Smuggling Control In Forest Using Raspberry-Pi

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***Abstract*—The proposed system is all about smuggling of the trees like sandal, red sandal, teak wood and essential medicinal trees. These trees are very costly as well as less available in the world. These are use in the medical sciences as well as cosmetics and medicines. Because of huge amount of money involved in selling of such tree woods lots of incidents are happening of cutting of trees and their smuggling. The purpose of this project work is to design an anti-smuggling system which is useful in Protected Forest areas. The Theft and illegal movement of commercial trees like Sandalwood, Teak, Sagwan, etc. have been a major concern. It is also a theft to Forest Flora and fauna. As concerned citizens our ideology is to prevent such smuggling activities by using latest technologies. Trees are made Smart with sensors embedded in them, forming a Sensor Network that communicates using Server and based on Internet of Things (IOT) concept. The Server uses "Heroku" Technology. To restrict such smuggling and to save the forests around the globe some preventive measures need to be deployed.**

I. INTRODUCTION:

From many years we are getting news about smuggling of the trees such as sandal, Sagwan etc. The poaching or smuggling of environmentally and economically important species of trees in forested areas- such as Sandalwood, Teak-wood, Pine and Rosewood has been tremendously increased. These trees are very expensive and less obtainable in the market. Sandalwood trees are one of the richest resources for the government. They are well known for their medical and fragrance and also a very ancient one. It is in the usage from many hundreds of years. There have been several initiatives undertaken by different stakeholders– and in particular by the Govt. of India, to mitigate these problems. These include the recruitment, training and deployment of anti-poaching watchers and/or private/govt. security guards across forests. Strict punishments for convicted offenders, as well as giving special incentives for anti-poaching activities were aimed for eradicating the menace. We are forming a system which can be used to avoid the smuggling of the trees which would in turn stop the deforestation and uphold the Environmental stability, which would help to solve one of the issues with the Global Warming. The tree is having with one electronic division, which consists of sound sensor, accelerometer sensor, flame s e n sor. Tr e e c u t ting w i l l b e d e t ected b y sound sensor, accelerometer sensor. Communication between the trees and server will be done by GSM modules.

II. LITERATURE REVIEW

[T**itle**:Movable Surveillance Camera using IoT and Raspberry Pi. C**ontext:**The planned portable observation cameras can be utilized to screen the spots even the human can't enter and it saves human life. It can be moved to any place utilizing the engine driver. It tends to be utilized for recognizing the different creatures in the woods area. Continuous observing should be possible by utilizing the web browser. Whenever the framework involves an organization for getting the pictures there is an opportunity for programmers to hack the caught information.][1]

[**Title**:Anti-Smuggling Alarm systems for Trees in Forest.
Context:The proposed framework utilizes methods to safeguard the tree from getting Cut Down; Damage with fire, and so forth this framework sends the area data to higher specialists to make quick moves if there should arise an occurrence of pirating and fire get. The proposed framework comprise of not many sensor that used to distinguished any aggravation on trees and Fire by smoke sensor][2]

[**Title**:Anti-smuggling system for trees in forest using vibration Sensor and nrf.
Context:This paper recommended that really three units to be utilized in the Module to be planned like Tree Unit, Area/Sub Server Unit and Server Unit. It focuses on Zigbee and GSM advances while keeping up with the Server on Visual Basic.][3]

[Title:Design WSN Node For Protection Of Forest Trees Against Poaching based on ZigBee.
Context:The proposed WSN has 15-20 Sensor Nodes: Each Sensor Node will have sensor inputs as information of Accelerometer and receiver. 1 Master Node: Receives the messages from all the sensor hubs and forward it to Base station. It has extra Intelligence for example it processes the messages from the Sensor Nodes and raises the alerts levels. 1 Base Station: Receives the messages from more than one expert hub and logs the messages to the server. 1 PC based Server Software with GUI: To give general media cautions.][4]
[T**itle**:Anti Poaching of Trees using Raspberry Pi. C**ontext**:The proposed enemy of poaching framework involves a paradigm of an IoT model that screens the trees and lingerie the base station. Whenever the progressions in the slant values are distinguished, directions of the poached tree are shipped off the base station as well regarding the enrolled portable number. The proposed model limits the human impedance contrasted with the current plans. Proposed model includes raspberry pi board, GPS module, GSM module and accelerometer sensor which will helps in checking trees.][5]
[**Title**: Manish Y. Upadhye, P. B. Borole, Ashok K. Sharma, "Real-Time Wireless Vibration Monitoring System Using LabVIEW".
Context: Vibration analysis provides relevant information about abnormal working condition of machine parts. Vibration measurement is prerequisite for vibration analysis which is used for condition monitoring of machinery. Also, wireless vibration monitoring has many advantages over wired monitoring. This Paper presents, implementation of a reliable and low cost wireless vibration monitoring system. Vibration measurement has been done using 3-Axis digital output MEMS Accelerometer sensor. This sensor can sense vibrations in the range 0.0156g to 8g where, 1g is 9.81m/s2. Accelerometer Sensor is interfaced with Arduino- derived micro controller board having Atmel's AT-mega328p microcontroller. The implemented system uses ZigBee communication protocol i.e. standard IEEE 802.15.4, for wireless communication between Sensor Unit and Vibration Monitoring Unit. The wireless communication has been done using XBee RF modules. National Instruments's LabVIEW software has been used for development of graphical user interface, data-logging and alarm indication on the PC. Experimental results show continuous real-time monitoring of machine's vibrations on charts. These results, along with data-log file have been used for vibration analysis. This analysis is used to ensure safe working condition of machinery and used in predictive maintenance.]

A. Abbreviations and Acronyms

IOT-Internet of Things, IEE-Institute OF Electrical and Eletronics Engineering, ADC-Analog to Digital Convertor, RPi- Raspberry Pi,MEM-Micro-electro-mechanical

III. METHODOLOGY

A. Block diagram

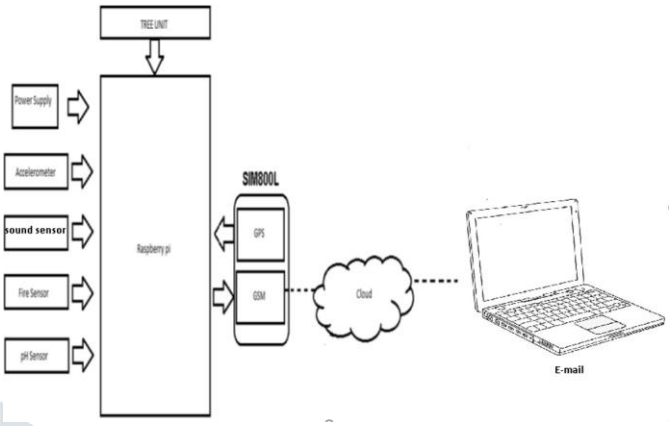

Fig. 1. Block Diagram

B. **Hardware:**RaspberryPi: The Raspberry Pi3 Model B+ is the most recent item in the Raspberry Pi3 territory, flaunting a 64-digit quad core processor running at 1.4GHz, double band 2.4GHz and 5GHz remote LAN, Bluetooth 4.2/BLE, quicker Ethernet, and PoE capacity by means of a different PoE HAT.

PIN DIAGRAM OF RASPBERRY PI 3B PLUS:

Raspberry Pi 3 GPIO Pin out / Pin diagram:
A strong component of the Raspberry Pi is the column of GPIO (universally useful information/yield) pins along the super right edge of the board. Like each Raspberry Pi chipset, it comprises of a 40-pin GPIO. A standard point of interaction for associating a solitary board PC or microchip to different gadgets is through General-Purpose Input/Output (GPIO) pins. GPIO pins don't have a particular capacity and can be tweaked utilizing the product.
Raspberry Pi 3 Power Pins:
The board comprises of two 5V pins, two 3V3 pins, and 9 ground pins (0V), which are unconfigurable. 5V: The 5v pins straightforwardly convey the 5v inventory coming from the mains connector. This pin can use to control up the Raspberry Pi, and it can likewise use to drive up other 5v gadgets. 3.3V: The 3v pin is there to offer a stable 3.3v inventory to drive parts and to test LEDs. GND: Ground is usually alluded to as GND. Every one of the voltages are estimated as for the GND voltage.

R*aspberry Pi 3 Input/Outputs pins*:
A GPIO pin that is set as an information will permit a sign to be gotten by the Raspberry Pi that is sent by a gadget associated with this pin. A voltage somewhere in the range of 1.8V and 3.3V will be perused by the Raspberry Pi as HIGH and on the off chance that the voltage is lower than 1.8V will be perused as LOW. Note: Do not interface a gadget with an information voltage above 3.3V to any of the GPIO pins, or, more than likely it will sear the Raspberry Pi. A GPIO pin set as a result pin conveys the voltage message as high (3.3V) or low (0V). Whenthis pin is set to HIGH, the voltage at the result is 3.3V and when set to LOW, the result voltage is 0V.

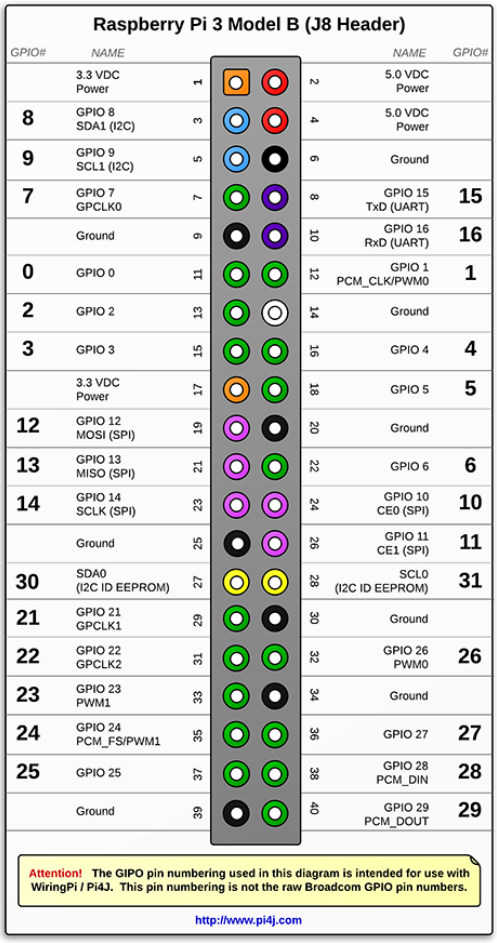

Fig. 2. Pin Diagram Of raspberry pi 3B plus

Alongside the straightforward capacity of info and result sticks, the GPIO pins can likewise play out an assortment of elective capacities. A few explicit pins are: PWM (beat width balance) pins:

• Programming PWM is accessible on all pins • Hardware PWM is accessible on these pins as it were: GPIO12, GPIO13, GPIO18, GPIO19

SPI pins:

SPI (Serial Peripheral Interface) is another protocol used for master-slave communication. It is used by the Raspberry pi board to quickly communicate between one or more peripheral devices. Data is synchronized using a clock (SCLK at GPIO11) from the master (RPi) and the data is sent from the Pi to our SPI device using the MOSI (Master Out Slave In) pin. If the SPI device needs to communicate back to Raspberry Pi, then it will send data back using the MISO (Master In Slave Out) pin. There are 5 pins involved in SPI communication:

• GND: Connect all GND pins from all the slave components and the Raspberry Pi 3 board together.

• SCLK: Clock of the SPI. Associate all SCLK sticks together.

• MOSI: It represents Master Out Slave In. This pin is utilized tosend information from the expert to a slave.

• **MISO**: It represents Master In Slave Out. This pin is utilized to get information from a captive to the expert.

• **CE**: It represents Chip Enable. We want to associate one CE pin for every slave (or fringe gadgets) in our circuit. Of course, we have two CE sticks however we can arrange all the more CE sticks from the other accessible GPIO pins. SPI pins ready:

• **SPI0**: GPIO9 (MISO), GPIO10 (MOSI), GPIO11 (SCLK), GPIO8 (CE0), GPIO7 (CE1)

• **SPI1**: GPIO19 (MISO), GPIO20 (MOSI), GPIO21 (SCLK), GPIO18 (CE0), GPIO17 (CE1), GPIO16 (CE2)

I2C pins:

I2C is utilized by the Raspberry Pi board to speak with gadgets that are viable with Inter-Integrated Circuit (a low-speed two-wire sequential correspondence convention). This correspondence standard requires ace slave jobs between the two gadgets. I2C has two associations: SDA (Serial Data) and SCL (Serial Clock). They work by sending information to and utilizing the SDA association, and the speed of information move is controlled by means of the SCL pin.

• Data: (GPIO2), Clock (GPIO3)

• EEPROM Data: (GPIO0), EEPROM Clock (GPIO1) **UART Pins:**

Sequential correspondence or the UART (Universal Asynchronous Receiver/Transmitter) pins give a method for conveying between two microcontrollers or the PCs. TX pin is utilized to communicate the sequential information and RX pin is utilized to get sequential information coming from an alternate sequential gadget. • TX (GPIO14) • RX (GPIO15).

2. **Sound Sensor:** A sound sensor is defined as a module that detects sound waves through its intensity and converting it to electrical signals. sound sensor consists of an in-built capacitive microphone, peak detector and an amplifier that's highly sensitive to sound.

3. **Accelerometer Sensor:** An accelerometer is an electromechanical gadget used to gauge speeding up powers. Such powers might be static, similar to the nonstop power of gravity or, just like the case with numerous cell phones, dynamic to detect development or vibrations.

4. **PH Sensor:** pH, commonly used for water measurements, is a measure of acidity and alkalinity, or the caustic and base present in a given solution. It is generally expressed with a numeric scale ranging from 0-14. The value 7 represents neutrality.

C. Software

1. Noob OS:

Noob OS is the fundamental one, which contains an installer for the Raspbian OS and LibreELEC working framework. It gives the capacity to on the other hand choose between some working framework, and download and introduce other various frameworks from the Internet.

2. **Fritzing.org (Online)**: Fritzing is an open-source drive to foster novice or leisure activity CAD programming for the plan of gadgets equipment, to help fashioners and Artists prepared to move from exploring different avenues regarding a model to building a more Permanent circuit. It was created at the University of Applied Sciences Potsdam.
3. **VNC Viewer**: VNC represents Virtual Network Computing. It is a cross-stage Screen sharing framework that was made to control another PC from a distance. A server part is introduced on the distant PC (the one you need to control), and a VNC watcher, or client, is introduced on the gadget you need to control from.
4. **Notepad (For Editing Code)**: Notepad++ is a free and open source code editorial manager for Windows. It is not difficult to use for fledglings and profoundly strong for cutting edge clients. It Comes with linguistic structure featuring for some, dialects including PHP, JavaScript, HTML, and CS.
5. **Heroku:** Heroku is a holder based cloud Platform as a Service (PaaS). Engineers use Heroku to send, make due, and scale current applications. Our foundation is exquisite, adaptable, and simple to utilize, offering engineers the most straightforward way to getting their applications to showcase.

D. Working

We are forming a system which can be used to avoid the Smuggling of the trees which would in turn stop the deforestation and uphold the Environmental stability, which would help to solve one of the issues with the Global Warming. The tree is having with one electronic division, which consists of Raspberry pi, sound Sensor, accelerometer sensor, flame sensor, GPS and GSM module. Tree cutting sound will be detected by sound sensor, accelerometer sensor. Communication between the trees and server will be done by GSM modules. The system consisting of 2 stages

A. Tree Unit: The Tree unit would be the primary unit for the implementation of the system. This unit would consist of three sensors to give the information of getting Cut Down the trees, Damage with fire, etc. The tree unit would be the primary unit. For the implementation of the system. The tree unit consists of four sensors: 1.Accelerometer Sensor 2. sound Sensor 3. Flame Sensor 4.pH sensor. These sensors would be responsible to send the data to the controller on the tree unit which would be then transmitted to the next stage i.e. Tree Unit to the tree unit which has GSM module, for further processing to Base station. This is the second and last stage of the system which would be responsible for gathering the data and facilitate the same to the Main-Server Unit. The Tree unit would consist of server(Heroku) and the Controller is accountable for data transmission from the primary stage to the Final Stage of the Project.

B. Main Server Unit: The main server unit would consist of the"website and E-mail". This unit is responsible for sending the data that was transmitted from the Stage 1. The server will send collected data via network to website and Email. The information consists of the location of smuggling, the ID of tree and surrounding temperature. After getting email on registered email account which contains information regarding Area name, Tree Name, Longitude and Latitude of the tree location [5], from these information, the location of tree cut can be tracked and smuggling is restricted.

IV. RESULT

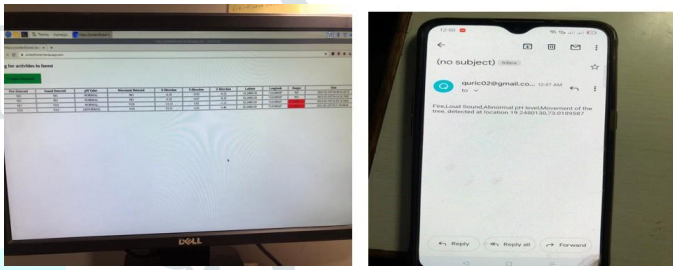

Fig. 4. Result on website and gmail

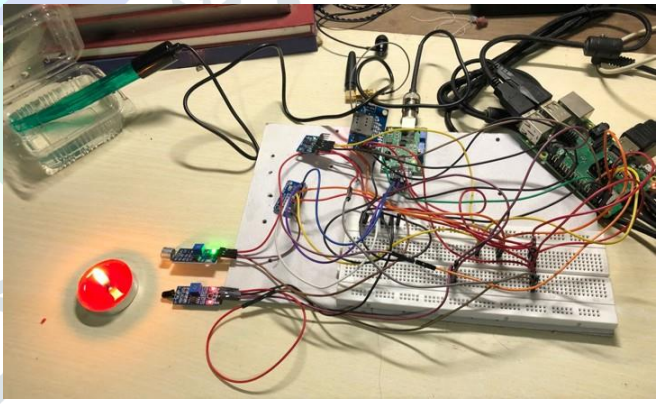

Fig. 3. Actual circuit photo

V. CONCLUSION

In this way the system is developed which is able to restrict the smuggling of trees in forest where the human being are not able to provide security. Such system is developed in the forest where the trees are costly and their protection is important. So in the forest this kind of system is proposed.

VI. FUTURE SCOPE

Though the claim has been made that a Smart module has been developed to protect trees, future enhancements are required to make the system more rugged:

1. **The Units/ Hardware/Sensors have to be rugged.**
2. **Suitable enclosure has to be made.**
3. **The Module should be placed in untraceable place on trees, not easily accessible to tree-destructors.**
4. **Forest Authorities has to be suitably educated.**

VII. REFERENCES

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