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IOT Early Flood Detection & Alerting System using Arduino

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Abstract: ***The technical and scientific advancements in the current industrial age have revolutionized our lives and provided us with plenty of comforts and conveniences. However, this industrial progress has come at a hefty cost of global warming and environmental disasters. The increasing carbon footprints and greenhouse gas emissions have severely disturbed the natural cycle of rains and floods. Hence, now we are facing the dangers of unwarned floods more than ever before. Flooding is typically brought on by an increased quantity of water during a water system, sort of a lake, river overflowing. On occasion a dam fractures, abruptly releasing a huge quantity of water. The outcome is that a number of the water travels into soil, and 'flooding' the region. In order to detect and reduce damages caused by floods in a timely manner, technology plays a crucial role. With the help of technology, we can reduce natural disasters caused by floods. In this system we make use of a Arduino Uno interfaced with 4 different sensors, named as Ultrasonic sensor for measuring water levels, float sensor detect full water, Flow sensor for knowing speed of water and humidity sensor. These combinations of sensor are used to predict flood and alert respective authorities with help of IOT and sound instant alarm in nearby villages to instantly transmit information about possible floods. These sensors provide information over the IOT using Wi-Fi module. On detection of conditions of flooding the system predicts the quantity of your time it migh take to arrive a specific area and alerts the villages/areas that would be affected by it.***

Keywords: Floods, Alerting System, IOT Flood Detection

I. INTRODUCTION

In India, the rainy seasons occur each year from June to October. Early rainfall is usually in June with full commencement in July, and stops in the months of October each year, with a few showers in November. Flooding is a natural phenomenon which attracts global interest. It results in tremendous environmental destruction and loss of lives. Flooding is a result of substantial rainfalls, structural failures and a large number of human factors. Floods rely on precipitation amounts and rates, topology, geology, land use, and antecedent moisture condition. In India 1,503 people and 7,842 cattle died, 27,5045 houses were damaged and 20.75 lakh hectares of crops were affected in the countrydue to heavy floods and rains during the current rainy season.

In order to detect floods and alert the people in remote areas in a timely manner, technology plays a crucial role. With thehelp of technology, we can reduce natural damages caused by floods. An IoT early flood detection and alerting system using the Arduino project is proposed as a solution to this problem. The project consists of five sensors which aretemperature, humidity, water level, flow level, and ultrasonic sensors. The project also consists of an Arduino controller, a Wi-Fi module, an LCD screen, a buzzer, and an IOT remote server based platform. The five different sensors measure the various environmental and weather-related parameters and monitor them constantly. For detecting changes in humidity and temperature the system has a DTH11 Digital Temperature Humidity Sensor. It is a advanced sensor module which consists of resistive humidity and temperature detection components. The water level is always under observation by a float sensor, which work by opening and closing circuits as water level rise and fall. It normally rests in the closed position, meaning the circuit is incomplete and no electricity is passing through the wires yet. Once the water level drops below a predetermined point, the circuit complete itself and sends electricity through the completed circuit to trigger an alarm. The flow sensor on the system keeps eye on the flow of water. water flow sensor consists of a plastic valve body, a water rotor and a hall-effect sensor. When water flows the rotor, rotor rolls. Its speed changes with different rate of flow.

The system also consists of a HC-SR04 Ultrasonic Range Finder Distance Sensor. The Ultrasonic Sensor works on the principle of SONOR and is designed to measure the distanceusing Ultrasonic wave to determine the distance of an object from the sensor. The data from these sensors is constantly fed to an Arduino controller. The Arduino program constantly checks for any irregularities in the sensor measurements and estimates the weather conditions based on the sensor data. A Wi-Fi module is also connected to the Arduino controller. The Arduino sends the sensor data to the remote IOT platform using the IOT protocols over the Wi-Fi connection. The LCD is used to display the real-time values of all the sensors. A buzzer is also connected to the output of the Arduino. If the value of water flow and water levelsensors crosses over a certain threshold value, the buzzer is turned on.

A GUI is constructed on the remoteserver IOT platform in order to display the sensor data in a visual format. Using thisproject, the flood-related parameters can be monitored from anywhere in the world remotely.

II. RELATED WORKS

Edward Udo, EtebongIsong Article. January 2014 Nigeria as a whole and Uyo, a southern province in Nigeria, in particular is facing a serious challenge with an increasing frequency of flood in recent years. It is therefore crucial to utilize the state-of-the-art sensing and communication technologies to monitor and detect flood occurrences The role of the designed Flood Monitoring and Detection System (FMDS) based on WSN is to continuously monitor, detect and report the environment's status to a control unit using relative humidity, temperature, water level and amount of rainfall as flood indicators, whose values are gathered by sensors in the sensor field. The flood monitoring and detection system monitors and know the development of floods and then send flood notification SMS to the inhabitant of such zones for necessary action. The developed Flood Monitoring and Detection System (FMDS) covers 15 flood prone regions in Uyo metropolis in Akimbo State, Nigeria. The GIS map of the flood prone zones is incorporated into the FMDS. The system is composed of three major modules which are the sensor field module, surveillance module and the phone module. The system was developed using Java Programming Language built into surveillance module of the system. The developed system is robust and gives timely alert of flood occurrences[1].

Thinagaran Perumal, Md Nasir Suleiman, C. Y. Leong. IoT Enabled Water Monitoring System IEEE Explore, 2015. In this paper proposed an IoT based water monitoring system that measure water level in real time. The prototype is based on idea that the level of water can be very important parameter when it comes to the flood occurrences especially in disaster prone area. A water level sensor is used to detect the desired parameter and if the water level reaches the parameter the signal will be freed in real time to social network like Twitter. A cloud server was configured as data repository. The measurement of water level are displayed in remote dashboard. The proposed solution with integrated sensory system that allows inner monitoring of water quality. Alerts and relevant data are transmitted over the internet to a cloud server and can be received by user terminal owned by consumer. The outcome of water measurement is displayed in web based remote dashboard[2].

Syed NazmusSakib, TanjeaAne, NafisaMatin, M. Shamim Kaiser This paper presents a neurofuzzy controller-based flood monitoring system using wireless sensor network. The distributed sensor nodes use IEEE 802.15.4 protocol, also called low rate wireless personal area network, to collect the sensor information such as water level data from the river, rainfall, wind speed and air pressure data from a selected site. In order to validate the proposed flood monitoring system, Chadpur, a flood prone district of Bangladesh, has been considered as selected site.

The sensors information is sent to the distributed alert center via Arduino microcontroller and the XBee Transceivers. At the distributed alert center, XBee Transceiver and a Raspberry Pi microcomputer are used to generate flood alert based on sensor information and two -decade flood data and these data are stored in a database. Sensor information are analyzed by the intelligent neuro-fuzzy controller used in Raspberry Pi microcomputer to announce the flood alerts. The wireless sensor network is connected as mesh topology which can send signals over far distance. The performance evaluation reveals that the environment using onboard sensors and send early warnings to family, friends and colleagues immediately proposed system accurately detect flood alert compared to the existing flood alert system[3].

Amiath Ali J 1, B. Thangalakshmi2 , A. Vince Beaulah3 1Lecturer, Department of Electrical and Electronics Engg,Ibra college of Technology, Disaster-LINK is a smart IoT device that acts as an alarm and monitoring system during natural disasters that operates by communicating over internet. It comes with Wi-Fi support for internet connectivity and uses an IoT cloud platform which helps to control, monitor and manage the device.

The device senses its local when it finds a disaster situation. It is also able to receive such warning alarms from other similar devices available on the internet and provide the user with voice, flashing light, SMS and E-mail alarm notifications. The ultimate aim of the project is to spread the disaster warning information quickly through internet and make it available to those who need it as early as possible. The fact thatinternet is faster than the seismic waves of an earthquake, and much faster than a flood or tsunami, helps the device to deliver the alert message much before the actual calamity reach the user’s location giving that vital extra time to take those precautionary emergency measures.[4]

Octavian A. Postolache, J. M. Dias and P.M.B Silva Giraoin 2009 implemented smart sensor network for indoor and outdoor air quality monitoring.

In this system sensor nodes are installed in different rooms and it consist of tin dioxide sensors which were hardwired or wirelessly connected to the central unit. It also measured the concentration of temperature and humidity for accuracy. In this research, the concept of multiple input single output(MISO) neural networks was implemented to compensatefor the influence of temperature and humidity on the concentration of gas present. IEEE 802.11n (Wi-Fi)technology was used for communication between sensors.[5]

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III. METHODOLOGY

"IoT Early Flood Detection & Alerting System" is an intelligent system which is used to detect the floods and alert the people in remote areas in a timely manner, technology plays a crucial role. With the help of technology, we can reduce natural damages caused by floods.This project is proposed as a solution to this problem.

The project consists of five sensors which are temperature, humidity, water level, flow and ultrasonic sensors. The project consists of an Arduino controller, a Wi-Fi module, an LCD screen, a buzzer, and IOT remote server-based platform. These sensors measure the various environmental and weather-related parameters and monitor them constantly. For detecting changes in humidity and temperature the system has a DHT11 Digital Temperature Humidity Sensor. The water level is always under observation by a float sensor, which work by opening and closing circuits (dry contacts) as water levels rise and fall. It normally rests in the closed position, meaning the circuit is incomplete and no electricity is passing through the wires yet.

The system also consists of a HC-SR04 Ultrasonic Range Finder Distance Sensor. The Ultrasonic sensor works on the principle of SONAR and is designed to measure the distanceusing ultrasonic wave to determine the distance of an object from the sensor. The data from these sensors is constantly fed to an Arduino controller. The Arduino program constantly checks for any irregularities in the sensormeasurements and estimates the weather conditions based on the sensor data. A Wi-Fi module is also connectedto the Arduino controller. The IOT Early Flood Detection &Avoidance. Arduino sends the sensor data to the remote IOTplatform using the IOT protocols over the Wi-Fi connection.The LCD is used to display the real-time values of all thesensors. A buzzer is also connected to the output of theArduino. If the value of water flow and water level sensors crosses over a certain threshold value, the buzzer is turnedon. A GUI is constructed on the remote server IOT platformin order to display the sensor data in a visual format. Usingthis project, the flood-related parameters can be monitoredfrom anywhere in the world remotely

IV.BLOCK DIAGRAM

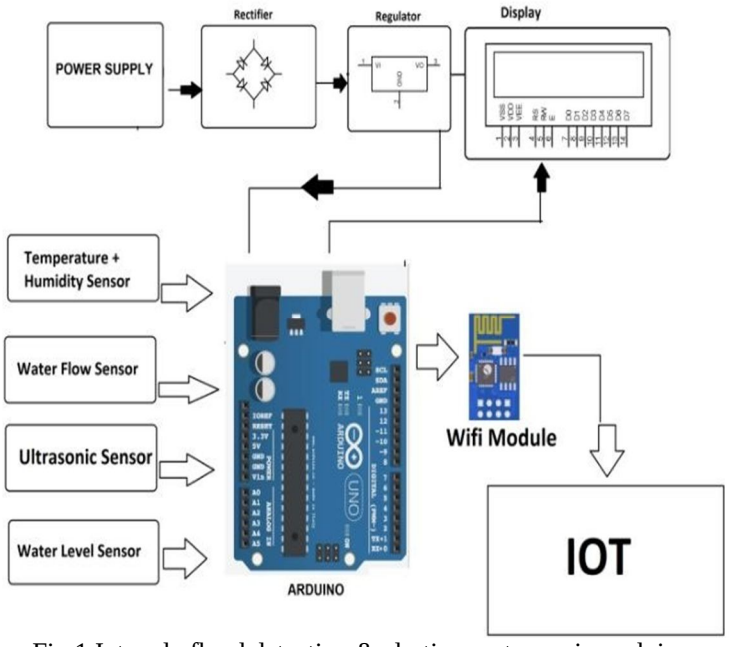

Fig 1:Iot early flood detection & alerting system usingarduino

The temperature sensor measures the temperature. The humidity sensor measures the level of humidity. The level sensor measures the level of water. The flow sensor measures the flow rate of water. The ultrasonic sensor detects the objects from a distance. The LCD screen display the sensor data in real time. The buzzer is turned ON when the water flow and water level sensor value passes the threshold value. The Wifi module is used to transmit the sensor data to the server based IOT platform. The Arduino controller communicates with all the peripherals and sensors.The IOT platform is installed on aremote server and is used to log the sensor data and display it in a visual format .

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V. FLOW CHART

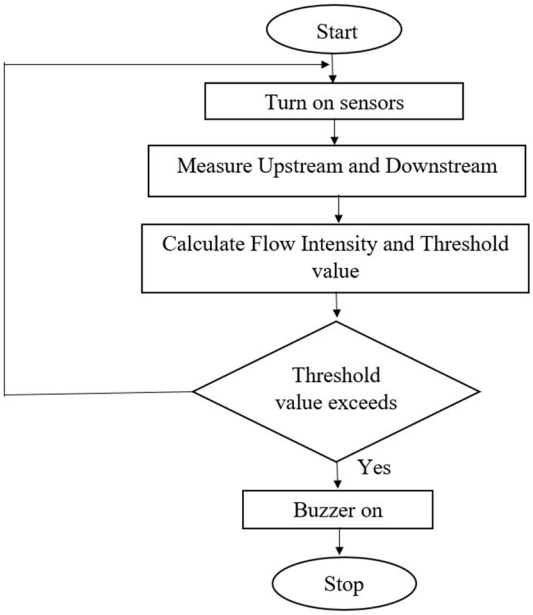

Fig 2: Flow Chart

We need to initialize the 16*2 LCD display, in which we can see the four sensor DTH11 Digital Temperatue Humidity sensor,Ultra Sonic Sensor,Water Flow Sensor and Water Leve Sensor collects the data and that data will be displayed on the LCD.If the Water Flow intensity and Water level values are greater than threshlod value then the buzzer turns ON.If the water flow intensity and water level values are less than or equal to threshlod value then the buzzer will be in off state.

VI.EXPECTED RESULT

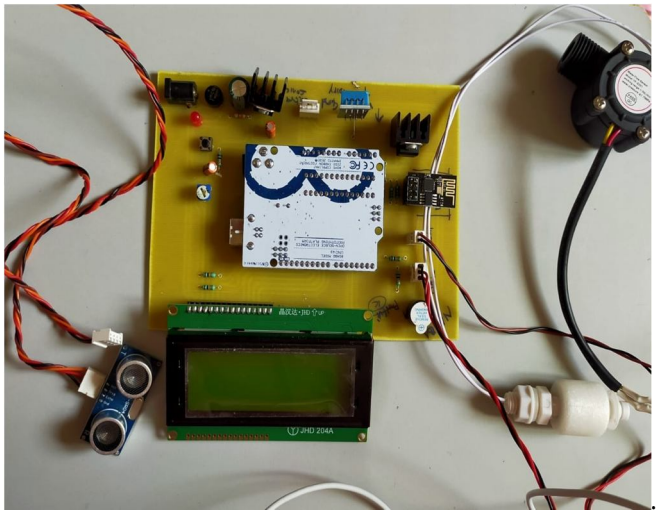

Fig 3: Expected Result

If the value of water flow and water level sensors crosses over a certain threshold value, the buzzer is turned on. A GUI is constructed on the remote server IOT platform in order to display the sensor data in a visual format. Using thisproject, the flood related parameters can be monitored from anywhere in the world remotely.

VII. CONCLUSION

In order to detect the floods and reduce the damage caused by floods, we are using this IoT early flood detection and alerting system using Arduino. This system uses Arduino along with some sensors like DTH11 to detect temperature and humidity, ultrasonic sensor to measure the distance using Ultrasonic wave to determine the distance of an object, float sensor to observe water level, flow sensor to observe flow of the water. A Wi-Fi module which is connected to Arduino controller,sends the sensor data to the IoT. If the value of water flow and water level sensors cross the threshold level the buzzer is turned on. This module generates an alert signal which is transferred wireless to the concerned authorities. The data collected is stored in thedatabase for future references.

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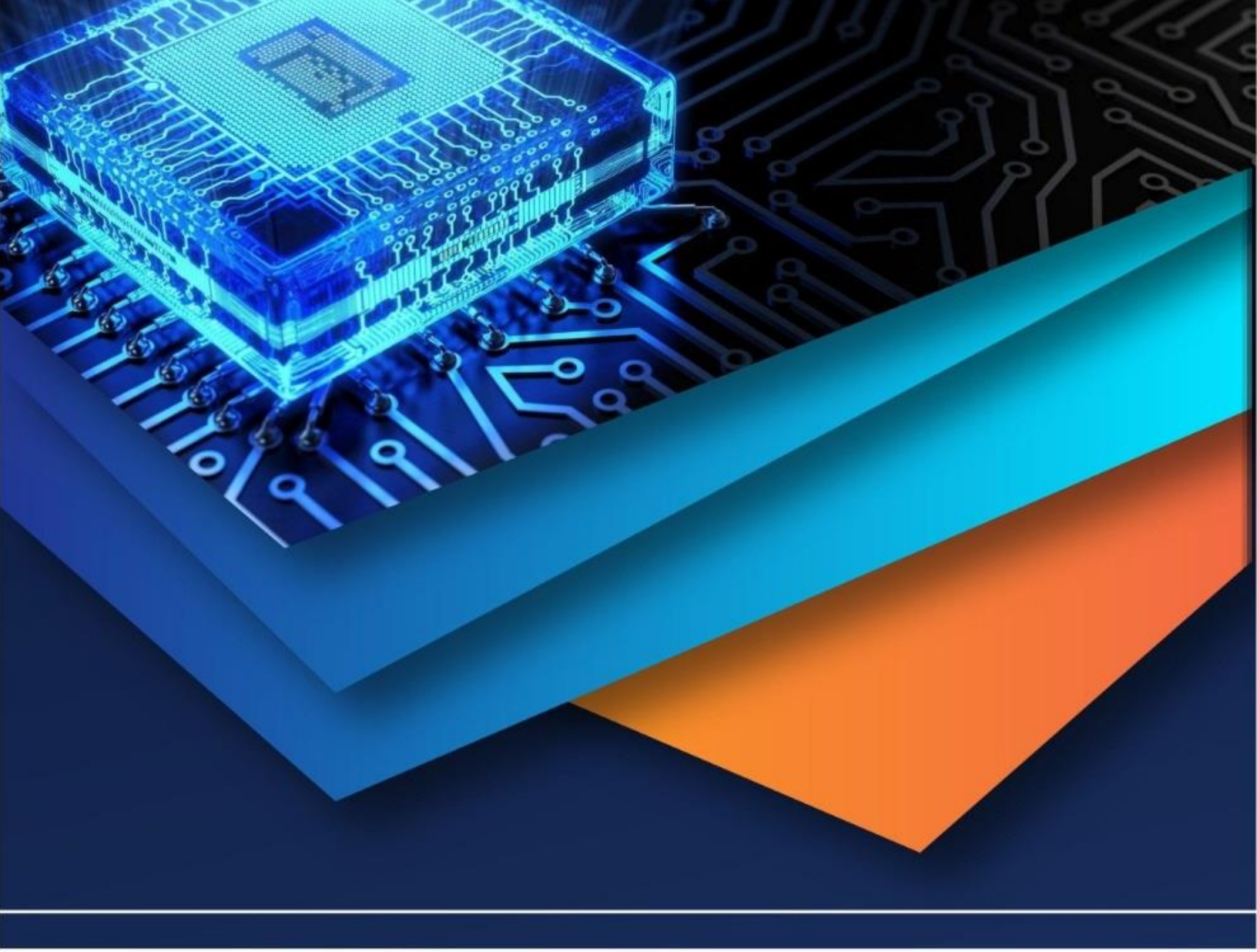

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