IoT based Rain Detection System using Arduino

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Abstract:
Rainfall is an important natural parameter that is taken into consideration in all aspects of environment. Every year changing patterns of rainfall causes Drought leading to heavy loss of crops and thus livelihoods. Anticipating the rainfall can help saving these losses. This paper presents the proposed rainfall detection system that has rainfall sensors and Arduino as controlling unit that senses the rain and processes the data to generate the intensity of the rainfall for the required measures to be taken in advance. The system is devised to calculate intensity of rainfall and the consequent response taken by the authorities to regulate the flow of water. GSM module and Wi-Fi connected to a cloud server is used for local and remote alert notifications to the authority.

Keywords: Rainfall, Arduino, Drought, sensor

1. Introduction
Food and agriculture Organisation (FAO), United Nations (UN) defines drought as deficient precipitation compared to the statistical multi-year average for a region that results in water shortage for some activity, group, or environmental sector. Since 1900 more than 11 million people have died as a consequence of drought and more than 2 billion have been affected by drought, more than any other physical hazard. Hence drought has always been a major challenge to the society. There have been several researches in the field of implementing the automated system to detect the rainfall. [1] has detected the rain using Wireless sensor network to detect the moisture, temperature water level and amount of rain to predict flood. The Rainfall Monitoring and Flood Control System monitor the development of flood and send alert messages to the occupant of such zones for necessary action. [2] has used a combination of moisture sensor and hall effect sensor to measure the rain conditions and divide it further into low, medium and high intensity and accordingly vary speed of the vehicle. In [3] three parameters are measured- Temperature, Humidity and Rainfall and is controlled by the controlling Unit-NodeMCU. All the data acquired is stored onto thingspeak platform from where it is compared using fuzzy logic algorithm. [4] proposed an IoT based system to monitor temperature, humidity, rainfall and light intensity. After acquiring the parameters, it uploads the data onto the thingspeak platform. [5] makes use of a flexible and efficient wireless sensor network for detecting rainfall-induced landslides. The idea offers the high-quality rainfall monitoring at very cheap rate in terms of labour invested and capital. This paper includes the WSN-enabled architecture for rainfall monitoring system to transmit and collect real time data using GPRS (General Pocket Radio Service) via a cellular network.

This paper has been divided into three parts. First part of the paper explains the methodology involved in proposing the system and the various components used. The second part deals with the algorithm and results and third part deals with conclusion and future scope.

2. Methodology
The proposed system involves a combination of three main units as depicted in block diagram in figure 1.
2.1 Sensing Unit

Sensing Unit consist of the following:

A. DHT sensor

DH11 is a digital 32 – bit output temperature and humidity sensor. It gives temperature and humidity both in 16-bit format with 8 bits as integer and 8 bits for decimal. DHT11 uses capacitive humidity sensor to measure humidity and thermistor to measure temperature of surrounding air. It is suitable for most of the applications due to its high precision and low cost.

B. Rain sensor

The rain sensor consists of a plate with conducting plates. When rain water falls on the conducting rates of PCB change the resistance of the plate and thus conductivity. The signal form rain sensor is fed to the comparator signal processing circuit, which depending on the signal form rain sensor plate above or below the threshold set for the sensor gives digital signal 0 or 1. Comparator also comes with the analog output whose value can be mapped from 0 to 1023 in digital as Arduino has 10bit – ADC.
2.2 Processing Unit

The processing Unit consist of Arduino Uno as the main controller board. It is a an AVR microcontroller ATMEGA328P based controller board that works on 16MHz of crystal frequency and 5V of Operating Voltage. It receives the data from the sensing units and based on the algorithm fed into it, directs the actuators accordingly.

![Arduino Uno Board](image)

2.3 Responding Unit

Responding Unit is in the form of communication modules - GSM module that locally sends the alert notification to authority in situations of extreme dryness while simultaneously using Wi-Fi module for remote alert notifications.

3. Algorithm and Results

The proposed system first undergo data acquisition process in which DHT11 sensor will measure Temperature and Humidity. Humidity is the present of moisture content in the atmosphere. It is the first cue for anticipating the occurrence of the rainfall. After then data from the rain sensors are used to further enhance the anticipation of rain occurrence. Arduino Uno is acquiring all the data through its GPIO pins and then send the alert notification to the concerned authority be in the farmer in case of a small land either locally or remotely using GSM and Wi-Fi Module.

4. Conclusion

The proposed system is extremely low cost and low power simple system that has minimum power consumption and complexity yet efficient in anticipating the occurrence of rainfall to inform the farmers of the drought condition if RISE in order to save the destruction of crops and livelihood. In its future use Machine learning can further be added to it to classify and further make a pattern of rainfall in a specific area.
References


