IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 3, March 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 3, March 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1003073 |

A Survey on Poaching Detection in Forests

Ameera Fathima, Amulya H.V, Ayesha Sultana, Ruqaya Siddiqua, Dr. Mohammed Muddasir

B.E Student, Department of Information Science and Engineering, Vidyavardhaka College of Engineering Mysore, Karnataka, India

B.E Student, Department of Information Science and Engineering, Vidyavardhaka College of Engineering Mysore, Karnataka, India

B.E Student, Department of Information Science and Engineering, Vidyavardhaka College of Engineering Mysore, Karnataka, India

B.E Student, Department of Information Science and Engineering, Vidyavardhaka College of Engineering Mysore, Karnataka, India

Assistant Professor, Department of Information Science and Engineering, Vidyavardhaka College of Engineering Mysore, Karnataka, India

ABSTRACT: Poaching of trees is an important issue that is faced globally. In India itself, more than 1 Lakh metric tons of trees are poached every year. There is a serious need for monitoring our forests and the current monitoring systems are mostly manual.
It is practically very difficult to manually keep a check on the large forest areas which leads to illegal trade of trees.
In this paper we have conducted a brief survey to prevent poaching activities in the forest using Internet of things and various algorithms.

I. INTRODUCTION

Sandalwood and redwood trees are among those that are most prone to be poached. They are known for their medicinal properties, which is why they are in high demand. Many laws have been laid down by the Government of India to penalize those that are caught smuggling trees. This by itself is not enough and should go hand in hand with better systems to detect and alert when any such activity occurs. Forest constitutes approximately 30% of the global area. They provide habitat for both humans and some species that share the valuable ecosystem's goods. Managing a forest has become an extremely hard task. Illegal logging represents one of the biggest challenges of forestsustainability. Forestry departments in many countries such as Brazil and Malaysia thought of digitizing trees and hence transforming forest management to a high-tech process using RFID tags. In recent years poaching of valuable treeshas been extremely increased due to man's selfishneeds.There have been several initiatives undertaken by different organizations, and in particular government of India, to ease this problem.
YOLO is an algorithm that uses neural networks to provide real-time object detection.A Convolutional Neural Network is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to different objects in the image and be able to differentiate one from the other.R-CNN is a two-stage detection algorithm. The first stage identifies a subset of regions in an image that might contain an object.Zigbee is a wireless technology used for low-cost, low-power wireless IoT networks. IOT is a collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves.

II. STUDY OF POACHER DETECTION

2.1 Poacher Detection using YOLO Algorithm

In (1)and (2) the author has used YOLO algorithm to detect the poachers from distant place. It is faster than other algorithms and best option for detecting poachers hence saving the lives of animals. The main objective of this paper is to protect animals from being killed for their ivory, horn, skin etc.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 3, March 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1003073 |

Yolo aglorithm is faster when comapred to fast R-CNN.By using this algorithm we can easily detect objects in streaming video no batch processing is involved in Titan X GPU which is fast version runs more than 150 frames per second.

Yolo makes some fewer background mistake when compared to fast R-CNN.So they have combined Yolo and fast R-CNN together that decreases background error and increase fast object detection.

2.2 Deep Learning for Large Scale Biodiversity Monitoring

In (3) author has used sensors, big data analytics and deep learning techniques. This system is used to monitor endangered species. Here the data is collected using a different sensor (including microphone, cameras) this raw data is transmitted back to a central data store, and is data analyzed with a variety algorithm. In this project author have developed techniques to speed up and semi-automate the data analysis process. This is done in two ways. Firstly, use of custom user interfaces (UIs) this is used to speed up the exploration and analysis of the data by a limited number of analysts. Data exploration is required at the initial phases of the analysis process. Secondly, using machine learning (ML) techniques, such as deep learning (DL), they have made use of deep convolutional neural networks (CNNs) and deep feed forward neural networks (DNNs) to audio spectrogram and image data, to distinguish the presence or absence different endangered species.

2.3 Poacher detection and wildlife counting system using Deep Learning

In (4) and (5) author has used Thermal imaging,CNN algorithm, Centroid tracking algorithm.

Image thresholding is a method of object detection that relies on high contrast scenes to be effective, which is why it is considered a good method of object detection when using thermal imagery. Global thresholding provides the simplest way of converting a greyscale image into binary, often resulting in a segmented image, which generally results in a segmented image. They are making use of drones to capture videos.

CNN algorithm provides an advanced solution for object detection and identification.

Centroid tracking is an algorithm which uses Euclidean distance between previously registered objects and new detected objects from frame to frame. It can be used for counting wildlife using unique ID's.

2.4 AirSim-W: A Simulation Environment for Wildlife Conservation with UAVs

In (6) they have made use of UAVs to locate animals and poachers. Finding poachers is done at night by using long wave thermal infrared cameras mounted on these UAVs. (6) Is advanced version of (4) because keeping an eye using live video stream is very tedious job, so they have trained the model using datasets.

Once the videos had been labeled, individual frames are used to train Faster RCNN for animal and poacher detection, which is a part of a larger system called SPOT.

Still there was a need to keep an eye on the videos to confirm if it's a human. To overcome this, they have made use of Unreal Engine and AirSim. Unreal Engine is a game engine where various environments and characters can be created, and AirSim is a simulator for drones and cars built on Unreal Engine. They are generating deep learning training data with AirSim-W, for generating data for poacher and animal detection in thermal infrared data.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 3, March 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1003073 |

2.5 Evaluation of Predictive Models for Wildlife Poaching Activity through Controlled Field Test in Uganda

In (7) the authors are using the behavior model called INTERCEPT, this model is based on an ensemble of decision trees. They are using this model to predict/identify the poachers. The authors are doing two field tests to check their model. In the first cycle they are doing one month field test on Uganda's Queen Elizabeth Protected Area, to test the power of their predictive model. In second cycle it is an eight-month field test to appraise the selectiveness power of the model.

One-month Field Test: INTERCPET was tested to evaluate the predictive ability of the model. After development and evaluation of the model on historical data, it was deployed to the field. Based on the predictions, two patrol areas were chosen for one month. These areas approximately 9 square km each. They were selected such that they were 1] predicted to have multiple attacks and 2] previously in-frequently patrolled routes. In this patrol route rangers recorded the observation of animal sightings and illegal human activities. Eight-month Field Test: In the effort for improving model performance the field test was extended to eight months. In this predictive power and selectiveness of the new models were evaluated with similar areas.

2.6 Using remote sensing imagery and machine learning to predict poaching in wildlife conservation parks

In (8) and (9) Protection Assistant for Wildlife Security (PAWS) is used as a machine learning approach to predict areas of highest poaching risk based on historical poaching patterns and geospatial features. An automated pipeline extracts remote sensing data from Google Search Engines and processes the data. In (9) a Gaussian process is used to quantify predictive uncertainty in the predictions of poaching risk to improve robustness.

2.7 Protection of Valuable Trees from Smuggling & Forest Fire using sensors

In (10) and (11) publishers have discussed several occurrences involving the smuggling of trees such as Sandal, Sagwan, and others. These trees are extremely expensive but have a limited supply. In this paper author have developed a system using Arduino UNO interfaced with tilt sensor, flame sensor, vibration sensor and PIR sensor. If the system detects any specious activity in the forest device sends an alert message to the forest officers using GSM module along with the exact geographical location using GPS.

2.8 Smuggling Control in Forest using GPS and GSM

The proposed system in (12) and (13) is an improvisation of (10) and (11).

In (12) system is built on the embedded platform using arm7 Microcontroller which controls all the processes and in (13) Control unit contains RF transmitter, receiver and wireless camera (to notice human involvement), and a 32-bit ARM cortex M3 microcontroller programmed in C is used.

(12) Consists of two modules:

1) Tree unit

2) Main server unit

The tree unit consists of Micro Controller, PIR sensor, Flex Sensor, accelerometer sensor, flame sensor, GPS and GSM module. Tree cutting will be detected by flex sensor, accelerometer sensor and flame sensor. These sensors are

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 3, March 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1003073 |

responsible to send the data to the controller on the tree unit which would be then transmitted to base station using GSM module.

Main Server Unit is responsible for the user interface and displaying the data that was transmitted from tree unit. In (13) the author is also using power unit. Power unit contains solar panel (this absorbs solar power & stores it in battery), dc-dc convertor and lead oxide battery (used to supply voltage to circuit). The authorized person will receive the message and he will take actions to provide security. By using GPS technology, tree can be tracked and can be identified very easily. This data can be used by concern forest authorities to take preventive action.

2.9 Real time poaching detection: a design approach

In (14) the author has made use of sensors to detect sound intensity above a defined threshold level and then transmits the sensor output to a computer system using a wireless module. Computer module employs digital signal processing techniques to determine whether it is a gunshot or any other sound.

If the computer detects a gunshot, then an alarm was triggered to alert the forest security forces.

System was designed in such a way that it was able to determine the distance between sensor position and sound source.

2.10 Trail-Tracker: Anti-poaching Intelligence using AI and IOT

In (15) the author has used Artificial Intelligence and Machine Learning techniques to prevent poaching of animals and conserve wildlife.

Proposed system includes the following:

Camera Module: This is used to record poaching activities in the forest; multiple camera modules cover complete forest, and an ID is given to each camera module to distinguish the area of poaching.

Computing Module: This is used to compute the input taken from camera module and to detect poaching.

Server: This collects message from all camera modules and analyze situation and gives message to forest officers.

2.11 Design WSN Node for Protection of Forest Trees Against Poaching Based on ZigBee

In (16) Smuggling/theft of valuable trees in forests, such as sandal wood, is a huge danger to forest resources, causes significant economic loss, and has a long-term impact on the environment. In this paper author have proposed a microcontroller based anti-poaching system using WSN technology, which can detect smuggling of trees by sensing vibrations produced by the cutting of trees/branches using a 3 axis MEMS accelerometer. Wireless Sensor Network [WSN] is used for detection of forest fire, to detect rearing/poaching of wild animals, and for environmental monitoring. WSN has many advantageous like easy installation and maintenance; they eliminate the use of expensive cables and save costs. The main goal of this project is to design a portable wireless sensor node which is a part of wireless sensor Network. This is mounted on trunk of each tree and can detect theft and automatically initiating and sending an alarm to remote terminal via wireless media. Zigbee is used as a network interface.

The system consists of 15- 20 Sensor Nodes each Sensor Node will have Accelerometer and microphone as sensor inputs. Master Node receives messages from all the other nodes.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 3, March 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1003073 |

Sensor nodes collect data and send it to the base station. It has additional Intelligence it processes the messages from the Sensor Nodes and raises the alarms levels. The base station positioned at the entrance of the jungle/farm it will communicate with Control room server through RF network. Designed Network will follow Star topology.

2.12 IOT Based Anti-Poaching Sensor System for Trees in Forest

In (17) and (18) they are making use of microcontroller and wireless sensor networks. Their main aim is to protect sandalwood, sagwan etc.

Burls give a unique and highly figured wood, prized for its beauty and rarity. Because of these burls ancient Redwoods are being poached.

So, to prevent this they are using 3 sensors (tilt, sound and temperature). The sensors are connected to the Arduino Uno. The information from the sensors is regularly seen with the help of Blynk App. For tilt and sound sensor buzzer is activated and for temperature water pump is initiated.

These gadget yields are initiated through Relay Switch.

2.13 Timely poacher detection and localization using sentinel animal movement

In (19) the author proposes and tests a poacher's movement response. The presence of human is accurately being detected and localized by algorithmically identifying characteristics changes in sentinel movement.

The behavioral signature includes increase in movement speed, energy, expenditure, body acceleration, directional persistence. This paper uses a combination of wireless biologging, predictive analytics and sentinel animal behavior. They are using a poacher early warning system which is based on the movement responses of non-targeted sentinel animals, which naturally react to hazards by fleeing and changing herd topology. They are examining human movement behavior of 135 mammalian savanna herbivores of four different species, using IOT architecture with wearable sensors, wireless data transmission and machine learning algorithms.

2.14 Poaching detection Technologies – A survey

In (20) the authors aim at reviewing poaching detection technologies that aims at saving endangered species from extinction. In this paper research challenges are being surveyed and effective poacher detection technologies are being presented. Poaching detection technologies are being described in four domains: perimeter based, ground based, aerial based, and animal tagged based technologies. In these paper different types of sensors technologies are also being discussed such as: radar, radio frequency, motion, seismic, chemical and (20) is referring (19) for animal sentinels.

III. CONCLUSION

There are several methods for securing trees where humans are not able provide security, but these are some methods which use Machine learning algorithms and IOT technologies. In these papers author have discussed various anti-poaching techniques like CNN, YOLO, ZigBee and IOT technologies to detect theft, hence contributing to the protection of essential and costly trees from being poached.

REFERENCES

1. **Shreya Shivaji Gaikwad, Pranit Mohan Mhatre, Cyril Silvester Dabre, Ms. Nazneen Ansari.***Poacher Detection using YOLO Algorithm.* Mumbai : International Journal of Engineering Research & Technology (IJERT)i, 2021.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 3, March 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1003073 |

2. **Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi.***You Only Look Once:Unified, Real Time Object Detection.*

3. **David J. Klein, Matthew W. McKown, Bernie R. Tershy.***Deep Learning for Large Scale Biodiversity Monitoring.* September 2015.

4. **Brown, Dane Lesley.***Poacher detection and wildlife counting system.* September 2019.

5. **Adrian Carrio, Carlos Sampedro, Alejanro Rodriguez-Ramos, and Pascual Campoy.***A Review of Deep Learning Methods and Applications for Unmanned Aerial Vehicles.* 14 August 2017.

6. **Elizabeth Bondi, Debadeepta Dey, Ashish Kapoor, Jim Piavis, Shital Shah, Fei Fang, Bistra Dilkina, Robert Hannaford, Arvind Iyer, Lucas Joppa, Milind Tambe.***AirSim-W: A Simulation Environment for Wildlife Conservation with UAVs.*

7. **Shahrzad Gholami, Benjamin Ford, Debarun Kar, Fei Fang, Milind Tambe, Andrew Plumptre Margaret Driciru , Fred Wanyama, Aggrey Rwetsiba, Mustapha Nsubaga, Joshua Mabonga.***Evaluation of Predictive Models for Wildlife Poaching Activity through Controlled Field Test in Uganda.*

8. **Guo, Rachel.***Using remote sensing imagery and machine learning to predict poaching in wildlife conservation parks.* s.l. : The Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21).

9. **Lily Xu, Shahrzad Gholami, Sara Mc Carthy, Bistra Dilkina, Andrew Plumptre, Milind Tambe, Rohit Singh, Mustapha Nsubuga, Joshua Mabonga, Margaret Driciru, Fred Wanyama, Aggrey Rwetsiba, Tom Okello, Eric Enyel.***Stay Ahead of Poachers: Illegal Wildlife Poaching Prediction and Patrol Planning Under Uncertainty with Field Test Evaluation.* 6 November 2019.

10. **Nandhini, Selvameena,Suganya, Yamuna, Manikandan.***Protection of Valuable Trees from Smuggling & Forest Fire and Preventing Wild Animal Roaming in Residential Areas.*

11. **Prof.Dr.M.C.Hingane, Vandana Datta Ingale, Snehal Choudhari, Sonali Awachare.***Anti-poaching Alarm System For Tree in Forest.* s.l. : International journal of Engineering development and research(IJEDR) Volume 7, Issue 4, 2019.

12. **Rajender Chintha, Benny Pears, O.Vijaylaxmi, Varsha Devi, Sanjai Prasada Rao.***Smuggling Control in Forest.* s.l. : International Journal of Engineering Science and Computing, IJESC, 2017.

13. **K Jyothi Latha, Harshitha L, Padmapria B, Chaluvaraju.***Anti-Smuggling for trees in forest using GSM technology.* s.l. : International Journal of Innovative Science and Research Technology, Volume 2, Issue 5, May 2015.

14. **Tridip Sarma, Vivek Baruah.***Real time poaching detection: A design approach.* Pune : International Conference on Industrial Instrumentation and Control (ICIC) College of Engineering, 2015.

15. **Vidya Zope, Sarvesh Relekar, Pramodkumar Choudhary, Manoj Ochaney, Rohit Bhagtani.***TRAIL-TRACKER: ANTI-POACHING INTELLIGENCE USING AI AND IOT.* s.l. : International Journal of Creative Research Thoughts (IJCRT), Volume-8, Issue 4, April 2020.

16. **Smita Gaikwad, Prof. Rajesh Patil , Ajay Khandare, Anshuman Rai.***Design WSN Node For Protection Of Forest Trees Against Poaching Based on ZigBee.*

17. **Parthiban M, Dharani M, Kathiga S, Keruthika M.***IOT Based Anti-Poaching Sensor System for Trees in Forest.* s.l. : International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8, Issue-6S4, April 2019.

18. **SarojaDevi H, Meghashree J, Shruthi D K.***IoT based system for alerting Forest Fire and control of Smuggling.* s.l. : International Journal of Advance Research and Innovation, 2019.

19. **Henrik J. de Knegt, JasperA. J. Eikelboom, Frank van Langevelde, W. François Spruyt & Herbert H.T. Prins.***Timely poacher detection and localization using sentinel animal movement.*

20. **Jacob Kamminga ID, Eyuel Ayele ID , Nirvana Meratnia and Paul Havinga.***Poaching Detection Technologies—A Survey*. 6 March 2018.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details