Conservation of trees in forest based on IOT

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***Abstract*- Tree conservation and wildlife conservation (Bio-diversity conservation) has become an important practice due to the negative aspect such as smuggling of trees, global warming, deforestation, forest fires, etc. From the few years we are been reading in the news papers about the cutting and smuggling of the trees like teak, sandal, oak, etc. These trees are very costly and less obtainable in the market.Even in the name of development many trees are been cutting unnecessarily due to the lack of coordination between the departments. In the many cases in the forest department could not able to track the trees that have been cut. As a result of these many species of trees are in the endangered situation and even few species are readily extinct. To avoid the smuggling of trees and to save a system "conservation trees in the forest using IOT". The system is based on the internet of things in which the different sensors such as temperature sensor, smoke sensor, vibration sensor, GPS are been interfaced with the microcontroller connecting them to internet, monitors and collection of the data into the cloud based platforms such as THINGSPEAK, cayenne and alerting technologies in case of any illegal activities are been carried out by intruders. The real time data is been uploaded from tree unit to the server unit using internet. This ensures data security and provides assurance for privacy.**

Index Terms- IOT, GPS, THINGSPEAK.

I. INTRODUCTION

Illegal cutting of trees is the major problem in the world,with studies indicating that more than 100 million cubic meter of timber is been cut every year . The percentage of amazon rain forests in the year 1975 was 22% but in the year 2015 was reduced upto 8% contributes upto 20% of global carbon di oxide emissions.And due to this issue few of the tree species are becoming extinct.

To solve these issues of anti-poaching Government of india has recruited ,trained and deployed the anti-poaching watchers across the forests.Even in the 12th Five year plan (2012-2017)had provided some incentives for eradicating illegal poaching activities but poachers are still able to continue their thrive.By 2020 almost 20 million sensors will be connected to the internet that indicates the growth of IOT .This is the fast growing effective technology for "implementation of real time ,Wireless sensor network and data collection system" which will be advanced and a cheaper modern technology to make monitoring more robust ,effective and feasible.

II. LITERATURE SURVEY

Hitachi India, a subsidiary of Hitachi, Ltd., and Institute of Wood Science and Technology (IWST), an institute under Indian Council for Forestry Research and Education under Ministry of Environment, Forest and Climate Change, Govt. of India have collaborated to implement a SMART Forest initiative.

[1] Proposed 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 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 plotting the variations simultaneously.

[2] Vibration analysis provides relevant information about abnormal working condition of machine parts. Vibration measurement is prerequisite for vibration analysis which is used for condition monitoring of machinery. Also, wireless vibration monitoring has many advantages over wired monitoring. In this project, implementation of a reliable and low cost wireless vibration monitoring system. Vibration measurement has been done using 3- Axis digital output MEMS Accelerometer sensor. This sensor can sense vibrations in the range 0.0156g to 8g where, 1g is 9.81m/s2. Accelerometer Sensor is interfaced with Arduino-derived microcontroller board having Atmel's AT-mega328p microcontroller. The implemented system uses ZigBee communication protocol i.e. standard IEEE 802.15.4, for wireless communication between Sensor Unit and Vibration Monitoring Unit. The wireless communication has been done using XBee RF modules. National Instruments Lab VIEW software has been used for development of graphical user interface, data-logging and alarm indication on the PC. Experimental results show continuous real-time monitoring of machine's vibrations on charts. These results, along with data-log file have been used for vibration analysis. This analysis is used to ensure safe working condition of machinery and used in predictive maintenance.

[3] In recent years poaching incidents has been massively increased encompass slaughtering of endangered species in Tanzania and Africa in totality. Different initiatives have been taken world widely including establishment of

International Anti-Poaching foundation (IAPF). Tanzania in particular has taken several initiatives on the matter at different time including sending her own military army across the borders of National parks as an attempt to eradicate poaching activities. However poachers are still continued to put a bullet on the heads of these species of monumental importance. The main idea presented in this project involve employing a modern and a sophisticated technology in which poachers will be left behind and being netted easily there by eliminating Poaching activities. The idea utilize animals themselves with sensors as mobile biological sensors (MBS) mounted with sensor fusion (having visual, infrared camera and GPS) that transmits the location of MBS, access points for wireless communication and a central computer system which classifies animal actions. The system propose three different actions of responses, firstly: access points continuously receive data about animals‟ location using GPS at certain time intervals and the gathered data is then classified and checked to see if there is a sudden movement (panic) of the animal groups: this action is called animal behavior classification (ABC). The second action can be called visualization where by different image processing techniques of the obtained images surrounding an animal group are performed and therefore provide an ample assistance in understanding what makes sudden movement of the anima group. The last action is to send messages to the game ranger's cellular phones about the panic of animals and the location through GSM network.

[4] Smuggling of the trees such as sandal, Sagwan etc. is one of the major national issue. These trees are very expensive and less obtainable in the market. To avoid such type of smuggling and to save the forests around the globe Some preventive systems need to be developed. In this project we are proposing a system based on Internet of things which can be used to detect the illegal cutting of tree and restrict the tree smuggling. This system can be used by government to protect the trees.

Smuggling of sandalwood has made financial and peace issues in regions circumscribing the condition of various states in India. To maintain a strategic distance from such kind of carrying and to spare the backwoods around the world some preventive frameworks should be created. We are framing a framework which can be utilized to confine this smuggling. In this project we are proposing a system based on Internet of things that can be used to avoid the smuggling of the trees which would in turn stop the de-forestation and uphold the Environmental stability, which would help to solve one of the issues with the Global

Warming. Each tree is having with one electronic division, which consists of Micro Controller, Flex Sensor, accelerometer sensor, TEMP sensor, and GSM module. Tree cutting will be detected by accelerometer sensor .Communication between the trees and server will be done by GSM modules.

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III. Problem Statement

Design and Implementation of a system with the help of Arduino uno that's interfaced with varied sensors (Temperature, smoke, PIR, and Vibration). Real time info is to be collected by all the sensors and might be fetched by information superhighway Server.
This info is also accessed by the user through an internet thingspeak application, a free open source iot application for data collection ,data aggregation and analyzing the data.

METHODOLOGY

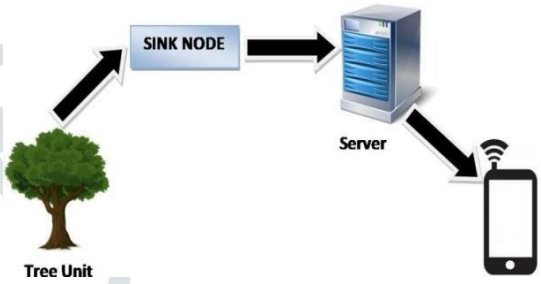


Fig 1: Block diagram

BLOCK DIAGRAM

The system consisting of 2 units:

1. Tree unit
2. Server unit

Tree unit:

The Tree unit would be the essential unit for the execution of the framework. This unit would comprise of three sensors to give the data of getting Cut Down the trees, Damage with flame, and so forth. The tree unit would be the essential unit for the execution of the framework. Figure 2 shows the tree unit

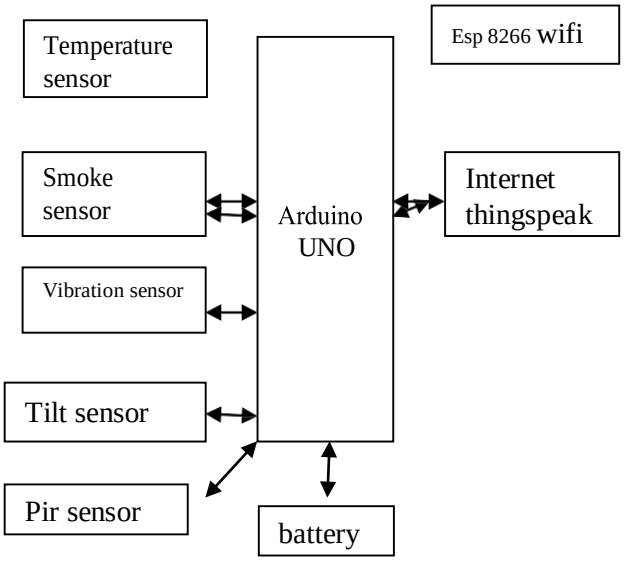


Fig.2:Block diagram of tree unit

Hardware components

Arduino uno:

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

PIR Motion Sensor:

Every object emits heat in the form of radiation when their temperatures are above the absolute zero. They actually work by detecting the energy given off with the aid of different gadgets. PIR sensors don't hit upon "warmness"; as an alternative, they discover the infrared radiation mediated by an object. The PIR sensors have various slots in it. Per slot is manufactured from a specific concrete that is perceptive to infrared radiation. While the sensor is vacant or inactive, per slot measures the equal amount of infrared radiation, which is the effective amount radiated from the room or partitions or exterior. When a warmish object like a mortal or an animal passes through it, it first pick off one half of the PIR sensor that results in a positive differential change between the two halves. When the object comes out of the sensing area, the opposite occurs, wherein the given sensor produces a negative differential alternate. These exchanged pulsations are then identified and realised.

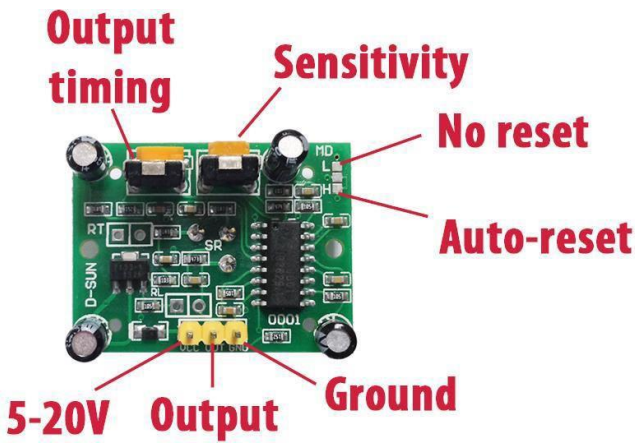


Fig.3:Block diagram of tree unit

Temperature sensor:

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in ºC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With **LM35**, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 ºC temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every ºC rise/fall in ambient temperature, *i.e.*, its scale factor is 0.01V/ ºC.

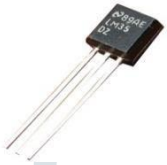
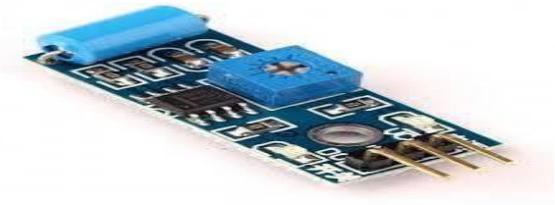


Fig.4: Temperature sensor LM-35

Vibration sensor:

Vibration module based on the vibration sensor SW-420 and Comparator LM393 to detect if there is any vibration that beyond the threshold. The threshold can be adjusted by the on-board potentiometer. Used for variety of shocks triggering, theft alarm, smart car, an earthquake alarm, motorcycle alarm.Rated



voltage: 3.3V-5V Output: digital switching output (0 and 1)

Fig.5:Vibration sensor

Smoke Sensor:

MQ2 is one of the commonly used gas sensors in MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor also known as Chemiresistors, as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material. Using a simple voltage divider network, concentrations of gas can be detected.MQ2 Gas sensor works on 5V DC and draws around 800mW.It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbo n Monoxide concentrations anywhere from 200 to 10000ppm.

Fig.6)Smoke sensor MQ-2

Battery

12v battery is used

ESP8266 is Wi-Fi

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications.

Fig.7:ESP 8266 wifi module

It employs a 32-bit RISC CPU based on the Tensilica Xtensa L106 running at 80 MHz (or overclocked to 160 MHz). It has a 64 KB boot ROM, 64 KB instruction RAM and 96 KB data RAM. External flash memory can be accessed through SPI.

ESP8266 module is low cost standalone wireless transceiver that can be used for end-point IoT

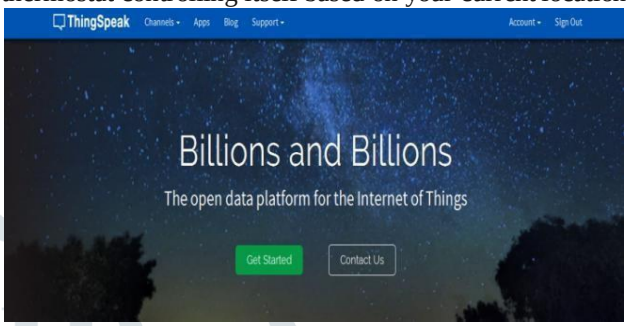
developments.

Working

Every tree will be equipped with one small microcontroller ,an array of sensors (temperature ,smoke, vibration, pir) module .The data that is read by the sensors is sent to the micro controller and through esp 8266 wifi module and channel code of thingspeak api the data is been sent into the Thingspeak channel while creating the channel the latitude and longitude location of the tree is been set it helps in the finding the location of the tree.the data collection and analysis is made at the server end GUI. If there is any problem then necessary action is taken.

ThingSpeak:

Open source data platform and API for the Internet of Things provides access to a broad kind of embedded devices and web services. ThingSpeak is associated in nursing open info platform and API for the IoT that allows you to assemble, store, analyze, visualize, and act on info from sensors or actuators, like Arduino, Raspberry Pi, and different hardware. For example, with ThingSpeak you will be able to manufacture sensor logging apps, location-tracking apps, and a social network of things with regular status updates in such a way that you may have your home thermostat controlling itself based on your current location



Channel Creation

ThingSpeak channels stores the data sent from sensors and devices. We have created our channel as IoT

Fig. 8: Channel Creation

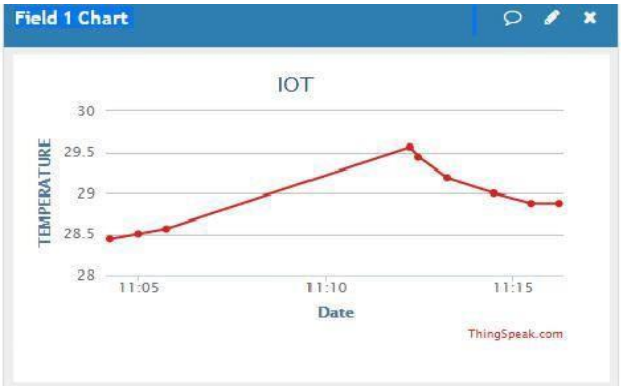
API Keys

API keys enable you to scratch info to a channel or read info from a private channel. API keys are self-generated when you made a fresh channel.

Fig. 9: API Keys

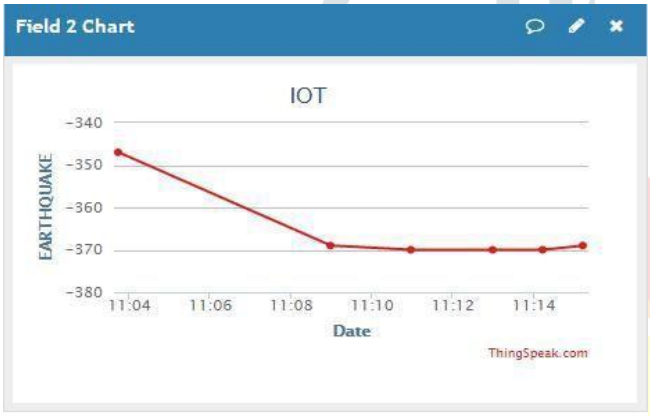
User observations and analysis

Fig 6.1:For Temperature Sensor



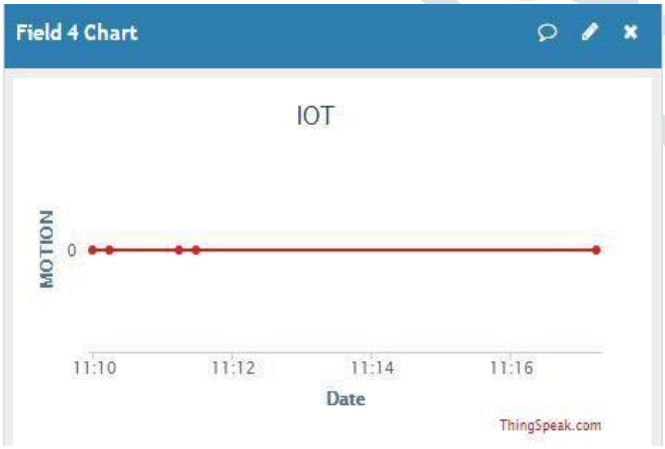
Temperature values are continuously monitored and been uploaded into thingspeak channel field 1

Fig 6.2: For accelerometer



vibration values are continuously monitored and been uploaded into thingspeak channel field 2

Fig 6.3:For Motion Sensor

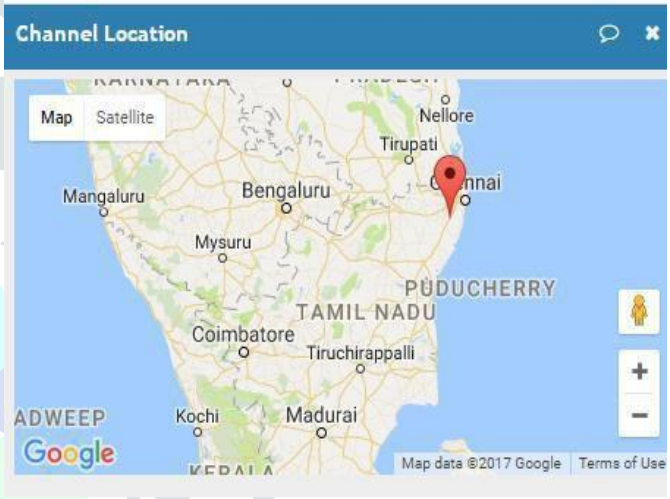


Pir sensor values are continuously monitored and been uploaded into thingspeak channel field 4

Fig 6.4:For Smoke Sensor

Smoke values are continuously monitored and been uploaded into thingspeak channel field 3

Fig 6.5:For Channel Location



Location of the channel can be identified easily

Conclusion

An IOT based tree protection system has been proposed in this work to endorse the concept of smart forests. The proposed system involves Arduino Uno and five sensors. The parameters monitoring is done using five sensors. The readings of sensors are successfully uploaded to ThingSpeak. Hence, before the occurrence of disaster, alert is sent to forest officer or users via Gmail and SMS in the group of Telegram app. Disasters like extreme temperature and fire detected can be controlled on time.

The proposed work proves to be a breakthrough in disaster management as it can be deployed in the smart forests with less budget requirements. Future work includes improving dynamic adaptation of modules to changing conditions, development of a dedicated protocol for disaster management, big data analysis on the obtained set of results. These results could be used for the prediction of occurrence of disastrous events inForests.

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