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IOT FLOOD FORECASTING AND EARLY WARNING SYSTEM

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Abstract:

Floods are a frequent natural disaster that severely devastate any nation. They are frequently brought on by precipitation and river runoff, especially during periods of an unusually heavy rainy season. Floods have gotten so bad that they have a severe effect on people and infrastructure as a result of global warming difficulties and harsh environmental repercussions. Sensor network technology has been applied to a variety of applications, including changing water levels. Effective flood monitoring and real-time notification systems are still essential, nevertheless, because this industry has not widely embraced IT-enabled solutions. In this study, an alert system for flood detection is described, with an emphasis on calculating the current water level using.

Keywords: Arduino, DHT11 sensor, flow sensor, rain sensor, ultrasonic sensor, buzzer, GSM, and LED

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1. INTRODUCTION

Information Natural disasters occur all over the world, which has an impact on the population and the nation's economy. Agriculture is the foundation of any nation's economy and development, so farmers must be watchful to prevent flooding of their fields. Current global technology is essential for quickly detecting and averting disasters like floods. An IOT-based early flood related parameter monitoring and detection system and its avoidance utilizing the Arduino project are presented as solutions to the described problem. This would help us prevent natural disasters brought on by floods.

1.2 LITERATURE REVIEW

[1] K.Vinothini, Dr.S.Jayanthy, Floods are one of the most common catastrophic catastrophes that can leave a country completely desolate. They are frequently caused by precipitation and river overflow, especially during a very rainy season. This project attempts to use IOT to monitor flood conditions and deliver alerts when there is a risk of flooding. To identify a flood, rising water levels are measured. To measure temperature, humidity completely desolate. This project attempts to use IOT to monitor flood conditions and deliver alerts when there is a risk of flooding. To identify a flood, rising water levels are measured. To measure temperature, humidity, and water levels at each stage, the system employs three sensors. The PIC Microcontroller is used to process the detected sensor values before sending them through Wi-Fi to the IOT. The technology immediately broadcasts sensor values across the cloud. The categorization process is carried out using the decision tree method. The experimental outcomes for Minimal Absolute Error

and Correctly Classified Cases shows that, compared to the Hyper Pipes Algorithm, the suggested Decision Tree Algorithm provides 99.6% classification accuracy with the lowest possible mean square error.

[2] Dola Sheeba Rani, Dr. Jayalakshmi G N, Dr. Vishwanath P Baligar, The Internet of Things, or IoT, is a constantly growing complex system of everyday items that emphasizes communication between computing systems, devices, and objects by providing connectivity from everywhere and at any time. By the end of 2020, there will be 50 billion connected gadgets, according to estimates. IoT technologies are essential for a wide range of practical smart applications. On the other side, the interconnectedness of IoT systems and components poses new security risks. IoT offers benefits for a variety of industries, including agriculture, business, healthcare, transportation, and home automation to enhance and automate numerous daily tasks. Floods are typically brought on by either a change in the water body's condition or by the overflow of rivers, dams, etc. Due he environment's problems also tend to get worse as civilization advances and human life quality improves.
This study outlines an efficient and adaptable flood detection and alarm system. The most cutting-edge technologies, including machine learning (ML), have a huge positive impact on technology and are particularly effective at detecting both normal and pathological machine behavior. This project's goal is to conduct a flood issue survey. The most common, extensively used, and effective method for forecasting rainfall is neural networks.

[3] Shahirah Binti Zahir, Phaklen Ehkan, Thennarasan Sabapathy,One of the natural disasters that cannot be prevented is flooding. It happened too quickly and had a huge impact on both people and property. Prior to this, the majority of the systems that have been developed only concentrated on a few areas. In addition, because they lack information and data on the weather, the bulk of the population is unable to track and is unaware of when a flood will occur. All the issues with the current system will be resolved by using a smart IoT flood monitoring system. The suggested technique works well in urban and rural settings. Additionally, if a member of the public has internet access, they can keep track of events and foresee the possibility of a web server flood. The suggested system is simple to maintain and has a minimal design cost. The web server's water level will be updated as a result of this project, and the system will inform the public to evacuate so that quick action may be taken.

[4] Mr.L.Saravanan, Ms.W.Nancy, Dr.K.Prabhu Chandran,
Floods can cause a great deal of destruction, including damage to vital open-access health infrastructure, private property, and railway tracks, as well as the death of humans and animals. Between 1998 and 2021, surges had an impact on more than 3 billion individuals globally.
The most vulnerable people to flooding are those who live in floodplains, in non-flood-resistant buildings, or who need warning systems and awareness of flooding threats. Governmental organizations can use early warning and detection systems to help, save many lives, and help distribute flood notifications. With the Internet of Things' recent expansion, information can now be transferred more quickly, which could help us save more lives in such natural disasters. Our aim is to develop a A model that may be fastened to a dam or the banks of rivers allows for the real-time monitoring of many variables, including water level, temperature, rain, and humidity. The data is then compared to a threshold value using this information, and when abnormal conditions are present, an alarm is published on a website and also sent as an SMS.

[5] Dr.A.Pravin , Dr.T.Prem Jacob, Dr.R.Rajakumar, The flood has caused significant damage throughout the entire planet. Lack of warning systems and foresight results in huge loss of lives and property. If the flood is predicted and an early warning is given, many lives will be saved. All of the nearby water bodies must be observed, and further action must be taken based on the findings. A recommended solution for these problems is an IoT Framework. The Framework will monitor groundwater levels and waterbodies with the help of IoT devices. The local population will be informed based on how the process turns out. An alert message with pertinent details and clear directions on what to do will be sent to the public. As a result, the human life will be preserved.

2. PROPOSED METHODOLOGY

Block diagram:

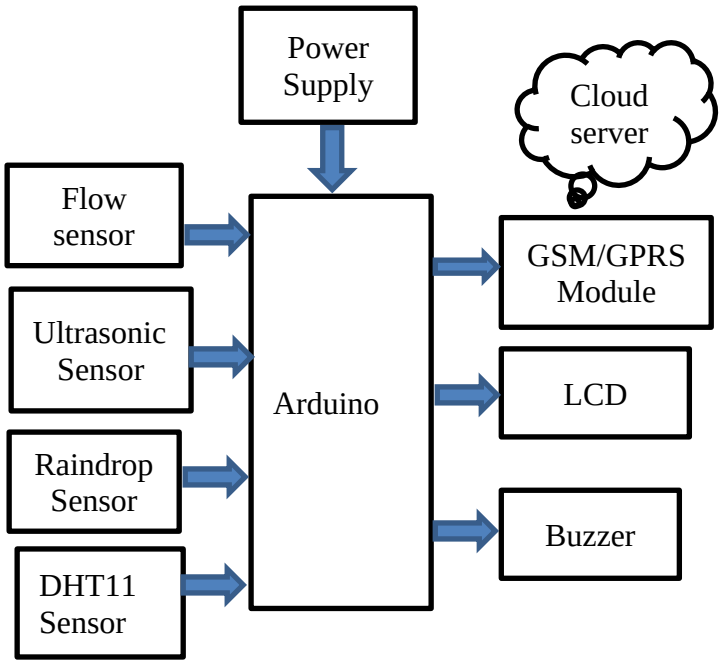

Fig 2.1: Block Diagram

Because of the efficiency, cost, and dependability of this monitoring system, lives are saved and property damage is decreased. In order for a flood monitoring system to function, sensors or gauges must be installed in bodies of water that are prone to flooding. These sensors—which could be pressure, ultrasonic, or radar ones—are frequently designed to measure changes in water level with a high degree of accuracy. The GSM module acts as the transmitting unit, the hardware unit is first deployed in flood-prone areas, and the system's associated sensors collect the essential data. The web application then receives the exact measurements of the parameters and shows them on the LCD display. In this instance, data is stored while a flood is taking place, and the web application alerts the public and the authorities in a private network.

3. IMPLEMENTATION FLOW

Stage 1: Taking into account the shortcomings of current approaches and providing a solution by taking into account the fundamental needs for our suggested system.
Stage 2: Taking into account the system's hardware requirements.
To do this, choose the following elements:
1. a microprocessor
2. Materials for the suggested system (ex: sensors)
3. Results (ex: water level)
Stage 3: After taking into account the hardware rrequirements, we must now look at the software needs. We can choose from a variety of coding, compiling, and debugging tools depending on the microcontroller we use. Based on our criteria, we must create the source code for the suggested system, build it, and debug it in the software.
After completing all of the hardware and software requirements, we must combine them to operate our system. To do this, we first burn our source code onto a microcontroller. Once this is done, we must link all of the input and output modules to the microcontroller in accordance with our needs.

4. COMPONENTS

4.1 Arduino:

A micro-controller board based on the ATmega328 is called the Uno with Cable. It contains 6 analogue inputs, a 16 MHz ceramic resonator, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything needed to support the microcontroller; to get started, just plug in a USB cable, an AC-to-DC adapter, or a battery.

Specifications:

- ATmega328P microcontroller. 5V is the operating voltage.
- 7–12V is the suggested input voltage.
- Voltage in and out (maximum): 6–20V.
- I/O Pins for Digital: 14 (of which 6 provide PWM output)

- Ports for PWM Digital I/O: six.
- analogue input pins,
- I/O pin current: 20 mA.

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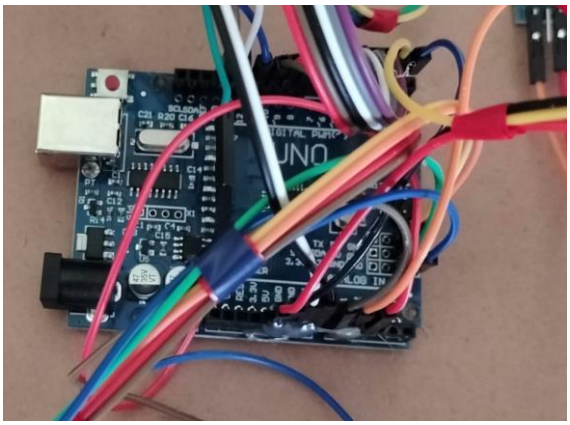

The capabilities of Arduino Uno boards and those of other boards in the Arduino series are generally equivalent in terms of usability and functionality.

Attributes of Arduino:

The USB interface, sometimes known as a USB port, on the Arduino Uno board allows for serial computer communication.

• Installed on the board is an Atmega328 microcontroller, which has a number of features such as timers, counters, interrupts, PWM, CPU, and I/O pins and runs on a 16MHz clock to provide a greater frequency and instructions per cycle.

4.2: Ultrasonic Sensor

An ultrasonic sensor is a piece of equipment that measures the distance to a target item with ultrasonic sound waves and converts the sound
that is reflected back into an electrical signal. Audible sound travels at a faster rate than
ultrasonic waves do (i.e., the sound that humans can hear).

Specifications:

- The sensing distance ranges from 40 to 300 cm.
- The reaction time ranges from 50 to 200 milliseconds.
- The beam angle is about 50 degrees.
- Accuracy is 5%.
- It works with voltages between 20- and 30-volts direct current.
- The ultrasonic wave has a 120 kHz frequency.

4.3: LCD

- Liquid crystal display is referred to as LCD. It is a particular type of electronic display module used in a wide array of circuits and devices, including mobile phones, calculators, computers, TVs, and other electronics.
- Seven segments and multi-segment light emitting diode displays are the most popular for these displays.
- The main advantages of adopting this module are its low cost, ease of programming, animations, and unlimited ability to display bespoke characters, unique animations, etc.

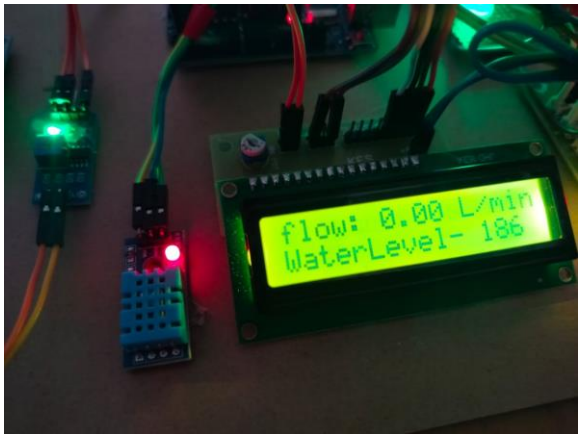

Fig 4.3: LCD DISPLAY

5. SOFTWARE REQUIREMENT

Arduino IDE:

Integrated Development Environment, or Arduino IDE, is a recognized programmer created by Arduino.cc that is primarily used for authoring, compiling, and uploading code to Arduino devices. With this open-source programmed, which is simple to install and use to

begin compiling code while on the move, almost all Arduino modules are compatible.

Introduction to Arduino IDE:

- Open-source software called Arduino IDE is mostly used for authoring and compiling code into Arduino Modules.
- Because it is official Arduino software, even a layperson with no prior technical expertise can get their feet wet in the learning process. Code compilation is made so simple.
- It runs on the Java Platform, which is easily accessible for operating systems like MAC, Windows, and Linux. This platform has built-in functions and commands that are essential for debugging, modifying, and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languages.

6. ADVANTAGES AND APPLICATIONS

Advantages:

- Reliable
- Smart
- Automatic Uploading to cloud server

Applications:

- To save lives of human and animal
- Infrastructure Planning
- Insurance
- Agriculture
- Floodplain Management
- Emergency Response

7. EXPERIMENTAL RESULTS

We are proposing a system to detect the floods by using flood monitoring and early warning system. Before floods occur the system should in rest.,i.e. We are placing the LED lights in our project. One is the green, if it lights means the water level increases. The uncertainty occurs in the weather.

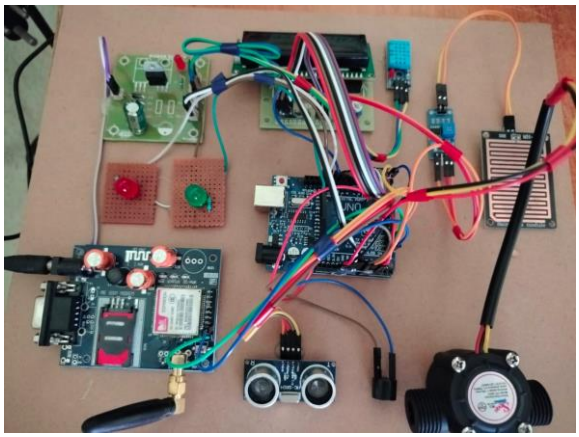

Fig 7.1: Before Detection of Floods

If our system detects the floods then the red light must be turned on, and it beeps the buzzer. Immediately it gives signals to the certain contact number.

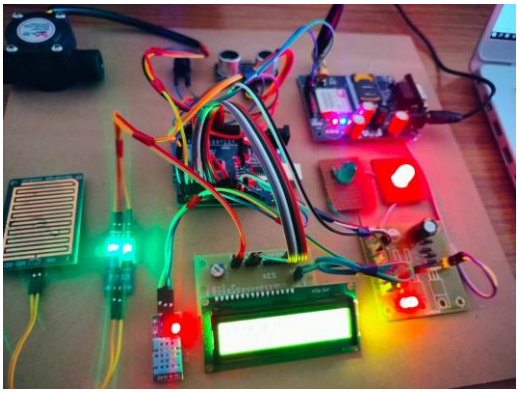

Fig 7.2: After Detection of Floods

The Output Panel at the bottom of the main screen shows what's known as the compilation status of the running code, as well as any problems that have occurred in the programmer. Before uploading the hex file into your Arduino Module, you must correct those problems.

Fig 7.3: SMS Received by registered number

Although there are certain specialized libraries used for calling and running particular functions on the board, the Arduino C language behaves largely similarly to the standard C language used for any embedded system microcontroller.

8. CONCLUSION

The potential to create an alarm system that will mitigate risk of flooding is highlighted by this project. Since the project is equipped with IOT technology, any location in the world can access the sensor data. To produce a more precise and effective flood detection system, more sensors can be added to the system. It may also help a number of government organisations or authorities that ultimately aid society and humanity in dealing with dangerous natural disasters like floods. It will keep an eye on all potential sources of flooding. It will quickly transmit a warning if the water level increases along with the speed. Also, it makes dealing with and recovering from this disastrous situation more accessible. In conclusion, it will assist the community in making timely decisions and developing plans to combat this dangerous natural calamity, such as the flood.

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