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IoT Based: Landslide and Flood Detection System

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Abstract

The IoT- grounded Landslide and Flood discovery system employs detectors and IoT technology to cover and prognosticate landslides and cataracts in real time. It provides early warning signals to help disasters. Detectors, including rain detectors and vibration detectors and rain hand are placed strategically in vulnerable areas. Data is transmitted wirelessly via protocols like Wi-Fi or cellular networks to a pall-grounded platform, where real- time analysis reveal implicit pitfalls.

Keywords: Rain Detector; Vibration Detector; Rain Hand; Wi- Fi

Introduction

An IoT- grounded Landslide and Flood discovery system is a smart result that utilizes Internet of things (IoT) technologies to cover and descry implicit landslide and flood tide events. This system employs detectors, data communication protocols, and data analytics to give real- time information and early warning cautions to help or alleviate disasters caused by landslides and cataracts. The system consists of a network of detectors like rain detectors, Vibration Detectors, Ultrasonic detector and Rain Hand, strategically placed in areas prone to landslides and cataracts. The detector data is collected and transmitted to a central mecca or pall- grounded platform using wireless communication protocols similar as Wi- Fi, Lora WAN, or cellular networks. The collected data is reused and analysed in real time on a pall-grounded platform. Advanced data analytics and machine learning algorithms can be applied to identify patterns and implicit pitfalls. It's essential to mention that planting such a system requires collaboration between government agencies, exploration institutions, and technology providers. Also, accurate estimation of detectors and nonstop conservation are pivotal to insure the system's trust ability and effectiveness. Northwest Himalayan Mountain Ranges including Uttarakhand, Himachal Pradesh, Jammu & Kashmir are loftiest landslide hazard prone areas. Presumably every time landslides passed in this area due to heavy downfall. This becomes necessary to cover the landslides with the help of Landslides discovery systems. But generally, in India the monitoring of landslides isn't important popular, due to lack of covering systems real- time monitoring of landslides becomes delicate.

Design of Proposed System

It observed that utmost of the landslides is cause due to the redundant severance water pressure present in the soil during heavy downfall. The expansion and compression in the soil causes it to fall piecemeal the material on pitch due to the graveness and climate. These climates can be in form of Natural like Earthquakes and can be mortal convinced like blasting. cataracts are caused by heavy rain, structural issues, and a variety of mortal influences. Flooding is told by antecedent humidity conditions, terrain, geology, land use, and quantum and kind of rush.

This design focus on the development of low cost and effective IoT grounded system for the landslide and flood tide discovery and warning system. NodeMCU ESP8266 board is used in the development of the system along with the vibration detectors, soil humidity detectors and in erected WiFi module in board. WiFi enables the detectors and board connect to the Internet Service Provider (ISP). All the detectors collect the real time data and with the help of NodeMCU ESP8266 development board the data is shoot to the pall storehouse ThingSpeak. ThingSpeak can act when threshold values reach and can swap with the third party. The alert is shoot in the form of SMS to the end stoner via registered mobile number. IFTTT prosecution service is used for transferring the SMS. The targeted phone uses IFTTT android app whose SIM number is registered. This IFTTT is used as a third party with the ThingSpeak waiters.

Interfacing of Vibration Sensor

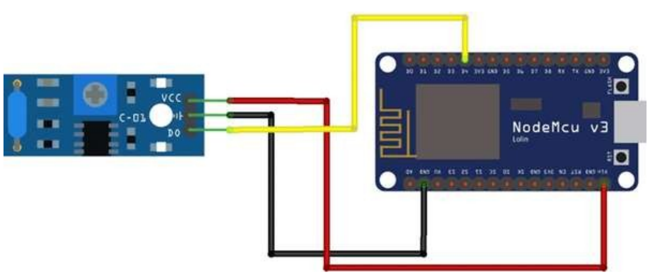

Fig 1. Interfacing of Vibration Sensor

The Grove - Vibration Sensor (SW-420) is a high sensitivity non-directional vibration sensor, which can work from 3.3V to 5V. The sensor uses the LM393 comparator to detect the vibration over a threshold point and provide digital data, Logic Low or Logic High, 0, or

1. When the module is stable, the circuit is turned on and the output is high. When the movement or vibration occurs, the circuit will be briefly disconnected and output low. At the same time, you can also adjust the sensitivity according to your own needs. There are two LEDs on the board, one for the Power state and another for the sensor's output. In this project, we will use 5V to power the module.

Connections

The SW-420 Module is powered by Vin pin and Its Output is recorded by the D4 pin of NodeMCU. An onboard warning LED is also powered by the D0 pin of the board.

Result

Fig 2. Vibration Sensor output

Interfacing Of Soil Moisture Sensor

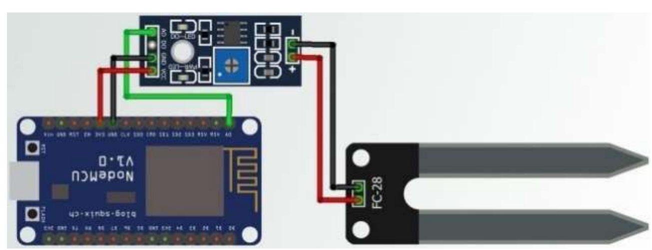

Fig 3. Interfacing of Soil Moisture sensor

The soil Moisture sensor FC-28 consists of two probes that are used to measure the volumetric content of water. The sensor works between the input voltage range of 3.3V to 5V. The output voltage given by it is 0 – 4.2V. The output signal appears both in analog form and in digital form. The Module also contains a potentiometer that will set the threshold value and then this threshold value will be compared by the LM393 comparator. The output LED will light up and down according to this threshold value.

Connection

Connect the analog output pin to A0 of Nodemcu. LCD Display is an I2C Module. So, connect its SDA SCL pin to

D2 & D1 of Nodemcu. Both the LCD & Soil Moisture Sensor work at 3.3V. So connect their VCC pin to 3.3V of NodeMCU.

Result

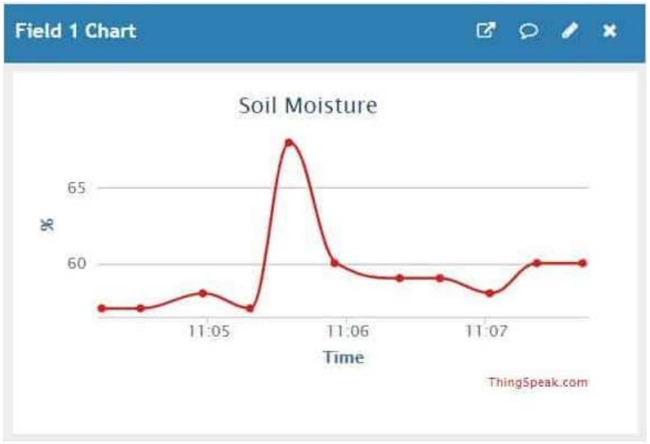

Fig 4. Soil Moisture sensor output

Interfacing of Rain Drop Detection Sensor

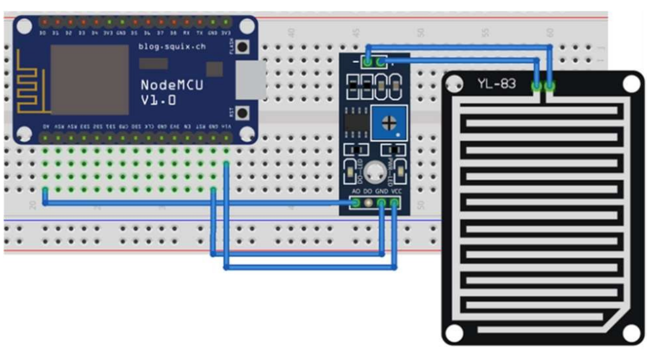

Fig 5. Interfacing of Rain drop detection sensor

Raindrop sensor is basically a board on which nickel is coated in the form of lines. It works on the principal of resistance. When there is no rain drop on board. Resistance is high so we gets high voltage according to V=IR. When rain drop present it reduces the resistance because water is conductor of electricity and presence of water connects nickel lines in parallel so reduced resistance and reduced voltage drop across it.

Connection

Connect to 3,3V power supply, the LED will turn Off when induction board has no rain drop, and output is Low. When dropping a little amount water, output is High, the switch indicator will turn on. When no rain digital output is 1 and analog output gives 1023 max value. When rain is present digital output is 0 and analogue output is much less than 1023.

Result

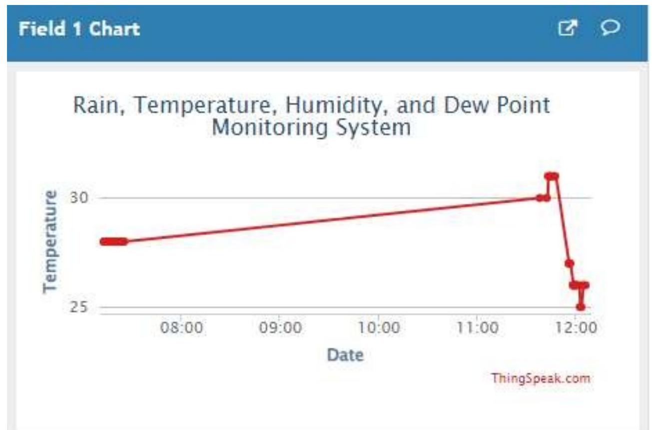

Fig 6. Rain drop detection Sensor Output

Interfacing of Ultrasonic Sensor

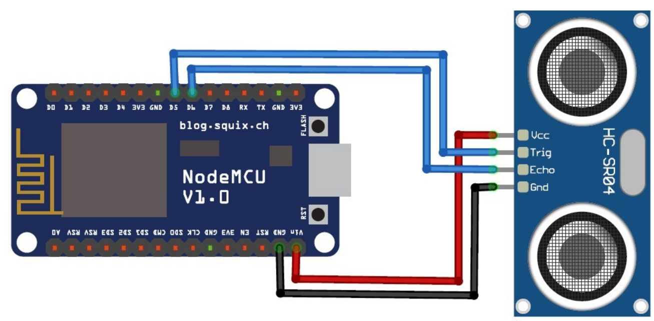

Fig 7. Interfacing of Ultrasonic Sensor

HC-SR04 ultrasonic sensor measures distance by using inaudible ultrasonic sound waves of 40KHz frequency. Like sound waves, ultrasonic waves travel through the air and if there is any obstacle in front of them, they reflect according to their angle of incidence. Moreover, if an object is placed parallel to an ultrasonic transmitter, ultrasonic waves reflect exactly at an angle of 180 degrees. Therefore, for distance measurement with HC-SR05 sensor, we place the object under test exactly in a parallel position with an ultrasonic sensor.

Connections

VCC pin of the Ultrasonic sensor is connected to the VU pin of the NodeMCU. GND pin of the Ultrasonic sensor is connected to the GND pin of the NodeMCU. TRIG pin of the Ultrasonic sensor is connected to the D5 pin of the NodeMCU. ECHO pin of the Ultrasonic sensor is connected to the D6 pin of the NodeMCU.

Conclusion

The monitoring and discovery of landside and flood tide is possible using this prototype. This is a low cost and effective system for early warning of the landslide and real time monitoring of the data. In order to assign the parameters for landslide the threshold values are set for both vibration, rain drop discovery and humidity detector. It's set up that when threshold values exceeded the system is able of transferring the alert to the end stoner. This prototype can be used for large area as well by adding the number of detectors to the NodeMCU ESP8266. Beforehand advising system for landslides can save mortal lives and property.

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