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Landslide Detection System Using IOT

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Abstract

Landslides are a geographical disaster occurs in a short period due to the variations in environmental actions and causes damages in human lives, properties of agriculture. During the rainy season, unlike divisions of India are affected by the landslide natural hazard every year. IOT based technology has the capacity of large scale deployment and real time detecting of landslide losses. IOT based network detect the slightest movements of ground or slope instability due to the several reasons such as dielectric moisture, pore pressure and so on that may occurs during a landslide.

Keywords: Soil moisture, Node MCU (Wi-Fi Module), DHTT11 Temperature and humidity sensor, Vibration sensor, Blynk Application

1. Introduction

A landslide is movement of a mass of rock, debris, or earth down a slope. In monsoons the rain water percolates and develop hydraulic pressure which exceeds the elastic limit of the soil or rocks. Due to this the strain gets accumulated which forces the soil and rocks to loosen their adhesive strengths entailing landslides. Landslides destroy agricultural/forest lands, road transports, destroys earth's natural environment as a whole causing great loss to life. Landslides can also be said of "Mass Wasting", which refers to any down slope movement of soil and rock due to gravity. It causes property damage, injury and death. Also, it adversely affects a variety of resources such as water supplies, Landslide objective to study the landslide detection

2. Materials and Methods

2.1. Materials

2.1.1 Soil Moisture Sensor

The Soil Moisture Sensor is one kind of sensor which is used to measure the amount of water content present in the soil. This sensor does not measure the water content directly. It measures by means of some other values like dielectric constant, Electrical resistance and interaction of neurons and so on. This sensor is applied in environmental science, agricultural science, soil science, biology, botony and horticulture.

2.1.2 Node MCU (Wi-Fi Module)

Node MCU is a device which is used to give its WiFi signal and it act as a WiFi router. It works as a open source platfformo where the objects can be connectedand the data is transferred to it. We can configure this module by creating a new SSID and password to access.

2.1.3 DHT11 Temperature and Humidity Sensor

DHT11 Temperature sensor is the basic module of ultra low cost sensor. It is used to detect the

ambient temperature and humidity. It was calibrated by DHT11 sensor. This sensor is a digital temperature and humidity sensor. It contains capacity humidity sensor to measure the humidity and thermistor to measure the temperature of the surrounding air.

2.1.4 Vibration Sensor

Vibration Sensor is used to sense or measure the vibrations created from the source. It consists of a transducer which is used to convert the mechanical force into vibrations. There are many types of vibration sensors. Piezoelectric accelerometer type is mostly used in industrial based application. It is very simple and easy to applications.

2.1.5 Buzzer

Buzzer is a device which is used to convert the audio signal into sound signals. It is a sounding device used indication in many applications. It is also available in mechanical type, Electromechanical type and piezo type.

Table 1: Chemical Composition of Cementing Material

S.NO	MATERIALS	SPECIFICATION	QUANTITY
1	Soft moisture sensor	3.3-5V,60X 30mm	1
2	Node MCU	ESP8266-12	1
3	Temperature and Humidity Sensor	DHT11,0.3mA,3.3-5V	1
4	Vibration sensor	15mA,40*15*7,3.3-5V	1
5	Buzzer	3.5-12V,15*30mm	1

2.2 Methods

Initially, a 5 volt supply is given to the Arduino UNO where the other components are connected together for the data transformation. Soil moisture sensor consists of conductive probes which

are fixed in the soil. It detects and measures the water content in the soil with the help of main sensor. This data is transferred to the Arduino UNO. Secondly, DHT11 sensor that is temperature and humidity sensor is fixed which detects the surrounding temperature and humidity level present in it. A vibration sensor is also fixed which is used to detect the vibration occurs during the initial stage of the land slide. These data are collected and transferred to the microcontroller. This controller send these response to the Node MCU module . This module receives the data and compared with the pre set values. This module is connected to the phone or laptop through IP address. The module is configured with the specific username and password. If the measured value is greater than the given values the alarm signal is passed to the buzzer and also for the mobile or laptop. Thus the real time situation can be viewed through the mobile application by the users.

3. Result And Discussion

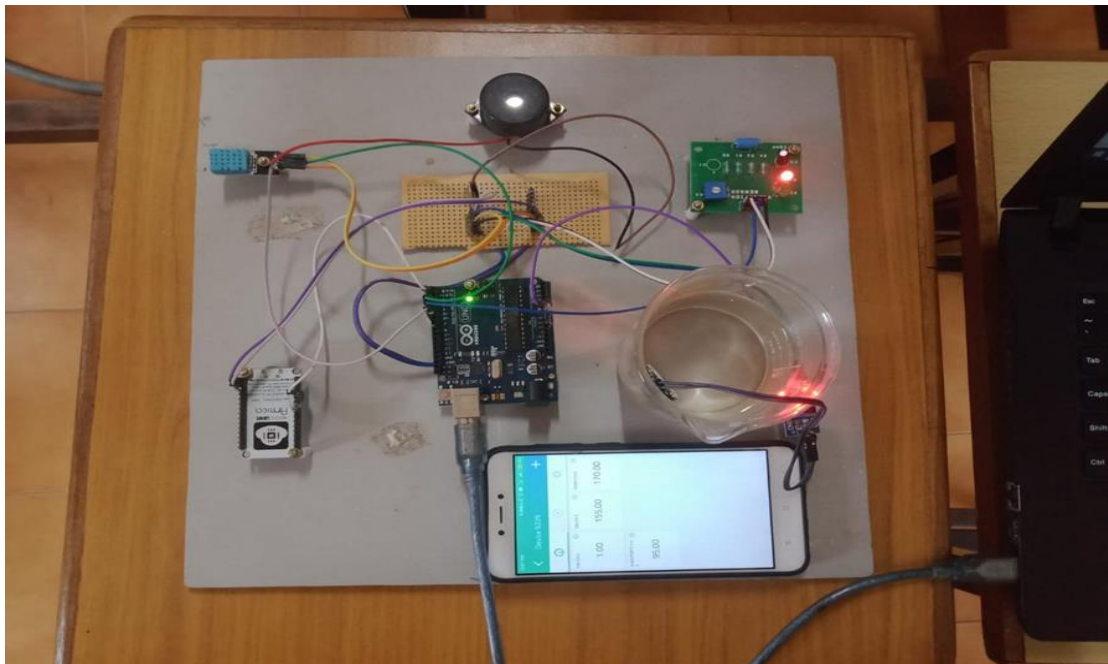


Figure. 1. IoT based Process Setup

In this setup, a 5V supply is given to Arduino UNO. The other digital sensors (vibration sensor, temperature and humidity sensor and soil moisture sensor are connected to arduino by using the jumper wires. The hotspot for the wifi module is given by using mobile and the Cayenne application is connected to the device. It displays the parameters like soil moisture, temperature, humidity and vibration in the range.

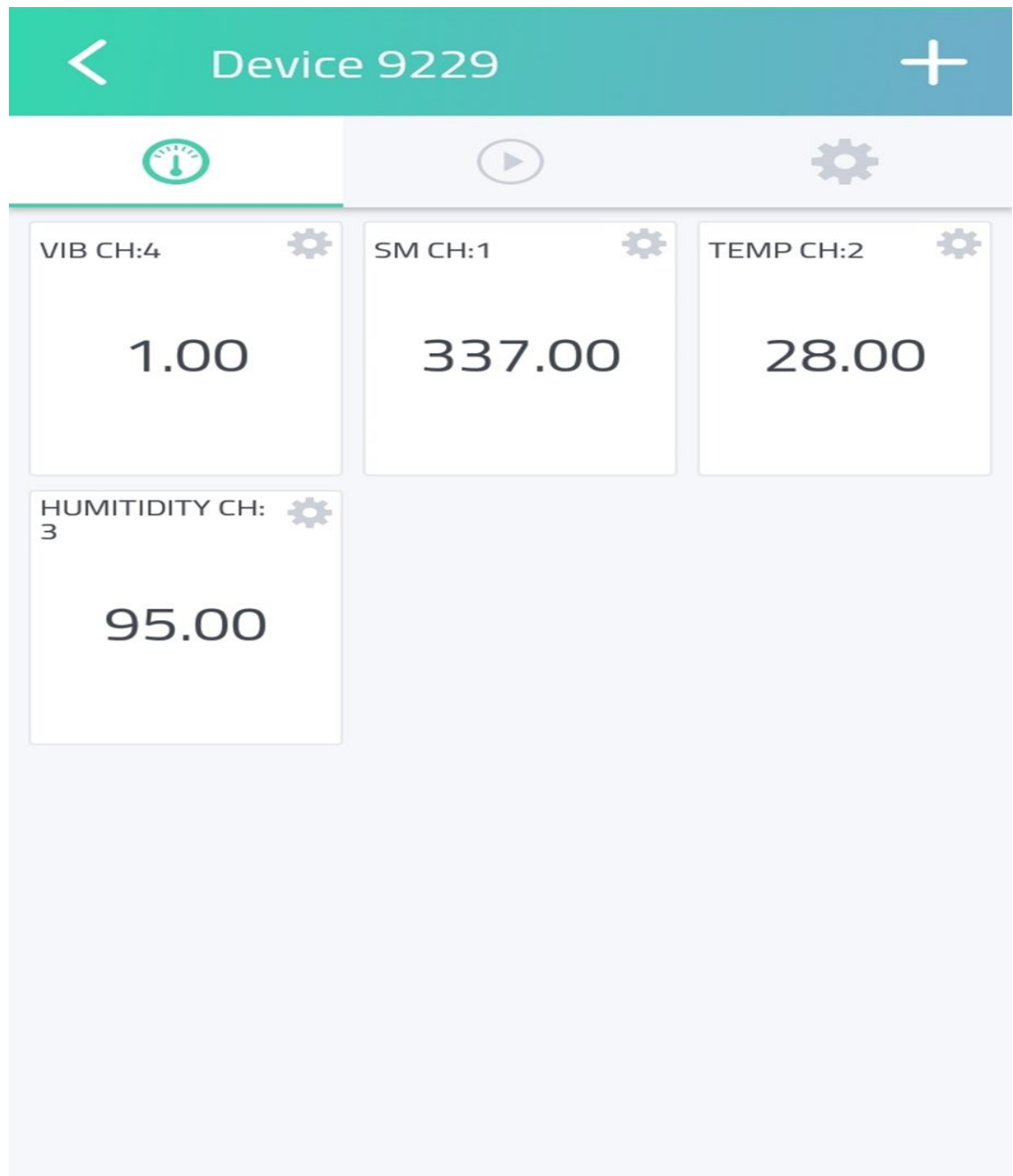


Figure.2. IoT Output Display

4. Conclusion

Real time monitoring of landslides is one of the challenging research areas available nowadays within the field of geophysical research. The event of an actual field deployment of a wireless device network primarily based landslide detection system. This system uses wireless sensor nodes, MQTT protocol for efficient delivery of real time data to the system for monitoring and provide warnings and risk assessments to the inhabitants of the area. This network will be used for understanding the capability and usability of wireless sensor network for critical and emergency application

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