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An Intelligent Anti-Smuggling System for Trees

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Abstract: It is commonly read in the Newspaper about the Smuggling of the Trees such as Sandal, Teak etc taking place throughout the world. Since the demands for these trees are more, the cost of such trees are also high. By selling the woods of such trees, a huge amount can be earned and hence the smuggling of such trees may take place which is considered to be an illegal act. In order to prohibit the illegal smuggling of these trees some measures are to be undertaken. The main objective of this system is to restrict the smuggling and save the valuable trees so to maintain balanced eco-system by preventing deforestation. The system uses the GPS technology from which admin can find the location of guards so that if particular guard is present near to the location where smuggling is going on, the admin can approach that guard to take some preventive measures. The system also uses a chip (board) on which various Sensors (such as MEMS Sensor, Fire Sensor, Inductive Proximity Sensor, & Ultrasonic Sensor) are embedded 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.
Keywords: IoT, GPS, MEMS Sensor, Fire Sensor, Inductive Proximity Sensor, Ultrasonic Sensor, Android App

I. INTRODUCTION

Often we read in the newspapers about smuggling of the tress. These trees are very expensive and are commonly used in the field of medical science as well as cosmetics. Because of enormous amount of money involved in selling of such tree woods the smuggling of such trees are increasing day by day. This problem isn't related to India only, but also other countries are also struggling with same issues. Taking cost into the considerations these valuable trees needs to be protected.

Even though government of India is putting effort in stopping this illegal smuggling, yet some corner of newspaper shows us the same title. The problem what observed is there is no system or any medium to detect illegal logging and cutting of trees. A mean by which, at your workplace, you will know what's happening with my trees should be installed. Such system will help you to detect and will alert you so that you can take actions. Putting this problem in mind, a system is designed which help us to achieve our goal i.e. TO PROTECT NATURE.

II. ANALYSIS

A. Review

Every year millions of hectares of forest are devastated by fire, which causes huge damage to forest and nature especially in a country such as Algeria where the size of our forests are in degradation. [1] Existed methods for forest monitoring and fire detection are traditional and based on humans observation, which is inefficient due to the size of controlled regions.

Choose ATmega328 microcontroller that based on the Arduino Uno platform as the core of the control system.[2] Using temperature & humidity sensor DHT11 to collect data of temperature and humidity. The processed data transmitted through nRF24L01 wireless transceiver module. Finally, displaying the results of communication on dot-matrix LCD12864. In addition, in order to let it alarm when data beyond the expected range, we can through potentiometer to set low and high limit of temperature and humidity Most smartphones have built in a variety of sensors such as ambient light sensor, proximity sensor, global positioning system, accelerometer, compass, and gyroscopic sensor[3]. Especially, recent produced smartphones have contained more environmental sensors such as temperature, humidity and baromete. This service has shown that the semantic based sensor specification and observation has advantage in the sensor's interoperability and service scalability on the proposed semantic open IoT service platform. Vehicle accidents are one of the most leading causes of fatality. One approach to reduce the delay time is to use the Real Time Wireless Accident Tracker Using Mobile Phone [4]. The main purpose of this system is as early accident detection. This system uses PIC 16F microcontroller, piezoelectric sensors, GPS and Global System for Mobile (GSM) modules to detect traffic accidents. High number of vehicles on road has obviously increased traffic hazards and accidents, putting more life at risk.The system utilises piezoelectric sensor to automatically detect the occurrence of an accident, Global Service for Mobile Communication to send help signals, GPS to locate the coordinates of the accident. In the experiment, an LCD display is used in the design to indicate the status of each process.

*B. Hardware and Software Requirements*

1) Hardware Requirements:

a) Arduino Uno

b) MEMS Sensor

c) Fire Sensor

d) Proximity Sensor

e) Ultrasonic Sensor

f) Wifi

g) Motor

h) Android Phone

2) Software Requirements:

a) Programming Languages: Java, XML, PHP and JSON

b) Database: MySQL

c) IDE: Android Studio

III.METHODOLOGY

The Figure depicts the system design/system architecture. All the peripherals and the hardware used will help us to make this system a reality. The WI-FI module we have used is ESP8266 for the transferring of the data from the Arduino UNO to the receiver android smartphone via server.
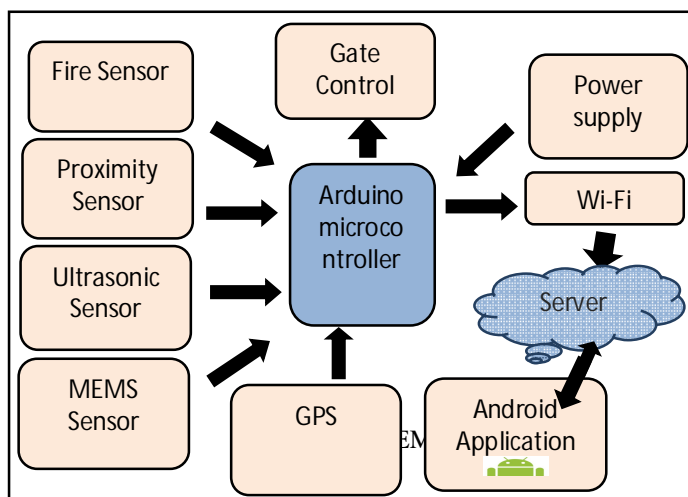
A. Receiver Side

The Notifications can be received in the Android app installed in Android Phone.
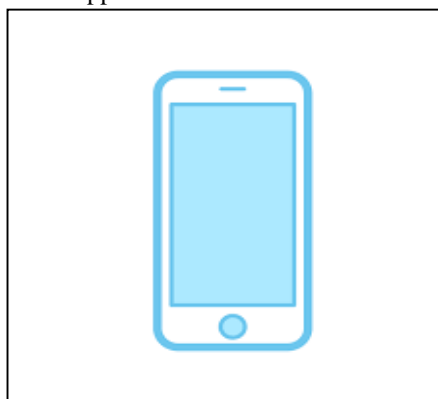
Android phone
Fig 2: receiver unit

IV. IMPLEMENTATION

The implementation of the modules means the working of those modules when integrated together to achieve a specified goal. Here the working of the device is being distributed amongst the three phases. When the device gets started (Figure 4.1) there are some of the components that needs to be started as well. All the components must be initiated and programmed before so that they work in the similar way as the actions specified.

The sensors like fire, MEMS, proximity and ultrasonic sensor are used here to sense fire taking place at forest, bending of the tree, cutting of the tree with metal and distance between the trees respectively which on sensing this will provide an alert message to the android app.

First, all the components associated with Arduino board must get started for their normal functionalities.

A. Sensor Selection

1) *MEMS Sensor:* MEMS are made up of components between 1 and 100 micrometers in size (i.e., 0.001 to 0.1 mm), and MEMS devices generally range in size from 20 micrometers to a millimeter (i.e., 0.02 to 1.0 mm), although components arranged in arrays (e.g., digital micro mirror devices) can be more than 1000 mm^2. They usually consist of a central unit that processes data (the microprocessor) and several components that interact with the surroundings such as micro sensors. It is used to detect the bending motion of the trees.

2) *Fire Sensor:* These are the important aspect of the device. Fire Sensor is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection.

3) *Inductive Proximity Sensor:* A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target.

4) *Ultrasonic Sensor:* As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

B. Microcontroller

The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.

C. Programming

Arduino code is written in C++ with addition of special methods and functions. The arduino Integrated Development Environment (IDE) is the main text editing program used for arduino programming.
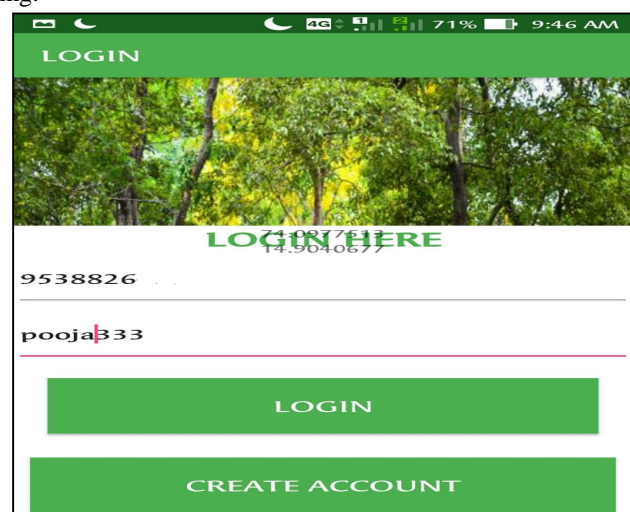

Fig 3: Prototype of the system

Fig 4: Android Application

V. APPLICATIONS

A. Keeping forest intact also helps prevent floods and drought by regulating regional rainfall.

B. Can be used for the private plantation area.

C. Teak wood has a natural oil content that resists termites (white ants), fungal stains, and also repel other insects that can destroy wood hence these can be used in protection of such tree plantation area.

VI. CONCLUSIONS

Today World is progressing rapidly. The class, design and the technologies being used is very advanced. With the change of technologies, we somewhere lack in forest management. People try to fulfil their needs by cutting the trees but they are not bothered about the effects on the Earth which will in turn cause effect on living beings.

Basic idea of our application is to provide ease to software project management. Our application works on Android, a phone that adds the mobility feature. The user can access the data from anywhere anytime through the mobile phone. It provides the security for the sandalwood trees. Alerts messages are automatically sent to the officers if any abnormal things happens in forest. This application is developed for forest department to protect sandalwood trees from smugglers.

VII. ACKNOWLEDGMENT

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