



INNOVATIVE PROTECTION OF VALUABLE TREES FROM SMUGGLING USING AI & IMAGE PROCESSING

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Abstract: In recent years poaching or smuggling of environmentally and economically important species of trees in forested areas- such as Sandalwood, Teakwood, Pine and Rosewood has been tremendously increased. 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 (Twelfth Five Year Plan 2012-2017) were aimed for eradicating the menace. The main idea presented in this paper is to design a image processing through camera. It will be mounted on forest area, capable of detecting theft as well as automatically initiate send alert signal.

IndexTerms – Image Processing, Tree Smuggling, Raspberry Pi, Pi Camera, Artificial Intelligence.

I. INTRODUCTION

The proposed system is all about smuggling of the trees like sandal, red sandal, Sag wan essential medicinal. These trees are very costly as well as less available in the world. These are used 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. To restrict such smuggling and to save the forests around the globe some preventive measures need to be deployed. “Digitalization of forest”, as this phrase itself suggests the sustainable implementation of cutting-edge technologies into forests for improving the current trends that are being used for forest environment monitoring, data acquisition, and analysis in the field of research and development. Technologies that can be used effectively for achieving these objectives include the Internet of Things, Wireless Sensor Networks, Internet of Trees, Deep Learning, etc. In this project we will going to design anti tree smuggling system using image processing and artificial intelligence.

Aim and Objective of project

- The system is developed which can be used to restrict this rustling which would in turn stop deforestation and maintain the Environmental balance which would help to solve one of the issues with the Global Warming.
- The proposed system employs techniques to protect the tree from getting Cut Down; Damage with fire, etc. this system transmits the location information to higher authorities to take immediate actions in case of smuggling and fire catch.

The data associated with the forest management & regulation is of non-linear type of data & artificial neural network is the best possible way for the processing of such type of data.

II. LITERATURE REVIEW

To protect sandalwood trees the authors Santhosh Hebbar, Praveenraj Pattar, Rajeshwari Madli, Varaprasad Golla in [1], have proposed a system that make utilization of Bluetooth and GSM to alert owners or concerned authorities in case of sandalwood theft. Immediate notification is sent to their mobile to provide information about the trees that is chopped by smugglers. Implementation of this system is predicted on cluster architecture. It's a master-slave design within which each tree is taken into account as slave node and mobile acts as master node. The two elements of the system include: Protection circuit and Mobile application. Bluetooth 4.0 system on chip is used at protection circuit that is programmed and functions of slave node are served by Bluetooth and 3V battery is used for power. An application is put in each master node, manages the tracking of all slave nodes. Organization of the master node and assigning slave nodes to that is provided by the setting choices of this application. The disadvantage is that this technique does not specify the cluster to which the tree may belong, it only sends alert in general.

To provide protection for valuable trees using RFID the authors Suguvanam K R, Senthil Kumar R, Partha Sarathy S, Karthick K, Raj Kumar S in [2], have proposed a system that consists of three sub-sections namely tree unit, sub-server and forest officer unit. Sensor which is fitted on tree is tree unit, control section consisting sub-server unit and finally the forest officer mobile phone or

personal computer is the forest officer unit. When the smuggler starts to cut the tree, the vibration created by it is sensed by the vibration sensor and RFID receiver receives the tag details of the tree and send signal to sub server via Zigbee transmitter. Then this Sub server receives signal from tree unit and send alert to forest officer via GSM. And it also sends the location using GPS connected to sub server unit. There will be one Sub server per 50 trees. Continuity sensor to each tree is connected. This sensor checks the connectivity between neighboring trees. If the smuggler removed this system or cut the tree, there lags the continuity between them. So this will send alert to sub server via ZigBee transmitter and this sub server will send alert to forest officer via GSM module. The disadvantages of using Zigbee are its low transmission, as well as low network stability.

To preserve sandalwood trees iron fencing is being used in some topographic point of Tamil Nadu [3]. Document [4] shows a number of measures that are enforced for defense of trees. However, these are ineffective as a result of constructing huge continuous vertical brick or stone structure for the whole forest area with solar or electrical fencing is one among the foremost ancient technique. Has the space will increase the wall length and price needed to make it increases proportionately.

Wireless Sensor Network technology has been deployed by the authors Akshay D. Sonwane, V N Bhonge, and Ajay Khandare in [5], have proposed a system that consists of portable wireless sensor node which can be an element of a Wireless Sensor Network. On the stem of each and every tree wireless sensor node will be placed. It will be capable of detecting stealing, yet as mechanically begin and forward alarm signals to main base station. It consists of sensor nodes: Every sensor node can have input. As information from Accelerometer and microphone. Base Station: Messages are received from sensor nodes. There will be one or many base stations for correct coverage of the specified space.

To monitor forest fire the authors Pero Skorput, Sadko Mandzuka, Hrvoje Vojvodic in [6], have proposed a system that make use of UAV (Unmanned Aerial Vehicles) an aerial vehicle that doesn't carry somebody as an operator, aerodynamic forces are used to produce vehicle elevate, will fly independently or be piloted remotely, will be expandable or retrievable, and may carry a deadly or nonfatal payload. The mechanism used in controlling is by on-board computers or by device on the earth.

III. PROPOSED SYSTEM

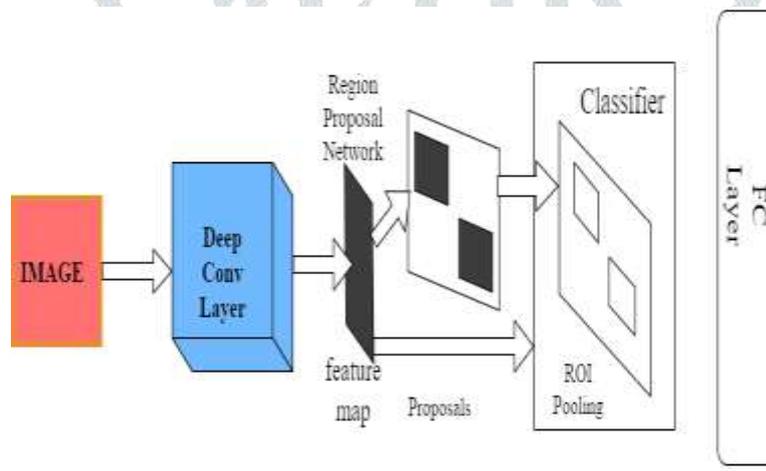


Fig -1: System Architecture

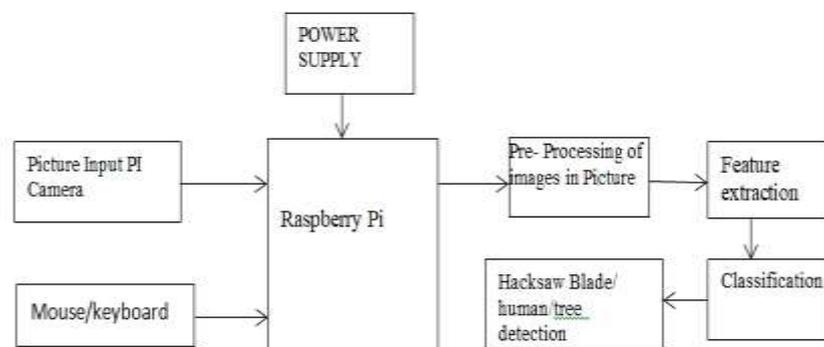


Fig -2: Block Diagram

Figure 1 above shows the overall project's flow chart of the system. Basically, for the hardware which is the Raspberry Pi Zero W (Wireless). The Pi connects with the compatible camera which is Raspberry Pi Camera Module V2. The camera will capture the image based on the angle facing it and the camera comes with 8-megapixel lens. The image will be saved in the microSD that on the board and can access it in the SD card, either to transfer or remove the images. For the software, divided by two which are RGB image and Wavelet Analyzer. The raw image will be enhanced to RGB colour model and then into Y chrominance and luminance.

When we discuss Artificial Intelligence alone then even the Artificial Neural Network (ANN) is one of the most important factors over which the major research is going on. ANN is one of most important tools for the machine learning. Under this all the

data presented before it is analyzed & processed as a human brain but on extremely higher rate. So when we talk about forest management & regulation with advance technique than the major problem is that how that huge amount of data & information will be processed as the data associated with it is in huge amount. ANN perceived the data & evaluate or process it with the algorithms with is provided for.

3.1 Raspberry Pi

Raspberry Pi is a small single board computer. By connecting peripherals like Keyboard, mouse, display to the Raspberry Pi, it will act as a mini personal computer.

Raspberry Pi is popularly used for real time Image/Video Processing; IoT based applications and Robotics applications. Raspberry Pi is slower than laptop or desktop but is still a computer which can provide all the expected features or abilities, at a low power consumption.

Raspberry Pi Foundation officially provides Debian based Raspbian OS. Also, they provide NOOBS OS for Raspberry Pi. We can install several Third-Party versions of OS like Ubuntu, Arch Linux, RISC OS, Windows 10 IOT Core, etc.

Raspbian OS is official Operating System available for free to use. This OS is efficiently optimized to use with Raspberry Pi. Raspbian have GUI which includes tools for Browsing, Python programming, office, games, etc. We should use SD card (minimum 8 GB recommended) to store the OS (operating System). Raspberry Pi is more than computer as it provides access to the on-chip hardware i.e. GPIOs for developing an application. By accessing GPIO, we can connect devices like LED, motors, sensors, etc and can control them too.

Features:

- Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz
- 1GB LPDDR2 SDRAM
- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
- Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
- Extended 40-pin GPIO header
- Full-size HDMI
- 4 USB 2.0 ports
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touchscreen display
- 4-pole stereo output and composite video port
- Micro SD port for loading your operating system and storing data
- 5V/2.5A DC power input.

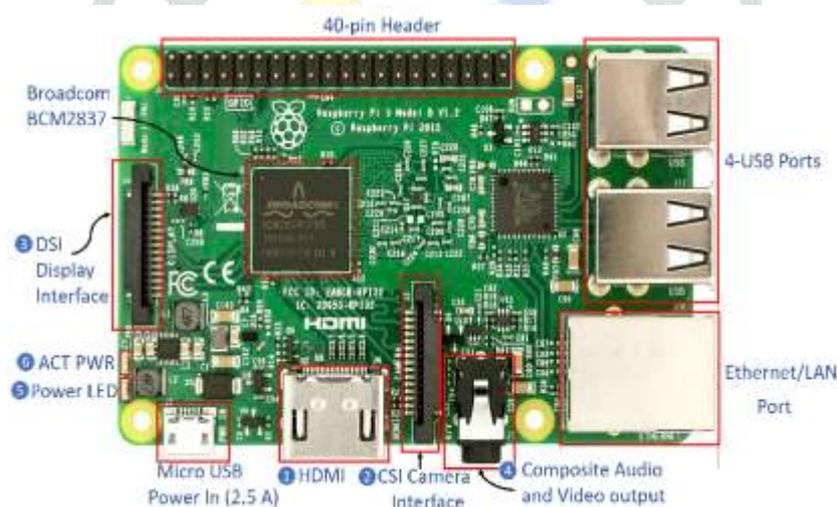


Fig -3: Raspberry Pi

3.2 Raspberry Pi Camera

Raspberry Pi Camera Board plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image or 1080p HD video recording at 30fps! Latest Version 1.3! Custom designed and manufactured by the Raspberry Pi Foundation in the UK, the Raspberry Pi Camera Board features a 5MP (2592x1944 pixels) Omni vision 5647 sensor in a fixed focus module. The module attaches to Raspberry Pi, by way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2835 processor. The board itself is tiny, at around 25mm x 20mm x 9mm, and weighs just over 3g, making it perfect for mobile or other applications where size and weight are important. The sensor itself has a native resolution of 5 megapixel, and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592 x 1944-pixel static images, and also supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video recording. The camera is supported in the latest version of Raspbian, the Raspberry Pi's preferred operating System.

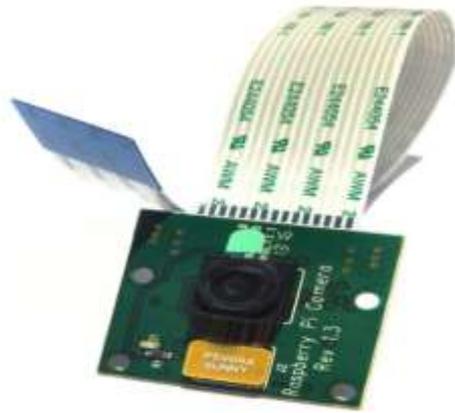


Fig -4 Raspberry Pi Camera

IV. CONCLUSION

The main purpose of this project is to protect the valuable trees such as sandalwood, teakwood, rosewood etc. Using this system, we can easily track the poaching activity which reduces deforestation and helps in maintaining the ecological balance and also protects the wildlife. The main goal of the system is to enhance forest management efficiency and decrease trees illegal logging cases. Continuity camera monitoring of the tree being cutting down. And immediate alert. So that they can take immediate actions. Thus, from implementation of this system smuggling can be prevented and eco system is maintained balanced by preventing deforestation

4.1 Feature Scope

Although the design was successful there are improvements that could be made in future adaptations of this project. The future scope of work is implementation of multi-node network and incorporation of microphone motion detector sensor to make systems more effective to acquire data such human or animal interference.

V. ACKNOWLEDGMENT

It gives us great pleasure in presenting the paper on “Innovative Protection of Valuable Trees Form Smuggling Using Artificial Intelligence and Image Processing”. We would like to take this opportunity to thank our all-staff members, Department of Electronics and Telecommunication Engineering Department, Amruvahini College of Engg., Sangamner for giving us all the help and guidance we needed. We are grateful to him for his kind support, and valuable suggestions were very helpful.

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