Wireless Sensor Network to Prevent Deforestation Using Node MCU

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Abstract
Forests are the most important wealth we have. Forest fires are dangerous and lead to massive destruction of environment. Huge numbers of trees have been lost because of forest fires across the world. Deforestation is one of the emerging and death provoking issue. Human is to principally fault for deforestation. The forest fires and deforestation have caused many deaths and extinction of habitats and our resources. This project shows an IoT based framework structure for identification of temperature and fire for preventing forest fires and for discovery of sound and plot for forestalling the cutting of trees as right on time as possible. In our proposed framework NodeMCU is interfaced with couple of sensors, buzzer and LCD. In the event that any disastrous occasions emerge, the framework consequently sends message to the receiver. The wireless sensor network is suitable network architecture for remotely monitoring or tracking applications in the environment.

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I.   INTRODUCTION

Deforestation means removal or destruction of trees. It is the cause of natural disasters caused by nature and the most important cause for deforestation is human appetite for money, acquiring land, business, industries and many. Illegal activities such as cutting of large trees for wood, like sandalwood for money happens even nowadays. For example, the cost of one Teak tree which is very much grown costly above ten thousand which is used for furniture. The trees are cut and sold illegal way. We are emerging such a system which can be used to limit wood trafficking and also to stop forest fires. The impartial of the scheme is to shape safe and protected forests to prevent smuggling and anti-social activities against unlawful cutting of the tress for Environment safety and pollution switch. Therefore, a system is developed. In this we use Nodemcu Wireless network to monitor trees using appropriate sensors which forms basically IOT. IOT stands for internet of things which means connecting physical things wirelessly over internet. IOT devices are used in our daily life to monitor and control the electrical and electronic systems used in buildings and homes.

II.   LITERATURE SURVEY

Naveen Raj et. al [1] proposes the IoT based Anti-Poaching Alarm System for Trees in framework. In that all the sensor hubs are control by the controller unit. Sensor information is prepared in the microcontroller and transfer it to the collector unit to recipient unit to make sure whether the woods fire or not. Use of tilt sensor is used to identify the tilting of a target object similar to a push button. Temperature sensor which has equipment which contains the thermometers, restriction temperature locators.

Smita Gaikwad et. al[2] proposed the Design of WSN Node For Protection Of Forest Trees Against Poaching Using MSP430.Wireless Sensor Networks (WSNs) innovation, which comprises of detecting burglary by checking the result delivered by the shifting of trees utilizing a 3-pivot accelerometer. A low power MSP430 microcontroller is utilized with RF modules.

Xhevahir Bajrami et. al[3] proposed a proficient way to deal with checking natural circumstances utilizing a remote sensor organization and NodeMCU. In this task they recommended a strategy to make a wireless sensor organization to really look at the ecological changes inside a lab. They utilized NodeMCU to communicate sensor values by means of Wi-Fi. The Web API is Used for Web Application. The cloud-based

data set is kept up with for putting away and breaking down the sensor values. The natural Fatalities were Shown by the mobile. The framework comprises of sensors for keeping away from the deforestation brought about by the cutting/falling of trees. It likewise utilizes low power msp430 and zigbee modules alongside RF modules for significant distance inclusion.

III.   PURPOSE

The degradation of forest is a serious problem that needs to be overcome in order to preserve its natural forest. Therefore, there is a need to constantly monitor the conditions inside a forest in order to aid a decision support system. A wireless sensor Network is capable of doing this at a relatively cheaper price than aerial or satellite imaging techniques. We live in the world of technology where it is advancing at a very faster rate. Rather than invention of new products the use of existing technology in a better way can be done. To solve many current problems in particular in this project for protection and prevention of many important trees use of IOT has done. Teak trees are very much used for furniture and other products. The cost of one tree costs not less than fifteen thousand. So, by use of existing technology to save each tree is possible when it has so much important. Also forest fires can be detected early and can be stopped. We have the technology but efficient use of it should be done. This project uses wireless sensor network to detect illegal cutting of trees and forest fires. When tree falls down it can be detected by tilt sensor and catches fire can be detected by fire sensor and various other aspects can be monitored with the use of available sensors. Now Cameras can also be used with this but requires dedicated wired network, more energy and satellite 3 can also be used but the wireless network we used has its own significance because it consumes less power when compared to others and helps early detection.

IV.   CONSTRUCTIONAL DETAILS

1. NodeMCU ESP8266:

NodeMCU is a Wi-Fi (Wireless fidelity) System On Chip (SOC) delivered by Espress if Systems. It depends on the ESP8266 - 12E Wi-Fi module. It very well may be modified straightforwardly through the Universal Serial Bus (USB) port utilizing the Arduino Integrated Development Environment (IDE). It very well may be utilized as a passageway and additionally, station, have a web worker or associate with the web to bring or transfer information. The prototyping hardware typically used is a circuit board functioning as a Dual In-Line Package (DIP) which integrates a USB controller with board containing the MCU.

2. Gas Sensor:

MQ gas sensors are used for detecting various gases from that MQ2 or 9 can be used to detect forest fire. Various gas sensors are available for detecting different types of gases from them MQ 9 is used in the project. Metal Oxide based gas Sensor, Optical gas Sensor, Electrochemical gas Sensor, Capacitance-based gas Sensor and Calorimetric gas Sensor are types of gas sensors.

3. Tilt Sensor:

TILT SENSOR MODULE can be used for knowing whether tree is upright or fallen down. Although they should be available in various types their basic function remains the same. Detecting the plane shift from horizontal to vertical, then sent of a signal when it happens. Small Planar movements are known but here we are going to discuss about simple contact type TILT SENSOR module. SW-520D TILT SENSOR MODULE is used for the unit. It has Vcc for +5 voltages, ground and one digital pin for digital value.

4. LCD Display Module:

The term LCD stands for Liquid Crystal Display. It is a type of electronic display module which is used in a wide range of applications like various circuits \& devices i.e., mobile phones, computers, TV sets, etc. These types of displays are mainly used for multi-segment LEDs and seven segments. Results are displayed on LCD.

V.   WORKING

Use of internet of thing (IOT) is of main importance in this project. For this purpose, we use Nodemcu Esp8266.It has onboard 802.11b/g/n HT40 Wi-Fi transceiver. This is used for wireless communication. Nodemcu can not only connect to a Wi-Fi network and interact with the Internet, but it can also set up a network of its own, allowing other devices to connect directly to it. This makes the ESP8266 NodeMCU even more versatile. I.e. For communication Nodemcu can be used as Access point (Hotspot) you can be connected to the ESP8266 using any device with Wi-Fi capabilities without the need to connect to your router. IN station mode (client) it is used for connecting to nearby access point like we use Wi-Fi in mobiles. Smoke sensor, Tilt sensor are interfaced with Nodemcu and this makes one unit. It is attached to each tree that we want to monitor. Like these individual units communicate information using wireless communication protocol. Tilt sensor (SW 520D)

can detect horizontal to vertical or vice versa positional shift. With this we can determine whether a tree of our interest has fallen down or not. Smoke sensor is used for detecting forest fires. These two sensors send data to nodemcu and nodemcu sends data wirelessly to Web where data can be monitored. Any change in desired data value can be known and action can be taken. Coding of Nodemcu can be done with the help of Aurdino Ide. Appropriate code for transmitter and receiver will be uploaded to each unit and program will be stored in MCU's.
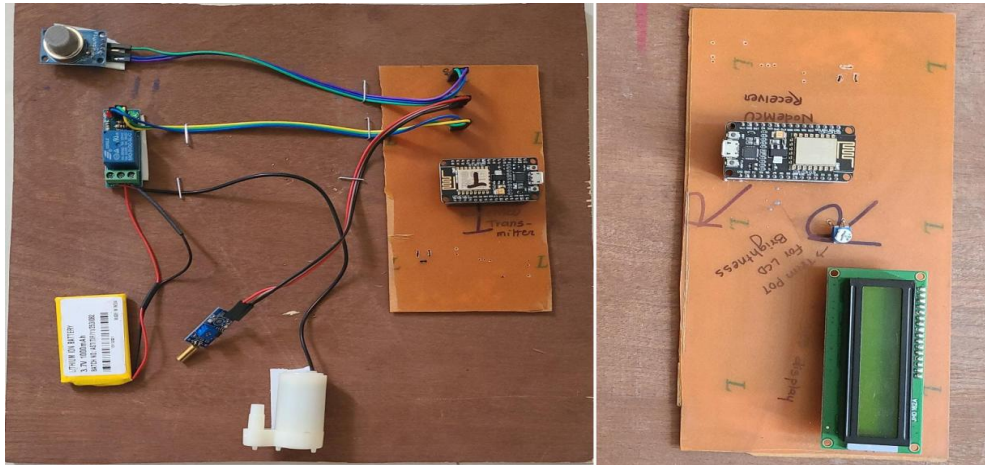
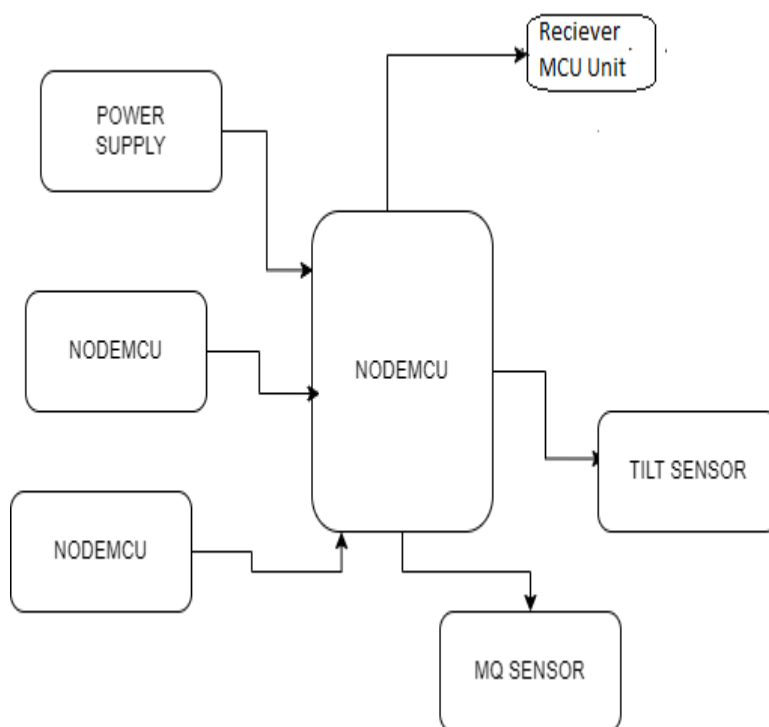**Fig. 1: Transmitter and Receiver(prototype) for detection of fire and tree fall**
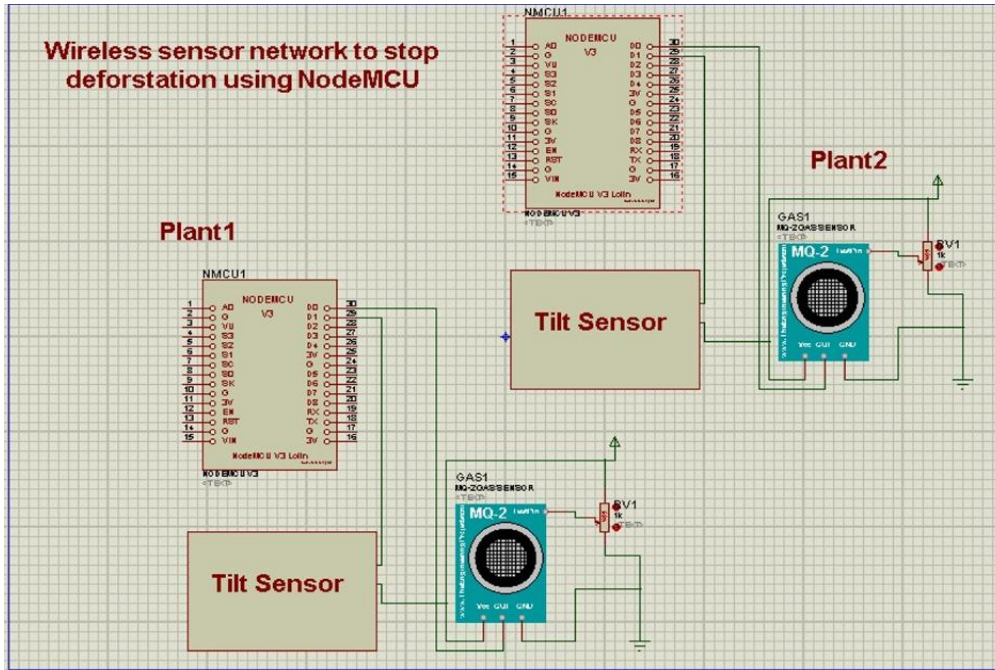

Fig. 2: Block Diagram

Fig. 3: Circuit Diagram

VI.   RESULT AND DISCUSSION

There are two cases here first when the tree falls, tilt sensor which is in vertical direction becomes horizontal in this case MCU computes the data and decides whether tree has fell or not and then sends the data to receiver. Second case if forest fire occurs the MQ 9 gas sensor monitors the gas from fire and sends digital value to microcontroller. If the monitored value reaches a threshold value it sends message to receiver that fire is detected and immediately MCU turn on the water pump or sprayer to stop fire. Results for both cases are shown below.
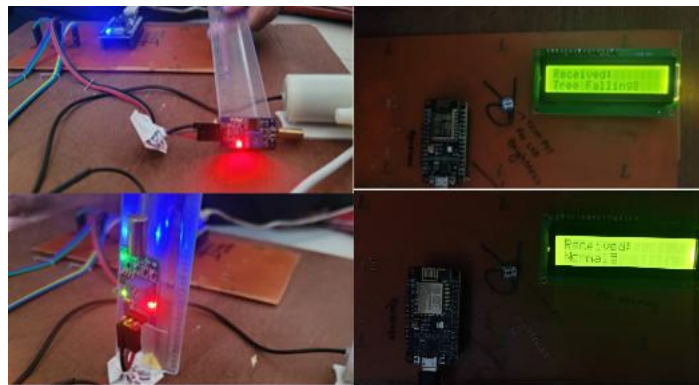

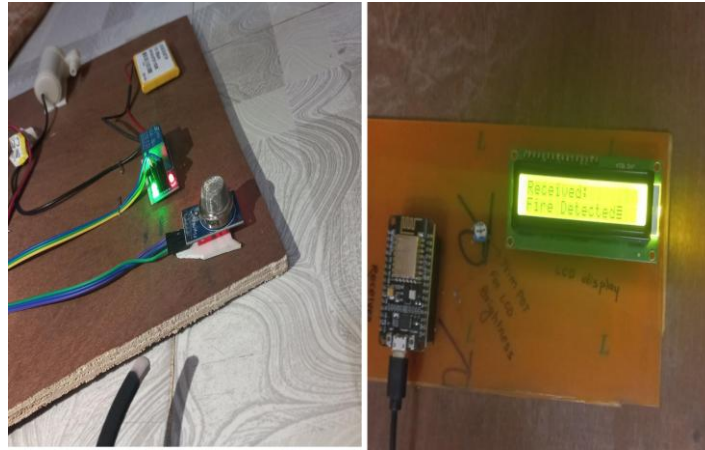**Fig 4: Prototype showing results for tree fall or nothing**

Fig 5: Prototype model showing results for Smoke detection.

VII. CONCLUSION

In this Project, it has been demonstrated that framework safeguards the private cultivating spot, for example, teak cultivating, sandalwood cultivating and it diminishes the human gatekeeper, continuously watching the region for long time. The framework includes straightforward sensors like, Flame sensor and Tilt sensor. These sensor information are shipped off fundamental microcontroller from each and every hub. The idea of IOT is executed to make the checking productive. The customary updates can be given to the clients through Wi-Fi module (ESP8266). Then, at that point, the cautions can be shipped off the clients remotely to the beneficiary when dubious action is advised. The fundamental adage of this task is to give cost effective and dependable checking of trees with assistance of NodeMCU which gives own Wi-Fi administration in view of remote innovation however there is no organization association in the backwoods.

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