Utilizing arduino for Monitoring the health of individual trees in forest eco system

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ABSTRACT

Now-a-days smuggling of expensive trees has been recent issue in the society as trees are one of most important Source for the living. This paper focusses on limiting the smuggling of important medicinal trees including Oak, Cedar, Elm and "Sag wan" among others. These medicinal trees are scarce worldwide and are quite expensive. These are employed in pharmaceuticals, cosmetics, and medical research. Numerous occurrences involving the chopping down of these expensive trees and their logging are occurring as the enormous sums of money involved in the sale of such trees. To prevent this smuggling and preserve the trees worldwide, some precautionary steps must be taken.

Keywords— Anti-smuggling, Smuggling, Oak tree, Medicinal trees, Flex Sensor.

1. INTRODUCTION

We read a lot in the newspapers about the trafficking of trees. These trees are very expensive. They are hugely beneficial in both cosmetics and medical research. Due to the substantial sum of money involved in such sales of tree trunks, cutting down trees and their smuggling is happening frequently. The issue we observed is that there is no method or system in place to stop illegal logging and the smuggling of trees. The forests and trees in other places need to be monitored. Such a strategy will assist you in locating and identifying unlawful tree cutting and logging while also alerting us to take appropriate action. A method is created with this issue in mind in order to assist in and help us achieve our objective ofrescuing trees from smugglers.

2. BLOCK DIAGRAM

The Arduino Mega serves as the system's "heart," wherein all other parts are connected. When an animal or person approaches the area within a 20-meter radius of the tree, the PIR sensor recognizes this situation and sends a notification to the mobile device with the text "Someone is near the tree." And flex sensor detects vibration and bending of trees when someone tries to cut them down using tools, alerting the appropriate authority that "Someone is chopping down the tree." The precise site where the

tree is being cut down is detected by the GPS as this system or unit is positioned to multiple trees, and this location is communicated to the respected officer. To obtain information about the temperature and humidity in the immediate area, a temperature and humidity sensor(AHT20) is bonded to the unit.
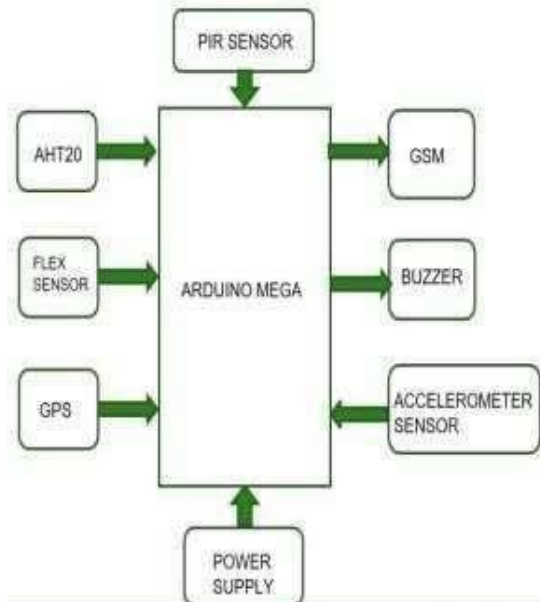
COMPONENTS

Arduino Mega 2560

The Arduino mega 2560 is the main unit of this system. It will take in the signal from a number of sensors that are attached to it and control the system's operation in accordance with the software. Moreover, it is needed to interface the sensors, GSM, GPS, and many other components
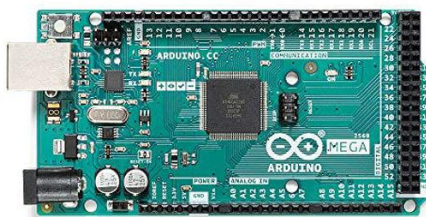

Fig: Arduino Mega

Flex Sensor

Flex sensor in this system is mounted to the tree's trunk to identify tree bending brought on by natural tree fall. Flex sensors are generally used to measure the resistance of the object. As resistance is directionally proportional to the amount of deviation

Fig: Flex Sensor

A. PIR Sensor

In the forest, a PIR sensor is utilised to detect movement of people or animals within a 20-meter radius. However, we are unable to distinguish between animals and people.

Fig: PIR Sensor

D. *Accelerometer Sensor*

The accelerometer sensor is utilised in this system to identify vibrations brought on by tree cutting.

Fig: Accelerometer Sensor

E. GPS

It is employed to determine a system's accurate locationinformation of latitude and longitude.

Fig: GPS

GSM:

The GSM gathers data from the Arduino and transmits location data to the appropriate professional via RF link.

AHT20 Sensor

At certain times throughout the day, the temperature and humidity are measured through the use of an AHT20 sensor.


Fig: AHT20 Sensor

Buzzer

Buzzer is included in this project to form alert to the approved deputy if one of the Sensor crosses allure limits.

WORKING

One small electronics device with an Arduino Mega 2560 controller, Flex Sensor, GSM, and GPS module will be installed in each tree. Flex sensors will be used to identify tree chopping. GSM and GPS modules will be used for communication between the trees and the server. The project unit, which is mounted to the tree, continuously monitors the sensor output signal. When a human or animal moment occurs, the PIR sensor will recognize it, convey the position information to the appropriate person, and the LED will glow. The threshold value of the flex sensor ranges from 700 to 860. If the tree bends beyond certain limits, a fallen tree is identified, and the authorized person is notified of its position. The threshold value for the accelerometer sensor ranges from 315 to 325. If the tree vibrates more than these values, its movement along the X and Y directions is identified, and the position data is sent to the appropriate authority. In this way smuggling of trees can be controlled.

PROJECT MODULE
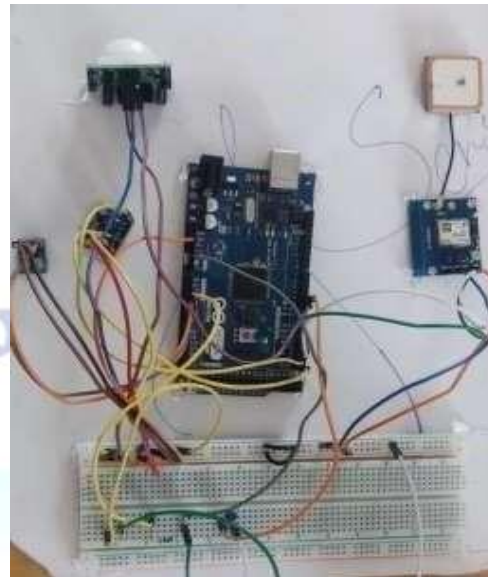
RESULT
TEMPERATURE AND HUMIDITY

GPS SYSTEM

```
//Arduino & AHT10//
Quick Test - Serial Monitor
Humidity(%RH):          3173.12%
Temperature(°C):        285636.63°C
Dewpoint(���):              -3538.74��
908
AccErrorX: -35.26
AccErrorY: 35.26
GyroErrorX: -0.01
GyroErrorY: -0.01
GyroErrorZ: -0.01
```

Overall results of unit

3. CONCLUSION

This paper has been written to control the logging of trees in forest areas that cannot be protected by humans. Such systems are developed in forests where protection of valuable trees is necessary. That is the reason why this type of project is proposed in the forest.

FUTURE SCOPE

Animal or human motion is detected by PIR sensors, but they are unable to distinguish between the two. Further improvements will be necessary to make the systwem more robust and to be able to distinguish between human and animal objects.

- The Units / Hardware / Sensors have to be rugged.
- Suitable enclosure has to be made.
- The Module should be placed in untraceable place on trees in this way it is not easily accessible to smugglers.
- Forest Authorities has to be suitably educated aboutthis project.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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