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IoT Based Anti-Poaching Alarm System for Trees in Forest

Pankil Chhabra, Teerth Jain, Harshvardhan Kalaskar, Prof. A. V. Bhamare
Department of Electronics and Communication Engineering
Pimpri Chinchwad College of Engineering,
Pune,India
pankilchhabra@gmail.com, teerth2000@gmail.com, harshvardhankalaskar@gmail.com, archanabhamare1234@gmail.com.

***Abstract*- All around the world there are numerous occurrence about stealing of trees like sandal, sagwan, timber etc. These trees are expensive and pitiful. They are utilized in medicine, beautifying agent, furniture etc. To limit their sneaking and to spare woodland around the world some preventive estimates should be conveyed and sometimes in forest, fire broke out which cause destruction to wildlife animal and also tree so it is necessary to control fire as soon as possible. For this we have built up a framework which can be utilized to limit sneaking. The structure framework utilizes three sensor i.e. tilt sensor, vibration sensor, flame sensor to recognize the tendency of tree when its being cut, to detect unlawful logging and to detect fire in forest respectively. And with the help of IOT model information being sent to Forest authorities.**

***Keywords*- Anti-Poaching, IoT based Smart-Forest, Monitoring Alert System, Human machine interaction.**

I. INTRODUCTION

As we know forest are part of the important and indispensable resource for human survival and social development that help and manage us to protect the balance of the earth ecology. The frequent fire and illegal poaching are among the serious disasters to wildlife animal, tree and climate change.

The prevention and monitoring of forest fire and illegal poaching has become a global concern for forest organization. Our suggested system consist of two module one is of transmitter side which contain sensor and controller module and other is of receiver side i.e. android phone.

As our system is IOT based project where we upload data continuously to cloud. Using built application we can turn on water pump in case of fire and buzzer in case of vibration and tilt. So we are designing a portable wireless sensor node which is a part of wireless sensor network. It will be mounted on trunk of each tree which is capable of detecting theft and fire.

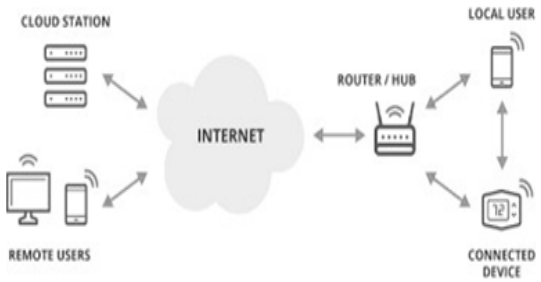

Fig 1. IoT Model.

II. METHODOLOGY

In this proposed system, we have come up with a system based on IoT that can be used to avoid the smuggling of the trees and the events of forest fires which would stop the deforestation. It will consist of two modules one involving sensors and controller module which will be at tree spot and another one is Android Phone.

Sensors includes Fire sensor, Tilt Sensor, Vibration Sensor. This will be mounted on trunk of each tree, capable of detecting theft as well as automatically initiate send alarm signals. They are interfaced with the Wi-Fi technology to the Blynk App server. This will convey the message to the monitor station and eventually to the control station and vice versa using wireless technology. With technology, we can also move to the betterment of the nature and surroundings around us to create a better place for everyone.

1. Block Diagram:

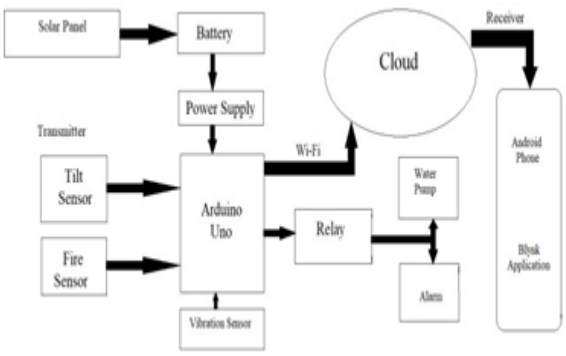

Fig 2. Block diagram of the system.

1.1 Power Supply: This system will be basically depending upon the Solar Panel for the power supply requirements in the form of solar energy.

1.2 Sensor Interfacing: The Sensors including the Fire sensor, Tilt Sensor and the Vibration Sensor are interfaced with the Arduino UNO for the input signal requirements. The input parameters they provide are the Fire Event occurrence i.e., the temperature of surrounding, the Vibration Sensor and the Tilt Sensor for the poaching activities indication in the timberland.

1.3 Arduino UNO programming: Arduino UNO has been programmed to interface the sensors input and has been calibrated to a specific threshold calibration value to detect the fire and poaching events. This data is then fed to decide the output characteristics. Upon the given instructions the information is displayed to LED screen simultaneously and the relay output is fed to turn on Water pump motor with buzzer alarm indication.

1.4 Blynk Application: The Blynk app will continue to upload the real time information to the Cloud so that the relevant information could be accessed remotely through any device. It also sends an automatic instruction to the system whenever it is directed to do so.

2. Flowchart:

First, we need to check the connections of the interfacing system. Then the sensors will start to start the input parameters. Fire sensor will continuously monitor the fire events by checking the temperature of the surrounding. Tilt sensor will sense the degree of tilt of the tree to check weather a poaching activity is going or not. Vibration Sensor Module will sensor the amount of vibrations on a particular tree to check if someone is doing a sort of illegal activity of cutting there or not.

If there is a event of forest fire is there, fire sensor will automatically send the signal to the Arduino UNO and then the geographical location of that fire event is traced by using the node number that we have given to that particular tree node. Then this information is stored in the cloud server for remote monitoring. The relevant information is then send to the forest officials to take action upon this event. Accordingly, the Water pump trucks and fire officials will be called as per the requirements to control the situation.

And if there is multiple events of Tilt is observed and also along with that vibrations are also observed then it is considered as an event of illegal poaching in that timberland area. Then the relevant information is sent to Arduino UNO followed by providing the geographical location of the poaching event. This data is uploaded to the cloud servers for the remote monitoring. The forest officials are then informed about this situation through the respective alert monitoring system. The actions are taken then by the Forest Police department accordingly to catch the illegal poachers and punish them respectively.

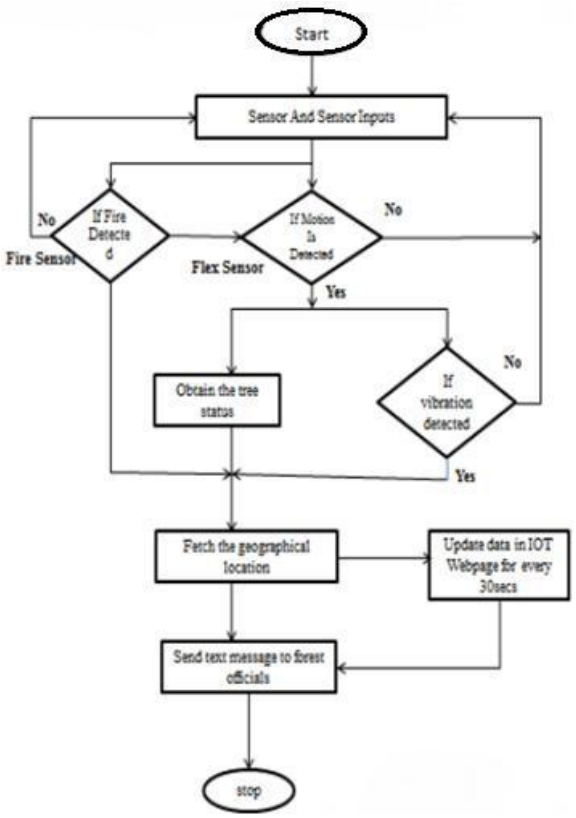

Fig 3. Flowchart of the system.

3. Technical Specifications

3.1 Hardware Specifications:

3.1.1 Arduino UNO board: The Arduino UNO (Microchip Atmega328P) is an open source microcontroller board based on the Microchip Atmega328P microcontroller and developed by Arduino. This 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 I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

3.1.2 Tilt Sensor: The tilt sensor is a segment that can identify the tilting of an article. Anyway, it is just the comparable to a pushbutton actuated through an alternate physical instrument. This kind of sensor is the ecological inviting form of a mercury-switch. It contains a metallic ball inside that will drive the two pins of the gadget from on to off and the other way around if the sensor achieves a specific point. These types of transducer produce an electric signal proportional to the degree of inclination with respect one or multiple axes.

3.1.3 Relay: A relay is usually an electro-mechanical device that is actuated by an electrical current. The

current flowing in one circuit causes the opening or closing of another circuit. Relays are like remote control switches and are used in many applications because of their relative simplicity, long life, and proven high reliability. Relays are used where it is necessary to control a circuit by a separate low-power signal or where several circuits must be controlled by one signal.

3.1.4 Flame Sensor: A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is working properly; it can be used to turn off the ignition system though in many cases they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

3.1.5 Vibration Sensor: Vibration Sensor Module comes with SW-420 vibration sensor, integrated with adjustable sensitivity via on board potentiometer. There are also LED indicators for power and the digital output status on board. It has a simple and straight forward 3-pin interface, VCC, GND and the DO (digital output). It supports 3.3V or 5V power.

3.2 Software Specifications:

3.2.1Arduino IDE: The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring.

3.2.2 Proteus Simulation Software: Proteus Design suite is an Electronic Design Automation (EDA) tool including schematic capture, simulation and PCB designing and layout modules. The software runs on Windows operating systems and is available in English and other many languages. The microcontroller simulation in Proteus works by applying either a hex file or a debug file to the Microcontroller part on the schematic. It is then connected to it. This enables its usage in a broad spectrum of project Prototyping in areas sucks motor control, fire control and user interface design. It also finds use in general Applications and since no hardware is required. It is convenient to use as training or teaching tool.

3.2.3 Blynk Application: It was designed for IoT. This app has capacity to remotely control hardware and also shows sensor information. This app also helps to visualize and store data. This platform contains 3 main elements: Blynk App, Blynk Server and Blynk Libraries. Blynk app- With the help of various widgets amazing interfaces for the projects can be created.

3.2.4 Blynk Server: Establishes a communication network between Smartphone and hardware. Blynk Libraries- All incoming and outgoing commands are processed and also enables communication between server and process.

4. IoT Modeling:

Internet of Things (IoT) is a set of technologies and use cases that has no clear, single definition. One workable view frames IoT as the use of network-connected devices, embedded in the physical environment, to improve some existing process or to enable a new scenario. These devices, or things, connect to the network to provide information they gather from the environment through sensors, or to allow other systems to reach out and act on the world through actuators.

They could be connected versions of common objects you might already be familiar with, or new and purpose-built devices for functions not yet realized. They could be devices that you own personally and carry with you or keep in your home, or they could be embedded in factory equipment, or part of the fabric of the city you live in. Each of them is able to convert valuable information from the real world into digital data that provides increased visibility into how your users interact with your products, services, or applications

The IoT which is deployed here consists of the Input section comprising of the various sensors which collects the required data and then it is fed to our Arduino UNO board to process it. This information is uploaded to our servers through the Blynk app.

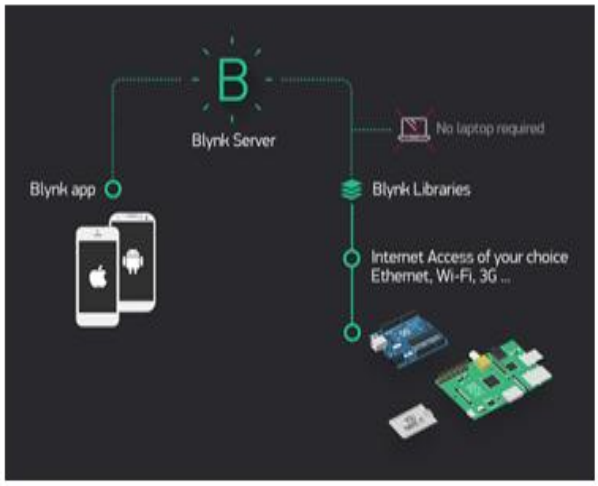

Fig 4. IoT Modeling in Blynk App.

III. CONCLUSION

Currently there is no system to detect illegal logging and cutting of trees. This proposed system will be helping forest officials in detecting and alerting so that proper actions could be taken. The proposed system will monitor when the tree logging occurs, the sound generated due to axing the tree is sensed by the vibration and tilt sensor. Also if the tree bends, the buzzer is activated.

And if in case forest fires, when the fire of the surroundings increases its sensed by the temperature of the surroundings increases its sensed by the fire sensor, through the relay switch the water pump is turned on. Then this generated data is send to the forest officer if any event occurs so that appropriate action can be taken.

IV. FUTURE SCOPE

This project is IoT based and uses Wi-Fi technology. It can be further extended by adding mini solar chips at tree section so that transmitter part can work on rechargeable power. Moreover a solar panel can also be installed at receiver part. IoT is the current trend in Government and corporate sector. Many big companies and industries are willing to move towards promoting of IoT.

Government sectors many countries are planning to digitalization of endangered animals, like Welgevonden Game Reserve in South Africa have digitalized Rhinos from being poached using LoRa technology and IBM Watson IOT Cloud platform. Similarly many organizations are planning to digitalize valuable trees. In that case this project gives the best results by using LoRa technology, so that signals can be transmitted in kilometers range, typically 10km.

ACKNOWLEDGEMENT

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