iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.34962

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

Anti-Smuggling Alarm System for Trees in Forest using Raspberry pi

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Abstract: ***Nowadays, There are trees like Sandal; Sagwan etc are going to be smuggled. These trees are very costly and meagre. These are used in the medical and cosmetic products. To restrict their smuggling and to save forests around the globe some preventive measures needs to be deployed. To restrict the smuggling, we have developed a system which consists of two units i.e. Tree Unit and Main Server unit. The Tree Unit consists of MEMS sensor (to detect the inclination of tree when its being cut), Fire sensor (to detect forest fires) and GPS system. Data generated from these sensors is continuously monitored with the raspberry pi. Through the sensors, their output devices are activated via relay switch. The data of different tree units collected by a base station (Main Server Unit) by using WIFI module. For MEMS sensor a buzzer is activated and for Fire sensor a water pump is activated. Generated data is stored in Server over the Wi-Fi module. Forest officials get the alert when any event occurs so that appropriate action taken place. Camera is used to capture Image and send to Gmail. The location where smuggling happens can be tracked by GPS system.***

Keywords: IOT, MEMS, Raspberry pi, camera.

I. INTRODUCTION

Poaching is not related to India only, some countries like China, Australia and African countries are struggling with same issue. Indian sandalwood costs 12000 to 13000 INR per kg whereas in international market Red Sanders costs INR 10 crore per ton. In recent years, The Indian sandalwood tree has Become rare in an attempt to control its possible loss, the Indian government is trying to limit the Exportation of sandalwood. As per Govt, for an individual, maximum permissible purchase is not Limited to exceed 3.8kg. If the trees are in already government controlled then cutting of trees is prohibited whether on private or temple grounds until the tree is thirty years old. Smuggling of trees Has created social economic and law and order problems in bordering arears of India. The main Objective of this project is to develop a system which can be used to restrict smuggling of Sandalwood trees. Currently there is no system to detect illegal cutting of trees. A mean by which, the Forests official knows happening with trees should be installed. Such system would help in Detect and alert.so those proper actions taken. To Protect the Nature, we designing this system can help Us to achieve our goal to prevent the cutting.

For ages Forests are suffering by illegal activities like smuggling of Precious and commercial trees Such as Teakwood, Sandalwood, Sagwan etc., from the protected Forest areas. These trees are Expensive and have lot of demand in the world market. The trees are generally protected by marking them with some tags. Also during Natural calamities, the trees may some damage. We had a existing system which can be used to avoid the smuggling of the trees which would in turn Stop the de- forestation and uphold the Environmental stability, which can help to solve one of the Issues with Global Warming.

As existing system has some disadvantages like less communication range and high components Cost because each tree equipped with one microcontroller. To overcome these problems, we Developed a proposed system based on IOT in which Microcontroller can control tree. We also including fire sensor to indicate presence of fire and camera to capture image while smuggling Happening. This system comes under embedded system,

II. LITERATURE SURVEY

The concept of Precious tree protection and prevention of theft is main idea of this thesis and those too using latest technologies. The ideas are clearly defined in Anti-Smuggling System for Trees in Forest using Flex Sensor and ZigBee Volume 3, Issue 9, September 2014, This paper explains as to how to restrict the smuggling activities and to save the using a mini Sensor network using ZigBee module, Flex sensor, GSM Module and GPS using the platform of Visual Basic. The concept has been further strengthened in Preventive System for Forests Volume 4 Issue 1, Jan Feb 2016, which talks of the main three units to be used in the Module to be designed like Tree Unit, Area/Sub Server Unit and Server Unit. It concentrates on ZigBee and GSM technologies while maintaining the Server on Visual Basic.

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Android based Anti-Smuggling Module has been discussed in Anti- Smuggling Alarm System for Trees in Forest Using Android. The idea of using accelerometer, temperature sensor forming a sensor is introduced here.

Android concept is very ideal for current scenario since almost all Mobile handsets are Android based. The anti- smuggling squad can immediately receive messages on their handsets during any interruption to the trees.

Accelerometer is used based on MEMS Technology and Micro Electro Mechanical Systems. Details about MEMS referred from Lee, G. H. Yoon, J Park, S. Seok, K. Chun, K. Lee, analysis and development of The vertical capacitive accelerometer, Sensors and Actuators A 119 (2012) 8-18. The paper is discuss about on MEMS accelerometer which is referred as capacitive torsional accelerometer (TXL).

III. IOT TECHNOLOGY

The IoT permits objects to be perceived or controlled remotely across existing network infrastructure, making opportunities for additional direct integration of the physical world into computer- based systems, and leading to improved efficiency, accuracy and economic profit to boot to reduced human intervention. Once IoT is increased with sensors and actuators, the technology becomes associate instance of the additional general category of cyber- physical system, that conjointly encompasses technologies like sensible grids, virtual power plants, sensible homes and sensible cities. every issue is unambiguously known through its embedded automatic data processing system however is ready to interoperate among the present net infrastructure.



Fig.1: IoT Representation

People need to speak with all non-living things through net like home appliances, furniture's, Stationeries, cloths etc. The folks have already got tons of technologies to move with living things However IoT allows to speak with non-living things with comfort manner. IoT may be a convergence ofmany technologies like omnipresent, pervasive computing, close Intelligence, Sensors, Actuators, Communications technologies, net Technologies, Embedded systems etc.

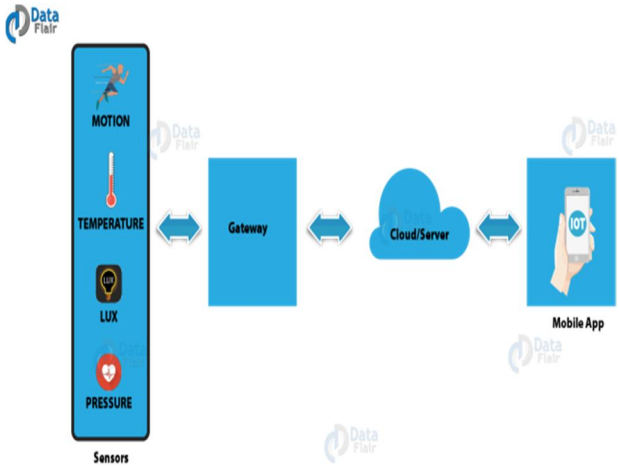


Fig.2 IoT Working

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
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IV. PROPOSED SYSTEM

Fig.1 shows the diagram Anti-Smuggling alarm for Trees in Forest Using Raspberry pi. The project consists both Software and Hardware components. The hardware part consists of input command by MEMS sensor and Fire sensor. The diagram consists of a Raspberry Pi, Fire Sensor, MEMS sensor, GPS Module, Camera, 5v power supply. Python is employed as a main programing language provided by Raspberry pi.

V. HARDWARE COMPONENTS

A. Raspberry Pi

Raspberry Pi is an ARM based computer MasterCard in size. it's single –on chip computing hardware. Here the raspberry pi3 model B is employed. Raspberry pi 3board has

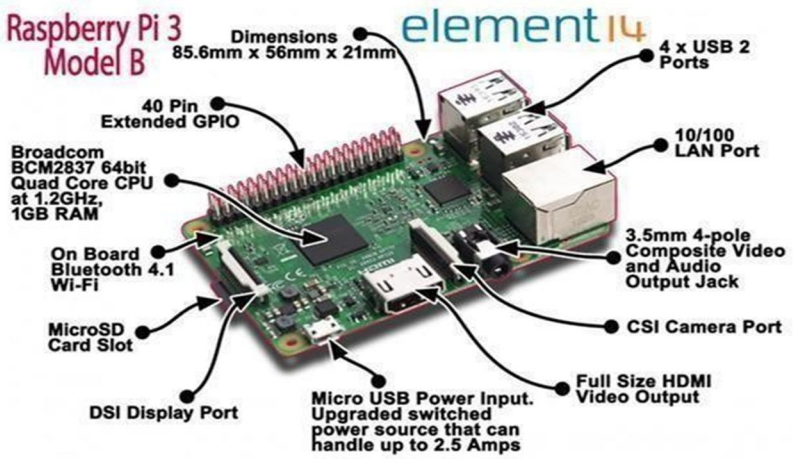


Fig 4: Diagram of Raspberry Pi

802.11 n wirelesses LAN and Bluetooth 4.1.and WIFI in built. We installed raspbian stretch in to the memory card used for the board. Raspberry Pi 3 features a LINUX based OS call Raspbian. The R- pi board contains 40 general purpose input output pins (GPIO) which may be used for digital input and digital output, it contains 4 USB ports, 1HDMI port, 3.5mm Audio jack, micro USB power supply. This board also has serial connections for connecting camera and a display.

B. Fire Sensor

A fire/flame detector is a sensor designed to detect and respond the presence of a flame or fire. The Flame sensor is used to detect fire flames and detects the fire up to a range of 1 meter.



Fig.5: Fire Sensor

Specifications

1) Allows your device to detect flames from upto 1M away
2) Typical Maximum Range :1 m .
3) Calibration present for range adjustment.
4) Indicator LED with 3 pin easy interface connector.
5) Input Voltage +5VD

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C. GPS Module

The NEO-6MV2 may be a GPS module, used for navigation. The module simply used to checks its location on earth and provides longitude and latitude of its position. it's from a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and price effective receivers offer numerous connectivity options during a miniature (16 x12.2x 2.4 mm) package. The Module architecture, power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost. Its Innovative design gives NEO-6MV2 excellent navigation performance even within the most challenging environments.

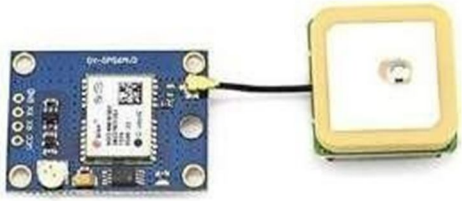


Fig.6: GPS Module

Specifications

1) Sensitivity: -160dBm
2) Supply voltage: 3.6V
3) Maximum DC current at any output: 10mA
4) Operation limits: Gravity-4g,Altitude- 50000m,Velocity-500m/s
5) Operating temperature range: -40ºC TO 85°C

D. Mems Sensor

Micro Electro-Mechanical Systems (MEMS) sensor consists of a 3-axis of Accelerometer and gyroscope. It used to measure acceleration, velocity, orientation, displacement and many other motion related parameter of a system. This module contains (DMP) Digital Motion Processor inside it which is powerful to interface external IIC modules like an magnetometer, however it is optional. Since the module MPU6050 are ADXL335 (3-axis accelerometer), ADXL345 (3-axis accelerometer), MPU9250 (9- axis IMU).



Fig.7: MEMS Sensor

E. PI Camera

The Pi camera module is portable light weight camera that supports Raspberry Pi. It used to communicate with Pi using the MIPI cam serial interface protocol. Normally, It is used in image processing, machine learning and surveillance projects. It is commonly used for surveillance in dronessince the pi cam is very less price. Apart from these , Pi can also be used as normal USB webcam that are used in computer.



Fig.8: Pi Camera

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Specifications

1) 5MP colour camera module without microphone for RaspberryPi
2) Supports both Raspberry Pi Model A and Model B
3) MIPI Camera serial interface
4) Omni vision 5647 Camera Module
5) Resolution: 2592 * 1944
6) Supports: 1080p, 720p and 480p
7) Light weight and portable (3g only)

VI. RESULTS

The Hardware arrangement of the ―ANTI – SMUGGLING ALARMSYSTEM‖ is given below.



Fig.9: Hardware Arrangement

A. Result Analysis

1) The tests have been performed to obtain the reading. With the help of Wi-Fi module in raspberry pi module…. whenever there is a forest fire or smuggling (indicating the cutting of trees by changing of directions) we get the alert message on our registered email Specifications.
2) The message will contain the following information: Alert (fire/smuggling), captured video, latitude and longitude of the tree location.
3) When there is a forest fire, a message alert is obtained in the email of corresponding Authorities and emergency water pump takes immediate precaution to save from fire.

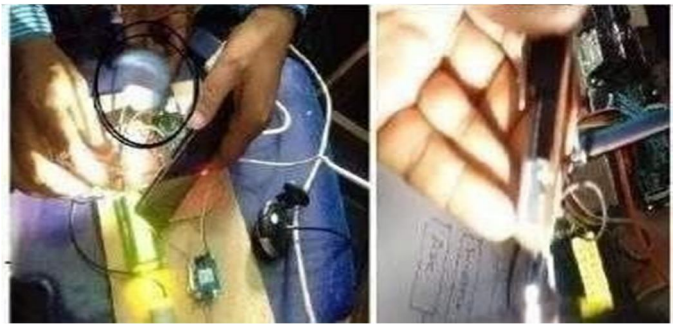


Fig.10: When the fire is detected, the Motor will ON



Fig.11: When the fire is NOT Detected, the Motor will OFF

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VII. ADVANTAGES

A. Raspberry pi Wi-Fi module increases the communication range.
B. Raspberry pi works as a normal computer at low cost server to handle web traffic
C. As raspberry pi consists of in built WI-FI module, no need of interfacing

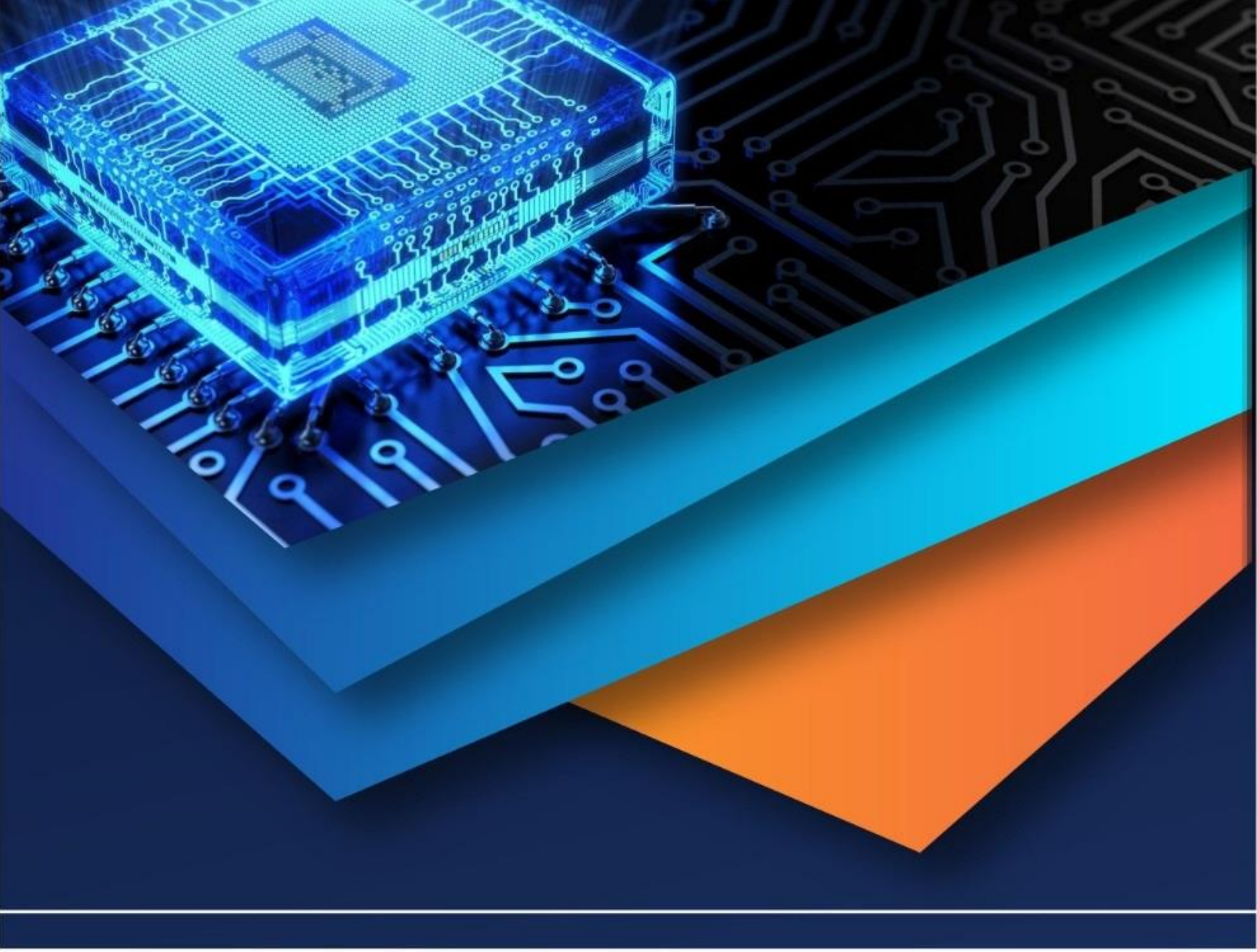
VIII. CONCLUSION

In this manner we are developing a system which will be able to control the smuggling of trees in forestry where the human being not capable to provide security. we use such systems in the forest where the tree are costly and their safety is important fact. Here we are protecting the trees using raspberry Pi microcontroller, GPS, MEMS and other various Sensors. Smuggling can be easily prevented by continuous monitoring of the valuable trees in the forest automatically. The main goal of the system is to enhance forest management efficiency and decrease trees illegal logging cases. Mems Sensor gives the robust monitoring of the tree being cutting down. Raspberry pi which receives information from tree unit gives an immediate alert to forest guard patrol through Gmail Containing a video captured by Pi camera and location tracked by using GPS. So that they can take immediate actions. A fire sensor and water pump is also included to protect the valuable trees from fire accidents. Thus from implementation of this system we can easily track the activities done by smugglers which in turn stop the deforestation and maintain the Environmental balance which would help to solve one of the issues with the global warming and to protect the wildlife.

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