

# IOT Based Smart Landslide Detection System

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**Abstract** — The study of the Iot based Smart landslide detection system as the aim of our title is landslide which is the most important issue not only for the Indian government but also for common people. Mostly, A landslide is one of the major problems which in India is facing mainly in the hilly region and ghats. It is a critical issue which we need to be addressed and it not only leads to death of many people but also can cause financial destruction. Which have some parameters to detect landslide, this proposed system mainly compromises of module and the website will be provided to main access for updated alerted SMS notifications to the main access There are some info provide in this paper.

**Keywords:** Internet of Things (IOT), Flex Sensor, Servo Motors, Microcontrollers, Relay Module

## I. INTRODUCTION

A landslide is one of the major problems which India is facing mainly in the hilly region and ghats part. It is a critical issue which needs to be addressed and it not only leads to death of many people but also can cause financial destruction. landslide is defined as variation in downward movement of a mass of rock, rubble or earth down a slope, landslide is a kind of mass wasting which leads to down slope motion of soil and rock with the direct influence of gravity, mudflow, mudslides rock falls are generally called as debris flow and these are the parameters which leads to unusual landslide. the projects in this domain that are present only send SMS which can be neglected easily and no major step can be taken to avoid disaster so in the proposed system SMS & alarm will be added so that necessary steps are taken Monitoring, detecting and warning of landslide are the essential features for saving the lives and assets from devastation the project will help to give alert to citizens whenever a landslide occurs If any other emergency is there that can also be taken into consideration The IOT website will help us to fetch the data and send it to the hardware and the admin can also display a message at the website itself. Early detection is beneficial to all the stakeholder.

## II. LITERATURE SURVEY

- 1) Yuga Hare and Team was introduced the concept of landslide detection system to research and understand how landslide detect in hilly region and ghats and which sensors use in detection it is the most important concepts to the projects [1].
- 2) S. Lacasse proposed a Paper on Landslide Risk to identify the landslide risk mitigation and also early warning of sms and alarm system to the save their life of peoples [2].
- 3) Zhang et el was focused on using SAR Interferometry to monitor ground surface displacement and detect landslide-prone areas which Wireless remote sensing Techniques overview on the remote sensing [3].

- 4) S. Kumar and Team was paper represent a comprehensive review of landslide detection using sensing data. And the review discussed the strengths and limitations of each approach in current trends and future direction in research [4].
- 5) M. S. Hossain and Team was Research and Discuss about a wireless sensor Network Based landslide Monitoring System it is a designed a detection of landslide to enable to early warnings [5].
- 6) R. Sivanpillai, B.Gharabaghi, S. Kassim was the role factors to a critical role in landslide initiation is often overlooked in landslide studies it discusses the mechanisms of the landslide detection sensors [6].
- 7) The authors was introduced a IoT based landslide detection for landslide it is can access the data of previously sms notifications for alert to the peoples and also in the vehicles through the website or blynk IoT to Get early sms and alerts [7].

## III. PROJECT CONCEPT

### A. Hardware Requirements

#### 1) Node MCU Esp 8266 Microcontroller:

Node MCU is an open-source LUA based firmware developed for the ESP8266 wifi chip. By exploring functionality with the ESP8266 chip, Node MCU firmware comes with the ESP8266 Development board/kit i.e. NodeMCU Development board. Since NodeMCU is an open-source platform. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. ESP8266 module is low cost standalone wireless transceiver that can be used for end-point IoT developments. To communicate with the ESP8266 module, microcontroller needs to use set of AT commands.

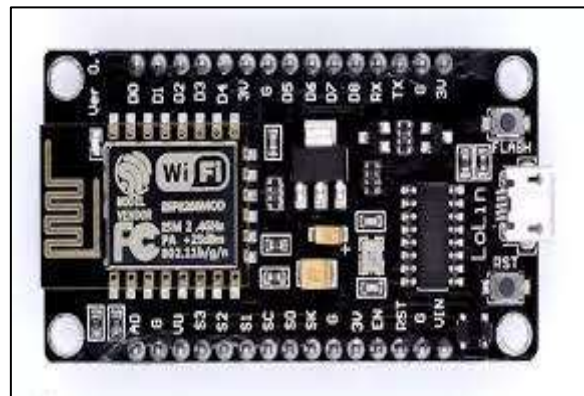


Fig. 1: Node MCU Esp 8266 Microcontroller

#### 2) Flex Sensor:

Flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually, the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to the amount of bend it is used as goniometer,

and often called flexible potentiometer. A flex sensor is a kind of sensor which is used to measure the amount of deflection otherwise bending. The designing of this sensor can be done by using materials like plastic and carbon. The carbon surface is arranged on a plastic strip as this strip is turned aside then the sensor's resistance will be changed. Thus, it is also named a bend sensor. As its varying resistance can be directly proportional to the quantity of turn thus it can also be employed like a goniometer.



Fig. 2: Flex Sensor

### 3) Servo motor:

Servo motor is an electrical device which can be used to rotate objects (like robotic arm) precisely. Servo motor consists of DC motor with error sensing negative feedback mechanism. This allows precise control over angular velocity and position of motor. In some cases, AC motors are used. It is a closed loop system where it uses negative feedback to control motion and final position of the shaft. It is not used for continuous rotation like conventional AC/DC motors. It has rotation angle that varies from 0° to 180°. It consists of DC motor, gear assembly and feedback control circuitry. PWM signal is used to control the servo motor. It is applied on control signal pin



Fig. 3: Servo Motor

### 4) Relay Module:

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit. Relay module is essentially a circuit board that houses one or more relays. These modules come in diverse shapes and sizes, with the most common configurations being rectangular boards containing 2, 4, or 8 relays. Each relay module is equipped with various

components such as indicator LEDs, protection diodes, transistors, and resistors.



Fig. 4: Relay Module

### B. System Architecture

The Smart Landslide Detection System is a Iot (Internet of things) based Project which include ESP8266 Microcontroller which are a control module and will play an important role in Project respectively. The project is divided into four modules, the hardware module includes a flex sensor, a servo motor, a relay module, a dc motor and a user interface. In Project the languages which are going to use will be embedded C Language and for website will be html and CSS language used. The flex sensor is detect landslide as like debris flow, rocks flow and detected landslide analog signal passes through to the Esp 8266 microcontroller. Then detected signal pass Esp 8266 to relay module. The relay module is working as on or off responses then signal pass the next to 2 access at the relay module first was the servo motor and second was the dc motor the servo motor is signal pass to their will be set 90° to perform the before landslide the stop vehicles on the road open or close road gates to avoid accidents and dc motor are set timer of open or close the protective gate of the village before detecting landslide. And also the notification to the peoples is living in village and the rescue teams will be notified before landslide. And also alert syren in their landslide areas. And The Web server module contains servers such as Web server and Web applications and is used to provide and notification and control of the both gates. also used Technology. MQTT (Message Queue Telemetry Transport) for send Message to the Server

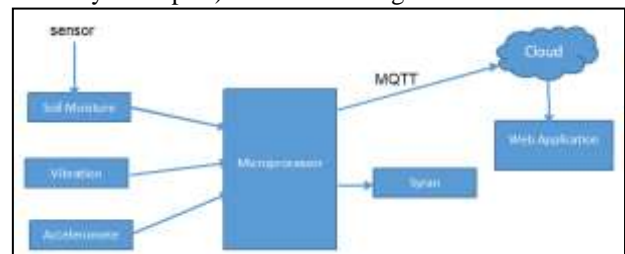


Fig. 5: Architecture

### IV. CONCLUSION

This study describes the real-world deployment of a wireless sensor network for landslide detection. WSN for Landslide. The proposed system collects data via a (wireless sensor network) and then communicates it, the system uses a wireless sensor node and Node MCU for efficient transport

of real-time data to the monitoring station. Advanced data processing is possible to the monitoring center's software and hardware. As a result of the analysis, residents in the area can be alerted landslide warnings and risk assessments.

*A. Future scope:*

The help of alarm system alert message can be sent which will eventually save lives and prevent damage to the cars, properties etc. Also after the data is received from hardware to the website using module the authority can act accordingly. The proposed system will not only help us to detect landslide but also to send a message at the concerned authority where other emergency messages also can be sent.

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