

# Anti-Poaching Alarm System For Trees In Forest

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**Abstract** -It is commonly read in the Newspaper about the Smuggling of the Trees such as Sandal, Teaketc which is taking place throughout the world. Cost of such trees are very high as well as they are less available in the world. Since the demands for these trees are more. Such trees are used in the medical sciences as well as for making cosmetics. By selling the woods of such trees, a huge amount can be earned and Because of huge amount of money involved in selling of such tree woods lots of incidents are happening such as cutting of trees and their smuggling. Smuggling of such trees which is considered to be an illegal act. In order to restrict the smuggling of trees and to save the trees some preventive measures need to be deployed. We are developing such a system which can be used to restrict smuggling of trees. The main objective of this system is to restrict the smuggling and to save the valuable trees so to maintain balanced eco-system by preventing deforestation. The system also uses a microcontroller (board) on which various Sensors are embedded and which are controlled through IOT. These sensors monitors and controls the parameters like tilting, burning and cutting of the trees, and these are accessed on Android App installed in Android Smart phone

**Key Words:** Accelerometer( Tilt Sensor), Fire Sensor, Ultrasonic Sensor, Node MCU, Relay, Waterpump, Buzzer .

## 1.INTRODUCTION

A Poaching isn't identified with India just, China, Australia and African nations are additionally battling with same issue. Indian sandalwood costs 12000 to 13000 INR for every kg [1] though in worldwide market Red Sanders costs INR 10 center for each ton. The Indian sandalwood tree has turned out to be uncommon as of late, trying to control its conceivable misfortune, the Indian government is attempting to restrict the exportation of sandalwood [2]. For an individual, most extreme admissible buy limit isn't to surpass 3.8kg according to Govt. On the off chance that the tree is as of now government controlled, at that point its evacuation is denied whether on private or sanctuary grounds until the tree is thirty years of age. Sneaking of sandalwood has made financial and peace issues in territories circumscribing in India. The fundamental goal of this undertaking is to build up a framework which can be utilized to confine sneaking of sandalwood trees.

## 2.PROPOSED SYSTEM AND METHODOLOGY



In this system we have used multiple sensors like pH sensor, fire sensor, accelerometer, ultrasonic sensor.

### Description-

- This project uses NodeMCU as the microcontroller. It has various sensors for controlling the system.
- A flame sensor is used to detect forest fires.
- An ultrasonic sensor is used to detect intrusion activities in forest.
- An accelerometer checks the value of initial tree position and final tree position in case of fall.
- A pH sensor detects changes in soil pH.
- The device would be powered by USB charger as well as it can be operated using power banks or any other power source.
- A water pump is used to water during forest fire.
- The android app for the Forest Intruder Alert System will have these data.
- The android app is developed on MIT App Inventor 2.
- If any of the value goes beyond threshold value then the change is sent to ThingSpeak and an alert is given.
- The ThingSpeak server then sends data to app.
- The app continuously shows readings of the sensor

### 3.LITERATURE SURVEY

This paper [1] proposes a microcontroller based anti-poaching system employing WSN technology, and MEMS accelerometer. WSN is widely used technology in remote monitoring applications. The micro-controller that is used over here is PIC16F877A. MEMS accelerometer senses the tilt of the tree. Sound sensor combines a microphone and some processing circuitry. It Capture sound from silence and outputs digital trigger signal. Fire sensor is used to detect the rise in temperature. Smoke sensor detects the lubricant gases in the surrounding environment. GPS gives the latitude, longitude and altitude values. For the purpose of serial communication UART is used. Internet of Things is used to transfer data without requiring human to human or computer interaction and objects, animals or people are provided with unique identifiers.

The main objective here [2] is to build a protection system using Bluetooth 4.0 and GSM to alert the concerned authorities in case of sandalwood robbery. IEEE standard for Bluetooth is 802.15.1. Technology called frequency-hopping spread spectrum is used in Bluetooth, where it makes use of 79 channels to transfer the packets. Version 4.0 of Bluetooth is called smart Bluetooth because it includes basic Bluetooth, low energy and high speed protocols. The protection mechanism proposed in this paper can be implemented using either cluster or distributed architecture. Cluster architecture is a master slave architecture in which each tree is treated as slave node. Whereas distributed architecture is collection of clusters in which for a particular master node, other master node acts as slave. This protection model consists of two parts; protection circuit which serves the function of slave node and mobile application which is installed in every master node and monitors all the slave nodes.

In this paper [3], a low power MSP430 microcontroller along with RF modules is being used. WSN is widely cast-off technology in monitoring and controlling the remote applications. The design that is discussed over here has a portable wireless sensor node which is the part of a Wireless Sensor Networks. It will be attached on trunk of each tree, and is used to identify robbery and also sends signals to Central Base Station. The system is designed to consume low power, and it works better with rechargeable batteries which can charge using natural solar system. A solar panel taken in the system is used for recharging node's batteries. The cluster of a node is around 5-10 trees. This can be formed into a cluster with a master node having extra properties and to communicate with central base station. The location of central base station is at the entrance of the forest which will communicate with node through RF network. The designed network will follow Star topology.

This paper [4] discusses the application of machine learning to prevent smuggling of trees. Inception-V3 model is the pretrained convolutional neural network used in the proposed system for training the system. System applies previous learning experiences to perform present or future classifications. The Application uses Infrared cameras to capture images of objects near the tree, captured images are processed to obtain high resolution images from low

resolution images. The processed images are next sent to pretrained inception model for classification of objects in the image. On the basis of resemblance of classified images with bottlenecks probability of finding an intruder is calculated. Hence on detecting any abnormal value of probability, an intimation in the form of message is sent to the concerned authority.

The suggested system over here [5] consists of tree unit and main server unit. Each tree has a micro controller, Flex sensor, Accelerometer, temperature sensor, Zigbee and GSM module. The cutting down of tree is sensed by flex sensor and accelerometer. Tree unit gives the information about cutting down of trees when it catches fire and consists of three sensors accelerometer sensor, flex sensor and temperature sensor. There are several tree units and tree unit 1 is responsible to host the information from the multiple tree units. Each tree unit consists of ZigBee module and controller is accountable for data transmission from primary stage to final stage. Main server unit is responsible for user interface and displaying the data that was transmitted from stage 1. Once the base station is modified, the authorized person takes action accordingly..

### 4.HARDWARE USED

#### a) Accelerometer:-

An accelerometer is an electromechanical device which is used to measure acceleration forces and proper acceleration. Such forces could be static. Acceleration gives measurement of the change in velocity. sensor's output signal specifications supported the level of acceleration and Which is typically specified in  $\pm g$ . This is the greatest amount of acceleration, the part of acceleration can measure and accurately represent as an output. For example, the output of a  $\pm 3g$ . Most of the cases, accelerometer is linear with acceleration up to  $\pm 3g$ . If it is accelerated at  $4g$ , then the output may rail.

#### Features:

It has complete 3-axis sensing

It can measure the static acceleration of gravity in tilt sensing applications, as well as dynamic acceleration and we get result from motion, shock, or vibration.

It is Small and thin in size.

And it has low-profile package.

It is Low power - 350  $\mu A$  (typical)

it provides Single-supply operation upto

1.8 V to 3.6 V. it has Excellent temperature stability and BW adjustment with a single capacitor per axis.

**b) Ultrasonic Sensor-**

Ultrasonic Ranging Module HC - SR04

**features:**

Ultrasonic ranging module HC - SR04 . These modules includes ultrasonic transmitters, receiver and control circuit.

The basic principle of work:

- (1) they Using IO trigger for at least 10us high level signal,
- (2) The Module automatically sends eight 40 kHz and it detect whether there is a pulse signal back.
- (3) IF the signal back through the high level , then time of high output IO in duration is the time which is from sending ultrasonic to returning.

Test distance = (time of high level × velocity of sound (340M/S) / 2,

λλ Wire connecting direct as following:

5V Supply

Trigger Pulse Input

Echo Pulse Output



**c) pH Sensor:-**

introduction:

There is Need to measure water quality and other parameters . but haven't got any low cost pH meter? and it is difficult to find low cost pH using with Arduino? Here using an analog pH meter, specially designed for Arduino controllers and it has built-in simple, convenient and practical connection and features. It has an LED which works as the Power Indicator, and a BNC connector and PH2.0 sensor interface. so You can just connect the pH sensor with BNC connector, and then plug the PH2.0 interface into any analog input on Arduino controller to read pH value easily.

**Specification:**

- Module Power: 5.00V
- Circuit Board Size: 43mm×32mm
- pH Measuring Range: 0-14
- Measuring Temperature: 0-60 H
- Accuracy: ± 0.1pH (25 H)
- Response Time: ≤ 1min
- pH Sensor with BNC Connector

- PH2.0 Interface ( 3 foot patch )
- Gain Adjustment Potentiometer
- Power Indicator LED

The pH meter measures the difference in electrical potential between a pH electrode and a reference electrode, and the pH meter is sometimes referred to as a "potentiometric pH meter". pH meter indicating its acidity or alkalinity and then it expressed as pH. And also it is used to monitoring the pH value of soil. The pH meter is used in many applications such as in laboratory experimentation and also used to quality control.



**d) Fire Sensor**

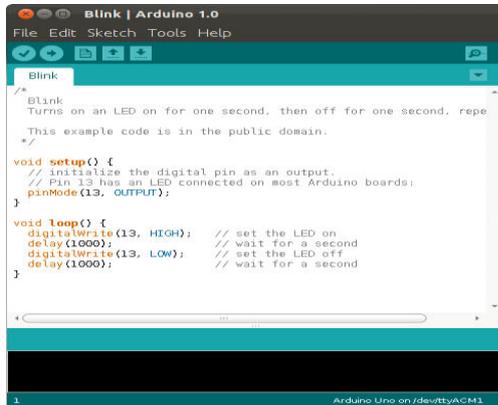
This Flame or fire Sensor can be used to detect fire source or other light sources of the wave length in the range of 760nm - 1100 nm. and It is based on the YG1006 sensor which is a high speed and high sensitive NPN silicon phototransistor. Because of its black epoxy, the sensor get sensitive to infrared radiation. Sensor is great addition in a fire fighting robot, and it can be used as a robot eyes and which find the fire source. When the sensor detects flame then the Signal LED will light up and the pin D0 get LOW.

**Features:**

- High Photo Sensitivity
- Fast Response Time
- Sensitivity adjustable

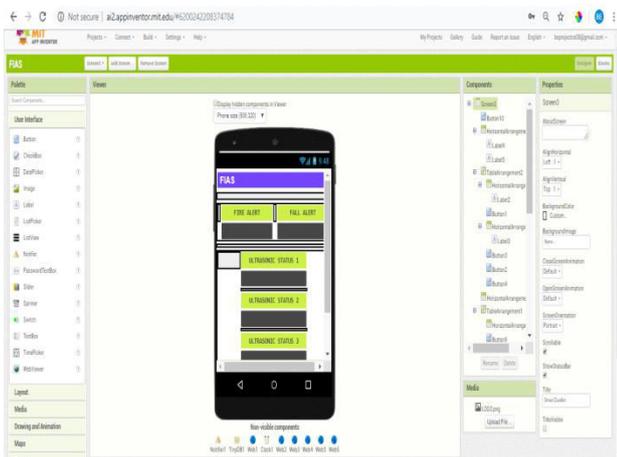
## 4.SOFTWARE USED

### A. ARDUINO IDE



The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board. The source code for the IDE is released under the GNU General Public License, version. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

### B. MIT APP INVENTOR 2



App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It allows newcomers to computer programming to create application software (apps) for two operating systems (OS): Android, and iOS, which, as of 8 July 2019, is in final beta testing, scheduled to be released publicly in summer 2019. It is free and open-source software released under dual licensing: a Creative Commons Attribution ShareAlike 3.0 Unported license, and an Apache License 2.0 for the source code.

It uses a graphical user interface (GUI) very similar to the programming languages Scratch and the StarLogo TNG user interface, which allows users to drag and drop visual objects to create an application that can run on mobile devices. In creating App Inventor, Google drew upon significant prior research in educational computing, and work done within Google on online development environments.

App Inventor and the projects on which it is based are informed by constructionist learning theories, which emphasize that programming can be a vehicle for engaging powerful ideas through active learning. As such, it is part of an ongoing movement in computers and education that began with the work of Seymour Papert and the MIT Logo Group in the 1960s, and has also manifested itself with Mitchel Resnick's work on Lego Mindstorms and StarLogo.F

### C. THINGSPEAK CLOUD

According to its developers, "ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates".

ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

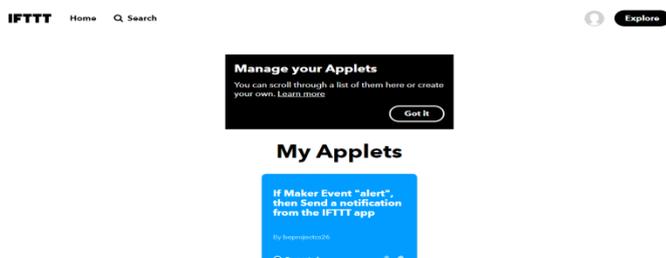
ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks.

ThingSpeak has a close relationship with Mathworks, Inc. In fact, all of the ThingSpeak documentation is incorporated into the Mathworks' Matlab documentation site and even enabling registered Mathworks user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Mathworks, Inc.

ThingSpeak has been the subject of articles in specialized "Maker" websites like Instructables, Codeproject, and Channel 9.

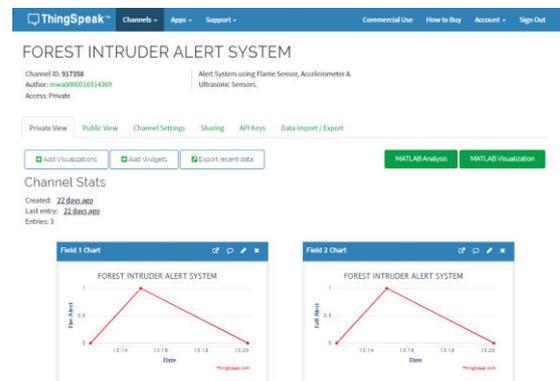
### D. IFTTT

If This Then That, also known as IFTTT is a free web-based service to create chains of simple conditional statements, called applets. An applet is triggered by changes that occur within other web services such as Gmail, Facebook, Telegram, Instagram, or Pinterest. For example, an applet may send an e-mail message if the user tweets using a hashtag, or copy a photo on Facebook to a user's archive if someone tags a user in a photo.



In addition to the web-based application, the service runs on iOS and Android. In February 2015, IFTTT renamed its original

application to IF, and released a new suite of apps called Do, which lets users create shortcut applications and actions. As of 2015, IFTTT users created about 20 million recipes each day. All of the functionalities of the Do suite of apps have since been integrated into a redesigned IFTTT app.



### 5.FUTURE WORK

- More area can be converted using more sensors.
- Device size can be reduced effectively.

### 6.CONCLUSIONS

The main purpose of this project is to protect the valuable trees such as sandalwood, teakwood, rosewood etc. Using this system, we can easily track the poaching activity which reduces deforestation and helps in maintaining the ecological balance and also protects the wildlife. It uses various sensors such as pH sensor and Accelerometer to detect the vibration and the angle of tree while it is being cut. Ultrasonic sensor, fire Sensor are also used.

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