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Inundation Monitoring & Alerting System Using IOT

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Abstract:- The purpose of this study is to develop a system for real-time flood monitoring and early warning in the northern part of Isabela's localities close to the river bank. In many applications in industry and basic research, ultrasonic sensing techniques are commonly used with a strong foundation. An ultrasonic sensor has the advantage of being able to non-destructively probe inside an object due to the fact that ultrasound can spread in several different kinds of materials, including solids, liquids, and gases. This research mainly evaluates the water level detection and early warning system (through a website and/or SMS), which alerts concerned agencies and members of a prospective flood occurrence.

Moreover, this research adopts an inquiry system in order to make it more interactive, allowing community members to ask about the related flood status and water level of a desired area or location using an SMS keyword.

The purpose of this paper is to provide communities with the knowledge they need to respond to and recover from flooding. The implementation of an Arduino, ultrasonic sensors, a GSM module, a web-monitoring platform, and an SMS early warning system to help stakeholders reduce flood-related injuries represents one of this work's useful features. In the developing world, there are many locations that are affected by flooding; therefore, the authors of the research hope that their efforts may help the locals there. This is necessary, as can be seen when thinking about the requirements for the security and well-being of the community.

Keyword:- *Internet of Things (IOT), Arduino IDE, Sensors, NodeMCU.*

I. INTRODUCTION

Flood damage is expensive for both domestic and commercial customers everywhere it occurs. It is important to have a well-functioning flood response operation system in place to coordinate the several organisations involved in the event of a flood. Many techniques have been created in recent decades to reduce the danger of flooding in populated regions [1]. Operation NOAH, operated by the Department of Science and Technology (DOST), is currently funded by the Filipino government. They constructed artificial rain gauges (ARG) and water level monitoring stations (WLMS) along the major river basins (RBs) of the region. However, due to the early stages of Mission NOAH, some important details are not yet visible on their website. These new technologies have great potential in fields like weather forecasting and flood detection and monitoring and use sensors, modelling software, the Internet, and mobile technology [2].

However, in most cases, just one person may send and receive messages using such a system. To get the most recent details or updates, communities can check the website. The majority of people also don't have the financial ability to afford a computer or smartphone with Internet access, which is necessary to see the information on this website (IOP Conf. Series: Materials Science and Engineering 325 (2018) 012020; doi:10.1088/1757-899X/325/1/012020) [3].

In addition, controlling its activities isn't everybody's main task throughout the day. Due to these considerations, people are unable to determine the actual state of the floodplain in their area. The river channel overflowed due to a lack of awareness, flooding many communities and causing major damage to both property and human lives. The regional capital of Ilagan is located close to the middle of Isabela [4]. It serves as the river basin for a number of nearby towns, particularly in the nation's countryside. Floods caused by these rivers travel very slowly as a result of water storage across the huge flood area, an extremely soft slope, flood retardation by multiple gorges, and river twisting.

II. LITERATURE SURVEY

A. The Internet of Things-Based Water Monitoring and Flood Detection System

As a result of living in the age of computing technology, every person and thing must now have access to the internet. They go a step closer to achieving this goal due to the technology associated with the internet of things. Our proposal consists of a smart water monitoring system that acts as a prototype for the detection and prevention of flooding [5]. This document provides extensive detail to describe each part of our paper and how it works as an entire unit. Users can access the collected data from their mobile device according to the cloud (Firebase Cloud) system.

The model gives a warning when a specific limit is reached. The model operates efficiently because it is an advanced version of a large flood warning and avoidance system [6]. The smartphone device can update in real-time to reflect changes made to the sensor data once it has been uploaded to the cloud and modified there. The number of people who will suffer in a potential disaster can be significantly decreased if this method is used.

B. Internet of Things Applications For Predicting Flood Risk

Floods can kill people, destroy buildings and industries, and cause a lot of damage throughout any place on earth. Thus, it is essential to create a flood detection system to monitor low-lying areas as the water level rises. To measure the height of flood waters, ultrasonic sensors must be constructed. When the level of water reaches a particular value, an installed Arduino board will help transmit data [7]. The microcontroller component simplifies the process of connecting to the internet and monitoring data. The information will be transmitted via the microcontroller and stored in the cloud. It will be simpler to make data stored on the cloud available for users to access.

The Android application provides up-to-date information on the condition of flooded roads. You can access data with a single tap due to the Android app's flexibility and effectiveness. Regular updates will be given to the local residents and authorities. To alert those who are in control of the monitoring system, both the buzzer and the LED will glow [8][9]. With the previous data that the recovery team has been maintaining, the flood can be predicted. This technology can also estimate the possibility of inundation. All you need is access to some recent cloud-based data. ML algorithms can be used to create this prediction.

III. PROPOSED SYSTEM

A. Existing System:

A method for local communities to receive food warnings. This ICT-enabled system is able to identify the occurrence of rising water simply by using a water sensor connected to the transmitter. An electronic signal is transmitted to the receiver once the level of water reaches a specified value. When a flood is threatened, mobile phones are used to alert downstream organisations and desperate individuals [10]. That constitutes the dangerous flood zone and is determined with the participation of stakeholders.

B. Proposed System:

Floods are still a major source of loss of life and property in many countries. Flood-related losses and property damage are, however, significantly more common in under developed countries due to a lack of technology and insufficient infrastructure.

In proposed system, the working of block diagram is shown in figure-1.

An ultrasonic sensor detects when the water level reaches a specific level, which can soon cause flooding. As a result, it alerts the NodeMCU with a signal. According to the NodeMCU's or controller's coding, the buzzer will sound an alarm when the ultrasonic sensor detects a rise in water level [11]. Similar to this, the water flow sensor detects a rise in water flow, at which time the buzzer also sounds an alert. So, everything can be monitored via the LCD screen and the Blink app.

The water level can be monitored in real-time using a cell phone, no matter whether you are in a meeting, outside your home, etc. You will be able to see everything in real-time. You can check the app at any time to find out about the water level and if it's increasing or decreasing. Different levels can be defined. Alert messages are generated automatically when the desired conditions are met.

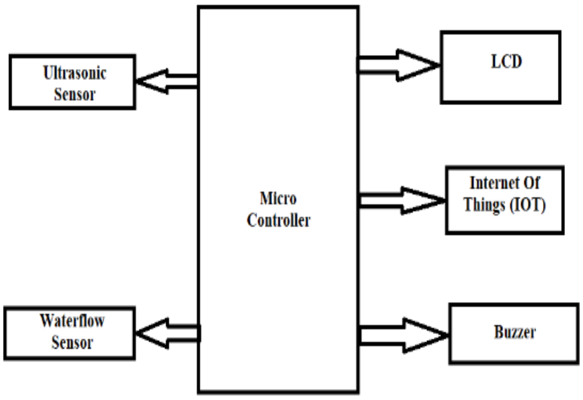

Fig-1: Block Diagram

IV. FUNCTIONAL BLOCKS OF PROPOSED SYSTEM

A. ESP8266 NodeMCU Pinout

The ESP8266 NodeMCU has a total of 30 pins that interface with the external world. The connections are as follows:

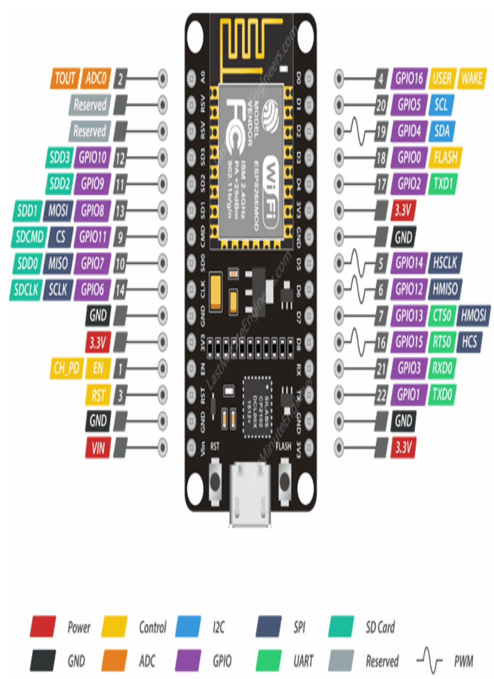

Fig-2: Pin Configuration of Node MCU

- Power Pins There are four power pins: one VIN pin, three 3.3V pins, or one 3.3V pin. If you have a regulated

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5V power source, you can utilise the VIN pin to directly supply the ESP8266 and its peripherals. The output of a voltage regulator built into the board is available on the 3.3V pins. Power can be supplied to external components using these pins.

- GND is a ground pin on the ESP8266 NodeMCU development board.
- I2C Pins All different types of I2C sensors and peripherals are connected to your proposal using I2C pins. There is support for both I2C master and slave. The I2C interface's features can be implemented programmatically, and the maximum clock frequency is 100 kHz. It is important to remember that the I2C clock frequency must be faster than the slave device's minimum operating frequency**.**
- GPIO Pins the ESP8266 NodeMCU has 17 GPIO pins, which can be assigned to various functions such as I2C, I2S, UART, PWM, IR Remote Control, LED Light, and Button programmatically [12]. Each digitally enabled GPIO can be configured for internal pull-up or pull-down, or set to high impedance. When configured as an input, it can also be set to edge-trigger or level-trigger to generate CPU interrupts.

B. LIQUID CRYSTAL DISPLAY (LCD):

Liquid-crystal displays are known as LCDs. Due to the following factors, LCD is gradually being used in place of LEDs (seven-segment LEDs or other multi-segment LEDs):

- The reducing cost of LCDs
- The ability to display data in the form of numbers, letters, and images This contrasts with LEDs, which can only display a few characters and digits.
- Adding a refresh controller to the LCD prevents the CPU from trying to update the display. In contrast, for the LED to continue showing the data, the CPU must refresh it.
- Simplicity of character and graphic programming.

These parts cannot be activated by conventional IC circuits because they are "specialized" for use with microcontrollers. They are used to display various messages on a small LCD.

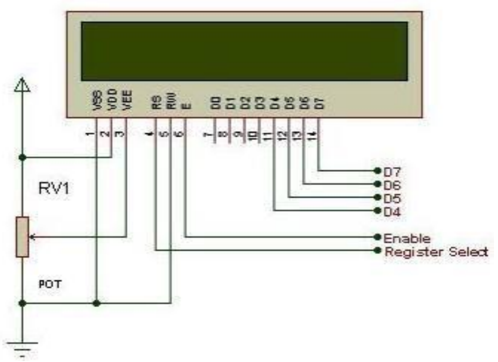

Fig-3: LCD pin configuration

The system described here is that which is most frequently utilised in practise due to its low cost and huge potential. The HD44780 microcontroller, on which it is based, allows for the display of information in two lines of sixteen characters each. It shows all the letters of the alphabet, Greek letters, punctuation, mathematical symbols, etc. Moreover, it is possible to show custom symbols that the user creates. Some important properties include an automatic message on screen (shift left and right), pointer appearance, lighting, etc.

C. Buzzer

A buzzer or beeper is an audio signaling device that can be mechanical, electromechanical, or piezoelectric (piezo for short). Alarm clocks, timers, and the verification of human input like a mouse click or keyboard press are common applications for buzzers and beepers.

Fig-5: Buzzer

D. ULTRASONIC:

An ultrasonic sensor is a part of technology that uses ultrasonic sound waves to detect the distance to a target object and then converts the reflected sound into an electrical signal. The speed of sound waves is higher than the rate of ultrasonic waves (i.e., the sound that humans can hear) [13]. The transmitter, which uses piezoelectric crystals to create sound, and the receiver are the two primary components of an ultrasonic sensor (which encounters the sound after it has travelled to and from the target).

The sensor analyses how long it takes for the sound to travel from the transmitter's release to the receiver in order to determine how far away the object is from it. D = 1/2 T x C, where D is the distance, T is the passage of time, and C is the sound speed, which is 343 metres per second. For instance, if a researcher placed an ultrasonic sensor at a box and the sound bounced back after 0.025 seconds, the distance between the ultrasonic sensor and the box would be as follows:

D = 0.5 x 0.025 x 343

Fig-4: Ultrasonic Sensor

E. WATER FLOW SENSOR:

In the automatic systems that exist nowadays, sensors are extremely important. Sensors can be easily included into larger electronics since they are compact, reasonably priced, and durable equipment. There are many different kinds of sensors available nowadays. The capacity and function of sensors have increased along with technological development.

Sensor sizes have decreased to the scale of nm from the early size of cm units. Using sensors, electronic and electrical engineers have been able to address a number of issues, including finding out how bright the space is, estimating the furnace's temperature, and calculating the relative humidity of the area. For determining the rate of liquid flow, a water flow sensor is a wonderful tool [14].

Fig-6: Waterflow Sensor

V. HARDWARE EXPERIMENTAL RESULT

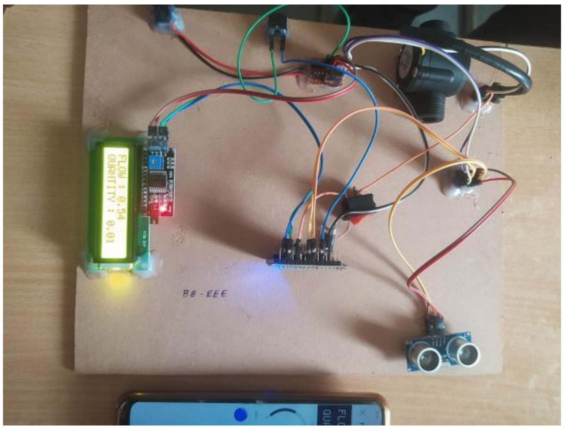

Fig-7: Under Normal Condition

Figure 1 shows that an ultrasonic sensor detects the water level and gives an alert that is displayed on the screen.

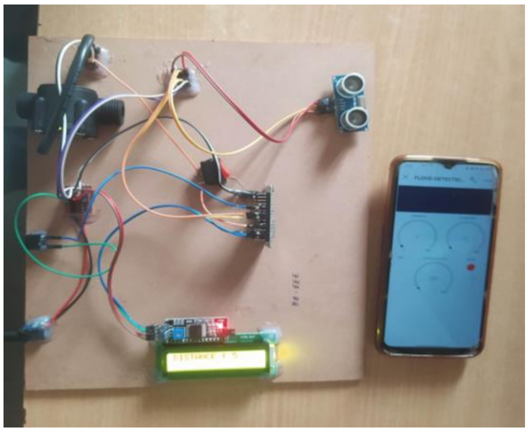

Fig-8: Under Fault Condition

Figure 2 depicts how the water flow sensor detects a rising water flow and sends an alert. It is visible on the display and in the Blynk app.

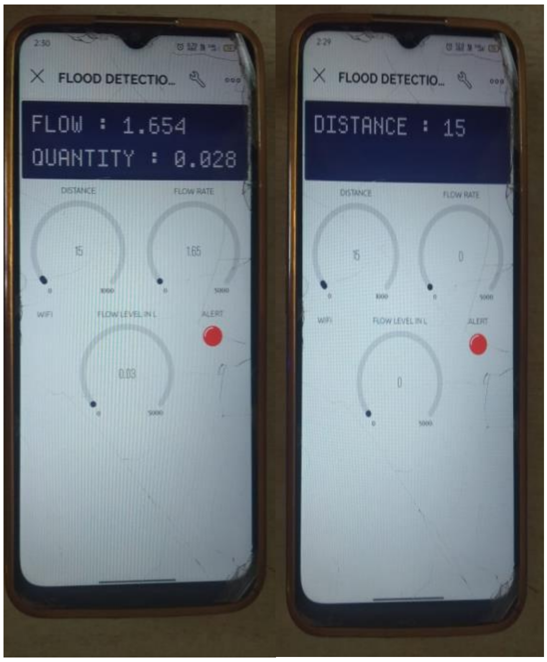

Fig-9: Using Blink App

VI. CONCLUSION

The paper benefits the people and the economy. Before, during, and after the destruction caused by storms, it anticipates a community that is secure, ready, and of less consequence. Additionally, the model encourages the use of real-time monitoring systems via web-based applications and SMS notification systems as an efficient means of information distribution, particularly in remote areas.

The system has more flexibility in how it may deliver crucial information to the community by enabling two-way communication. It is a fact that new technologies have been developed, such as the ultrasonic sensor to detect the level of water and the water flow sensor to measure the flow of water. By using both sensors and IOT, it can alert people.

REFERENCES

[1]. Pagatpat J C, Arellano A C and Gerasta J (Iligan City, Philippines: Mindanao-State University Iligan Institute of Technology).

[2]. Vitales J S, Villajin L D, Destreza F G, Ricafranca D V, and Rodriguez V M R 2016 College of Engineering and Computing Sciences (Batangas, Philippines: Batangas State University ARASOF Nasugbu).

[3]. V.Jyothi, Dr.M. V. Subramanyam " An Enhanced technique to improve the Network Lifetime of Cognitive Sensor Networks ', International Journal of Wireless Personal Communications' pp. 12757 – 12763, May-2021 DOIhttps://doi.org/10.1007/s11277-021-08575-0 [SCI].

[4]. Inquirer.com 2016 Available: http://newsinfo.inquirer.net/845239/heavy-rains-flood-bridgesroads-in-isabela-cagayan.

[5]. Inquirer.net 2012 Philippines: DOST undertakes flood Prevention and mitigation project Available: http://goo.gl/i1dd50 [Accessed: January 2012].

[6]. V.Jyothi, Dr.M. V. Subramanyam "An energy efficient fuzzy clustering-based congestion controlalgorithm for cognitive radio sensor networks', Wireless Networksl. Oct-2022. https://doi.org/10.1007/s11276-022-03143-1 . **SCI**1.

[7]. J.SofiaPriyadarshani&Dr.M.V.Subramanyam ' Emperor Penguin Optimized User Association Scheme for MMWAVE Wireless Communication' **Wireless Personal Communications.** An International Journal,ISSN 0929-6212 DOI 10.1007/s11277-020-07269-3.

[8]. V.Ramanjaneyulu "Buck-Boost Converter Topology with Improvement in The Gain "in International Journal of Research Available athttps://app.box.com/s/v20v9e43bpywm3dj62me78rtiiegm39a, Alochana Chakra Journal Volume IX, IssueVI, June/2020 ISSN NO:2231-3990.

[9]. M.Yerri Veeresh, A.Mallikarjuna Prasad & U.Chaithanya, A Strategy of High Voltage Gain Switched – Capacitor DC-DC Converter with Reduced Rating Component Rating and Count Fed DC Drive System, International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Volume 2, Issue 9, September 2013, Pg.no: 1835-1843.

[10]. Saraswati, B. Alekya himabindu, Dr. M. V. Subramanyam "Multiple Sensor Data Fusion Based Top-Down Embedded System for Automatic Plant Pot Watering" JOURNAL OF ALGEBRAIC STATISTICS Volume 13, No. 1, 2022, p. 884 – 891(ESCI).

[11]. Dr.M. V. Subramanyam et al 'Multiple Sensor Data Fusion Based Top-Down Embedded System for Automatic Plant Pot WateringJournal of Algebraic Statistics,e-ISSN: 1309-3452,Marmara University Istanbul University, Istanbul, Vol. 13, No. 1,PP: 884 – 891,2022, No.3.

[12]. M.Yerri Veeresh, Dr.V.Nagabhaskar Reddy, Dr.R.Kiranmayi, Modeling and Analysis of Time Response Parameters of a PMSM-Based Electric Vehicle with PI and PID Controllers, in Engineering, Technology & Applied Science Research (ETASR), ISSN: 2241-4487, Vol. 12, Issue. 6, December 2022, PP.No. 9737-9741.

[13]. dost.gov.p 2016 Available: http://dost.gov.ph/component/search/?searchword=flood%20monitoring%20with%20project%20NOAH&searchphrase=all&Itemid=101.

[14]. V Ramanjaneyulu "DTMF Based Irrigation Water Pump Control System" in International Journal of Research Available at https://edupediapublications.org/journals p-ISSN: 2348-6848 e-ISSN: 2348-795X Volume 05 Issue 12 April 2018.