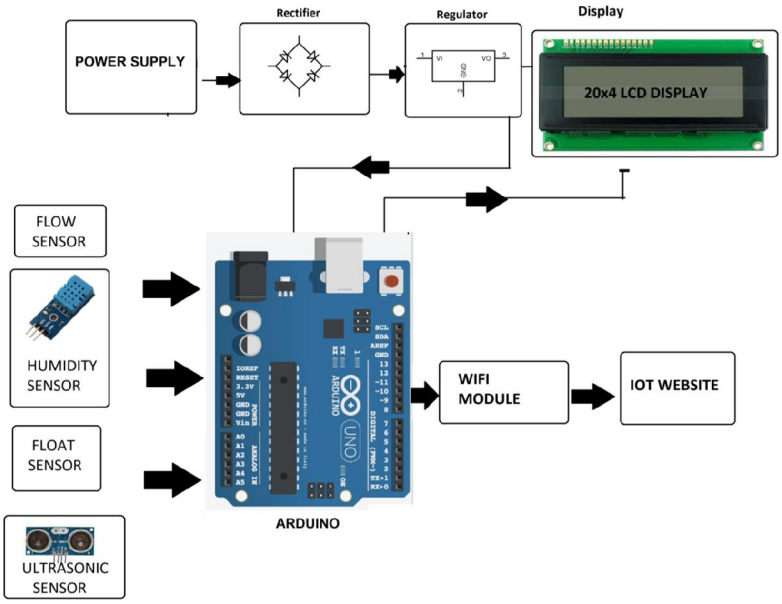

Figure: Block Diagram

VI. EXPERIMENTAL RESULT

6.1 LCD Display

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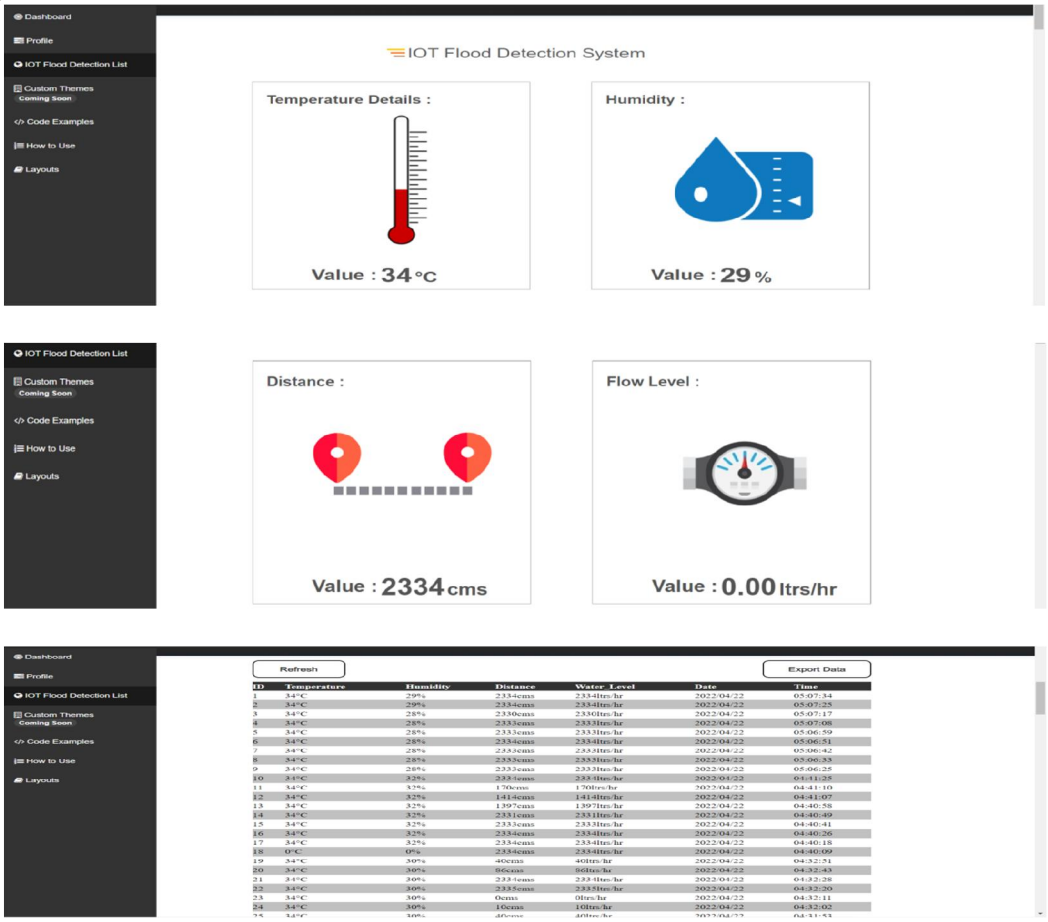
Web Page:



VII. CONCLUSION

This project is focused on the motive to come up with an alarm system to reduce the flood danger. Because the initiative uses IOT technology, the sensor data may be accessed from anywhere in the globe. More sensors might be added to the system to make it more precise and effective in detecting floods. It can also assist numerous agencies to assist the society and humanity in the event of a flood. It will watch on everything that might be cause a flood. In conclusion, it will assist the community in making timely judgments and planning against the flood, which is a dangerous natural calamity.

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