IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 2, May 2026
Impact Factor: 8.2

Innovative Protection of Valuable Trees Form Smuggling Using Artificial Intelligence and Image Processing

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Abstract: *This paper presents a model of preventing smuggling of valuable trees like sandal trees, red sandal trees in the forest area. In proposed system in order to detect cutting down of valuable trees immediately, we use vibration sensors and continuity sensors. Here vibration sensor is used to sense the vibration created during cutting down the tree and continuity sensor is used to check the continuity between neighbouring trees. In existing system, RFID is used to identify the missing tags in the tree. But this illegal activity can be identified only after those trees are being smuggled. In India sandal wood is sold for Rs 39.51lakh per ton. But some smugglers cut these trees and trade illegally. This causes huge loss to government and also affects the ecosystem. In order to prevent this, this technology is used. 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 at eradicating the menace. The main idea presented in this paper is to design an image processing through the camera. It will be mounted in a forest area, capable of detecting theft as well as automatically initiating send alert signals.*

Keywords: Image Processing, Tree Smuggling, Webcam, Tensor Flow, Python, Artificial Intelligence

I. INTRODUCTION

Forests constitute approximately 30 % of the global land area. They give natural surroundings to the two people and a few animal types that share the profitable environment's merchandise. Dealing with woodland has turned into an amazingly hard undertaking. Illicit logging speaks to one of the greatest difficulties of woods maintainability. For a long time we are perusing in the papers about pirating of the tress. These trees are all around exorbitant. These are for the most part helpful in the therapeutic sciences just as beautifying agents. Because of huge amount of money involved in selling of such tree woods and lots of incidents are happening of cutting of tree and their smuggling. This issue isn't identified with India just, in China, Australia and African nations are additionally battling with same issues. Placing cost at the top of the priority list, Indian sandalwood costs 12000 to 13000 INR for every kg though in global market Red Sanders order a high cost of INR 10 centre for every ton. The Indian sandalwood tree has turned out to be jeopardized as of late, and trying to control its conceivable eradication the Indian government is attempting to restrict the exportation of sandalwood. For an individual, most extreme passable buy limit isn't to surpass 3.8kg according to Govt. The tree is as of now government controlled, and evacuation is disallowed whether on private or sanctuary grounds until the tree is thirty years of age. But even though some corner of newspaper shows us the same title.

DOI: 10.48175/568

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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 & Objective:

• 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 SURVEY

To protect sandalwood trees the authors Santhosh Hebbar, Praveenraj Pattar, Rajeshwari Madli, and Varaprasad Golla in [1], have proposed a system that makes 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 are chopped by smugglers. Implementation of this system is predicated on cluster architecture. It's a master-slave design within which each tree is taken into account as a slave node and mobile acts as the master node. The two elements of the system include a Protection circuit and a 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 and 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 alerts in general.

To protect valuable trees using RFID the authors Suguvanam K R, Senthil Kumar R, Partha Sarathy S, Karthick K, and Raj Kumar S in [2], have proposed a system that consists of three sub-sections namely tree unit, sub-server, and forest officer unit. A sensor which is fitted on a tree is a tree unit, control section consisting sub-server unit and final, ly 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 the RFID receiver receives the tag details of the tree and sends the signals to the sub server via Zigbee transmitter. Then this Sub server the ecreceiveshe signal from the tree unit and san end alerts the to forest officer via GSM. And it also sends the location using GPS connected ted to the sub server unit. There will be one Sub server perThe continuity 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 an alert to the sub server via ZigBee transmitter and this sub server will alert to the forest officer via the 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 the sopointspographic point of Tamil Nadu [3]. Document [4] shows several measures that are enforced to define a sense of trees. However, these are ineffective as a result of constructing huge continuous vertical brick or ststructuresture for the whole forest area with solar or electrical fencing

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is one of the foremost ancient techniques 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], who has 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 tree, a wireless sensor node will be placed. It will be capable of detecting stealing, yet as mechanically begin and forward alarm signals to the 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, and Hrvoje Vojvodic in [6], have proposed a system that makes make use e of a 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 onboard computers or by a device on the earth.

III. PROPOSED SYSTEM

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 analysed & 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 this.

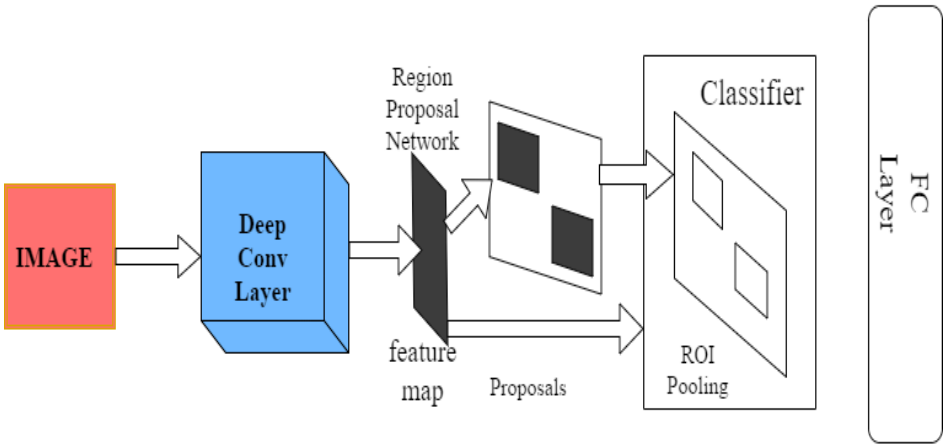

Fig. 1. System Architecture

The detection of urban trees in the optical image remains a challenge due to the difficulty of tree suppression and tree crown separations. Counting has been rarely conducted for tree crown detection using low-cost available Internet resources such as Google Earth. To obtain urban forest information cost-effectively and efficiently, in this study, we developed a novel deep learning ensemble model for ITCs detection based on Google Earth images. Our specific objectives were 1) to efficiently assess and delineate tree crowns in the highly diverse urban forest of New York's Central Park and 2) to apply the crown detection model to obtain tree attributes (e.g., number and area). By achieving these objectives, this study provides significant data to update the existing tree inventories. It also provides a new insight that using deep learning-based methods, large-scale information can be obtained from true color image data of natural systems.

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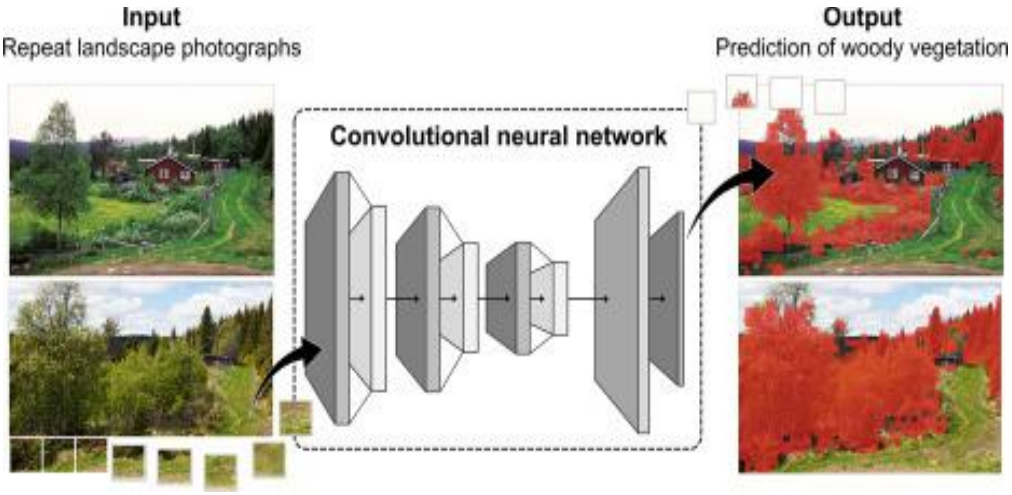

A. Materials and method:

This Central Park is a city park located in the Manhattan area of New York City, USA. This park was built in 1857, covers an area of 3.41 km2 (Ramirez et al., 2014). Its tree cover is well above the Manhattan regional average (approximately 20%), ranging from 60.1% to 70%. The main tree species in Central Park include Acer platanoides, Ailanthus altissima, Thuja occidentalis, Quercus alba, Sassafras, and Platanus × acerifolia (Nowak et al., 2018).

B. Segmentation method:

Segmentation is most important step in image processing, plant detection approaches aims to segment the different pixels that appear in images into two categories: plant (crop trees and weeds) and background (soil and residues). In [8], they considered image processing techniques for the detection and discrimination of plants and weeds, the plant has to be segmented from background soil, considering all field conditions [9], also most of the available machine vision techniques are not sufficiently robust for real-time conditions. Thus prominent segmentation performance is required for precision application in agriculture. A large number of studies employed color index methods to segment plants(crops and weeds) from the background (soil and residues) under various image conditions [10,11] To assess the performance of the proposed algorithm, the Excess Green Index (ExG) was proposed and used as a benchmark to separate plant vegetation from the soil background. Several shape features were fed to classify between trees and weeds. These methods are most commonly based on the RGB color space[12], and they generally rely on the principle that the green channel contains more useful information than the redone. However, these methods by themselves were unable to discriminate between crop trees and weeds. Often they could not even completely separate plant pixels from the background without threshold adjustments. Furthermore, in such algorithms, the colour-based methods failed to segment plant pixels from the background. To overcome this problem, several researchers proposed learning-based methods such as the Environmentally Adaptive Segmentation Algorithm (EASA) proposed by [13], the Mean-shift algorithm with Fisher Linear Discriminator (MS-FLD) [14], a Decision Tree-based Segmentation Model (DTBSM) [15] Affinity Propagation (AP) algorithm in the Hue-Saturation– Intensity (HSI) [16], and Particle Swarm Optimization clustering and Morphology Modelling (PSO-MM) [17]. Although these methods demonstrate good vegetation segmentation results, they are computationally expensive and may not suit real-time applications. In addition, they were applied only for the segmentation of all vegetation from the background, but not for distinguishing between crop trees and weeds. Segmentation of overlapping or occluded objects is an extremely difficult task to perform because the overlapping plants appear as one object. This overlapping problem exists in various applications of computer vision, such as biomedical [18], agricultural [19], and object search [20]. Although many previous studies using image processing and computer vision have demonstrated good plant segmentation performance [21], the problem of plant

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overlapping has been largely overlooked. In addition, the extensive survey in [22] reported that most studies that they included in their study have not considered the overlapping and occlusion between plants. They also reported that the main source error of plant segmentation (crop/weed) was caused by overlapping between crops and weeds.

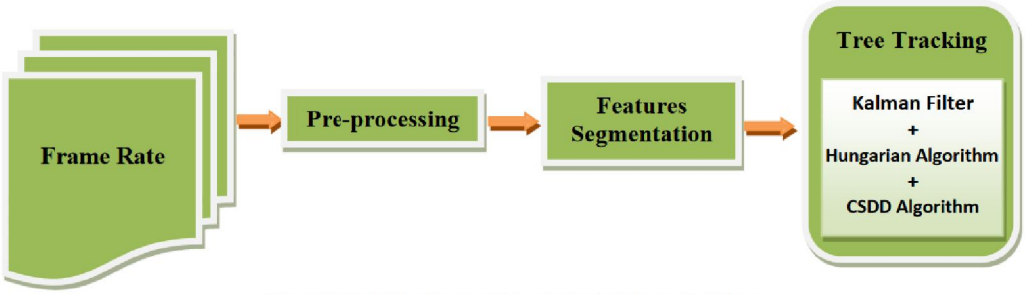

Figure 2: General scheme of the proposed tracking algorithm.

Fig.2 shows a block diagram of the tracking algorithm proposed in this work. This includes: (1) preprocessing (2) detection stage and extraction of features centroid (the x and y are coordinates of the centre of each detected feature); these coordinates will be used to predict the current location of the track; (3) tracking stage, which tracks detected objects and includes association of detected objects with plant trajectories. The proposed tracking
algorithm relies on a first detection algorithm in real time using calculated predictions. The method was tested against different conditions for different stages of growth. Various circumstances, such as partial occlusion between crop tree and weeds, partial crop disappearance from the scene, UAV motion caused by the wind, and various backgrounds (soil and other residues) were also included.

IV. METHODOLOGY

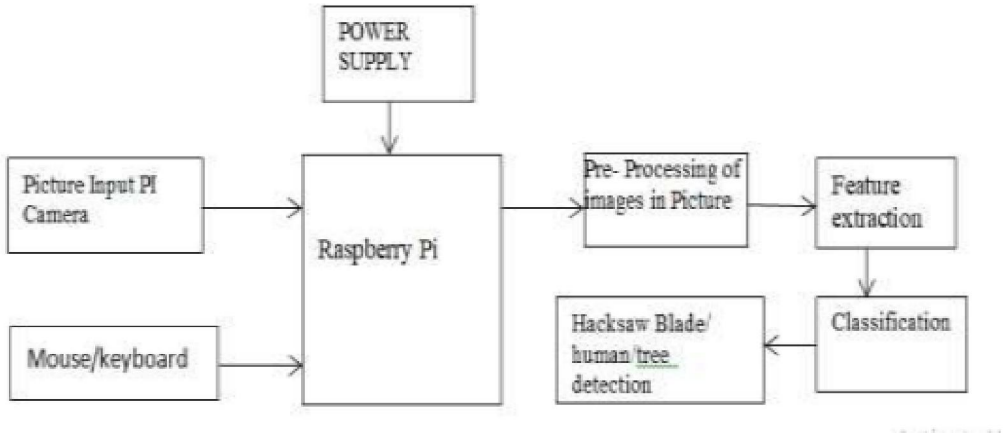

Fig. 3 Block Diagram

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

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& 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.

A. 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.4 : Raspberry Pi

B. 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

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by the Raspberry Pi Foundation in the UK, the Raspberry Pi Camera Board features a 5MP (2592?1944 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

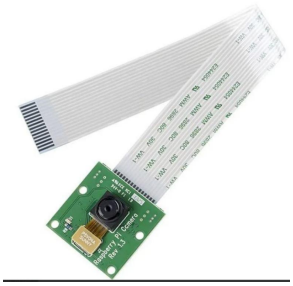

Fig. 5 Raspberry Pi Camera

V. 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

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.

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 Guide, all-staff members, Department of Electronics and Telecommunication Engineering Department, Adsul’s technical Campus, Ahilyanagar for giving us all the help and guidance we needed. We are grateful to them for their kind support, and valuable suggestions were very helpful.

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