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Devising A WSN to Protect Forest Trees against Deforestation

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ABSTRACT: Smuggling/theft of most important trees such as sandal wood in forests, poses a serious threat to forest resources, causes significant economic damage and ultimately has quite a devastating effect on the environment all over the world. This paper proposes an anti-poaching system employing WSN technology, which is capable of detecting theft by monitoring the tilt axis produced by the cutting of trees/branches using a tilt sensor. A temperature sensor is also attached to detect the occurrence of forest fire.WSN is a widely used technology in remote monitoring applications. The embedded system architecture and the hardware/software designs are described in detail. The sensor data is collected and simulated using Arduino IDE.The proposed system uses a controller, which comprises a Open-source electronic prototyping platform (Arduino) and a Global System for Mobile Communication modem to coordinate the operation of a network of radio frequency transmission and reception capable smoke detectors, alarms, the main source of power to the building.

KEYWORDS: sensors, trees, anti-poaching, WSN, tilt, temperature, arduino

I. INTRODUCTION

Poaching of trees is an important issue that is faced globally. In India itself, more than 1 Lakh metric tons of trees are poached every year. There is a serious need for monitoring our forests and the current monitoring systems in place are mostly manual. It is practically very difficult to manually keep a check on the large forest areas which leads to illegal trade of trees. Sandalwood and red sander trees are among those that are most prone to be poached. They are known for their medicinal properties, which is why they are in high demand. Many laws have been laid down by the Government of India to penalize those that are caught smuggling trees. This by itself is not enough and should go hand in hand with better systems to detect and alert when any such activity occurs. This project consists of a series of sensors to measure parameters involved in Forest fire. These sensors are connected to a microcontroller which has an inbuilt Wi-Fi module that can communicate to the cloud and send data on a regular basis. This data is monitored in the cloud and for any detection of flame a message is sent to the mobile.

II. EXISTING SYSTEM

Plundering of sandalwood trees is one of the key challenges faced by the department. The Forest department has found an innovative way now to protect these – steel amours. “Before we put up this mesh, we lost some trees to the thieves. They are very quick, they cut down the trees and take them away in a few minutes. After we put up the steel cover, Some thieves once again tried to cut the trees even after the steel mesh had been installed”.

Another existing system consists of hiring security personnel for monitoring the entire area for suspicious activity. However due to physical limitations in humans it is hard to monitor the entire area continuously. Thus hiring of guards proves unreliable and inadequate. Another existing system is the installation of CCTV cameras for covering large areas proves very costly and is hard to implement. Also, the latest trend for protection of trees is to tag an RF-ID to trees just like tagging an animal for knowing the whereabouts of a particular tree.

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III. LITERATURE SURVEY

PAPER 1: DESIGN OF WIRELESS SENSOR NETWORK NODE ON ZIGBEE FOR TEMPERATURE MONITORING.

AUTHORS: SRIDEVI VEERASINGAM, SAURABH KARODI, SAPNA SHUKLA

ABSTRACT:

In this paper a portable wireless data logging system for temperature monitoring in real time process dynamics. Process variables (like temperature, pressure, flow, level) vary with time in certain applications and these variations should be recorded so that a control action can take place at a defined set point. This paper proposes a 8-bit embedded platform for a temperature sensor node having a network interface using the 802.15.4 ZigBee protocol, that is a wireless technology developed as an open global standard to address the low-cost, low-power wireless sensor networks. The wireless temperature sensor node senses and transmits the variations in the local temperature to the central computing unit placed within the range. The central base station receives the data and stores it in the file and plots the variations simultaneously.

PAPER 2: REAL-TIME WIRELESS VIBRATION MONITORING SYSTEM USING LABVIEW

AUTHORS: MANISH Y. UPADHYE, P. B. BOROLE, ASHOK K. SHARMA

ABSTRACT:

Vibration analysis provides relevant information about abnormal working conditions of machine parts. Vibration measurement is a prerequisite for vibration analysis which is used for condition monitoring of machinery. Also, wireless vibration monitoring has many advantages over wired monitoring.

PAPER 3: A ZIGBEE-BASED WIRELESS SENSOR NETWORK NODE FOR ULTRAVIOLET DETECTION OF FLAME

AUTHORS: PEDRO CHEONG, KA-FAI CHANG, YING-HOI LAI

ABSTRACT:

This paper describes a ZigBee-based wireless sensor network node for the ultraviolet (UV) detection of flame. The sensor node is composed of a ZnSSe UV photodetector, a current-sensitive front end including a high-gain current-to-voltage amplifier with 120 dB and a logarithm converter, and a transceiver operated at a 2.4-GHz industrial, scientific, and medical band. A passive photodetector is designed to have a cutoff at 360 nm and convert the UV emission of flame into pico amperes. Including mixed signal processing and ZigBee transmission, the speed of flame detection is as fast as 70 ms. The sensor node consumes only an average of 2.3 mW from a 3.3-V supply. The performance of a prototype sensor node was verified when the luminous flame was imaged onto the sensor node with different angles ranging from -30° to 30° and distances of 0.1, 0.2, and 0.3 m enabling effective fire safety applications.

IV. PROPOSED SYSTEM

We are developing such a system which can be used to restrict this smuggling and forest fire monitoring system. Every tree will be equipped with one small electronics unit which consists of a Microcontroller, tilt sensor, temperature sensor and IOT module. In a big forest, each tree will have a sensor unit which is fitted on the stem of the tree and will Communicate with their server unit. The communication between the tree unit and server unit takes place by using an IOT module. Tree cutting will be detected by MEMS. Once the tree has fallen, it sends the signal to the server. Temperature sensor value crosses the threshold level and it will send the alert signal to the server . In this all status updated to IOT webpage and displayed on LCD.

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BLOCK DIAGRAM:

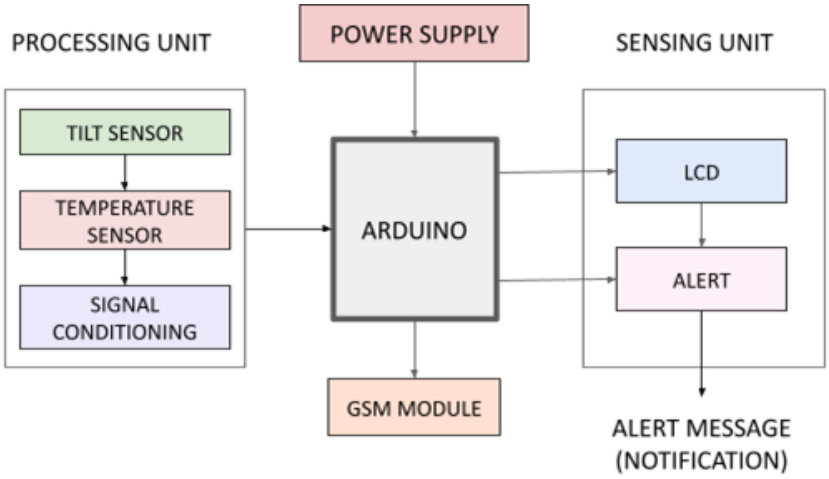

Fig 1. Block Diagram of Proposed System

V. COMPONENTS

Microcontroller	ATMega328P (Arduino UNO)
Operating Voltage	5V
Input Voltage (Recommended)	7-12V
Input Voltage (Limit)	6-20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	256 KB of which 8KB used by bootloader
SRAM	8KB
EEPROM	4KB
Lock Speed	16MHz

Table 1. List of Components

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VI. WORKING AND RESULTS

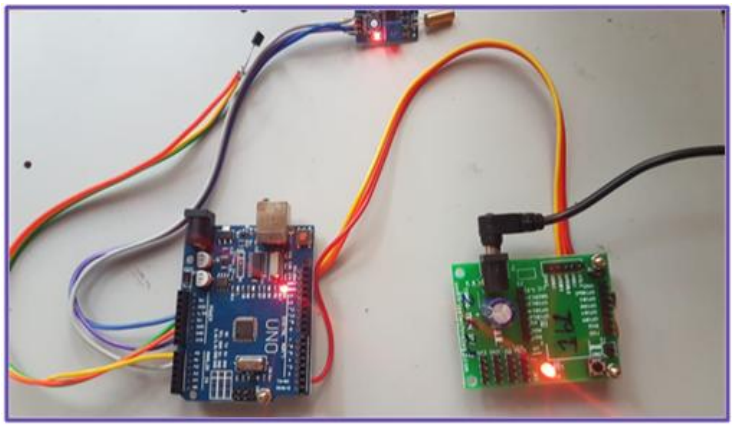
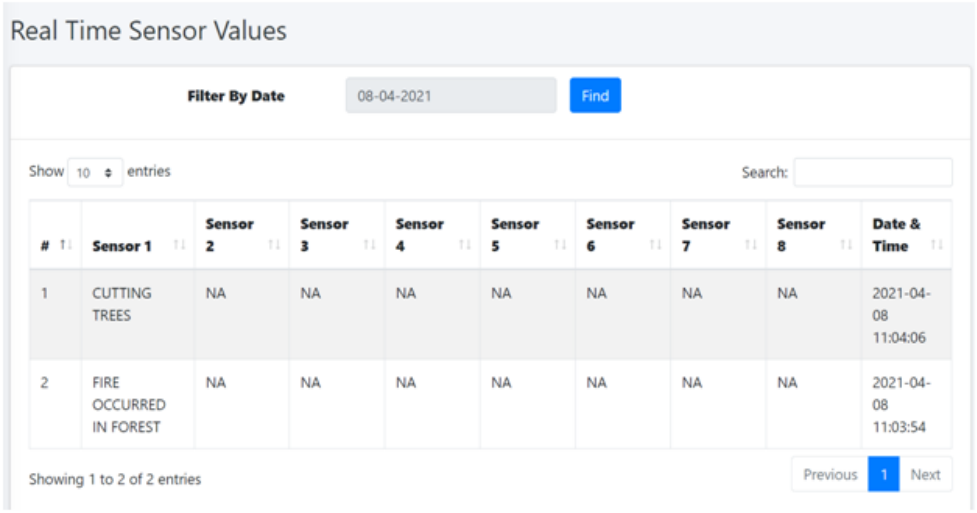


Fig 1. Circuit of the Proposed System



Real Time Sensor Values

Filter By Date 08-04-2021 Find

Show 10 entries Search:

#	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8	Date & Time
1	CUTTING TREES	NA	NA	NA	NA	NA	NA	NA	2021-04-08 11:04:06
2	FIRE OCCURRED IN FOREST	NA	NA	NA	NA	NA	NA	NA	2021-04-08 11:03:54

Showing 1 to 2 of 2 entries Previous 1 Next

Fig 2. Sample Cloud Data Output

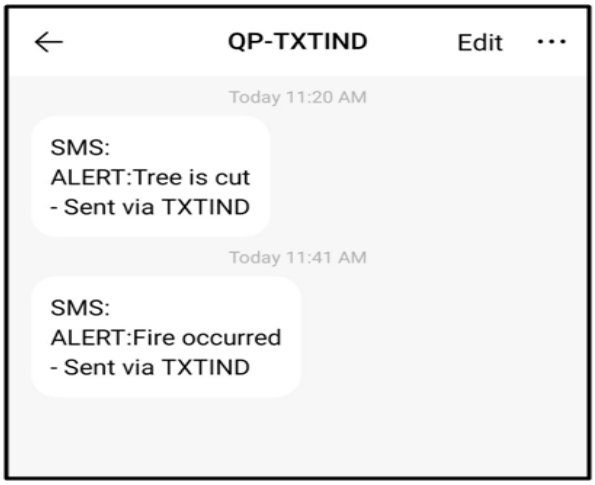


Fig 3. Sample SMS Output

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VII. Conclusion

These systems provide useful solutions while making the forest monitoring system by using IOT. The cost of the system is less and it gives a reliable output as compared to other systems which is useful for forest to ensure safety and it is mainly implemented on a long scale for better results and problem free solutions in the future.

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