IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ANTI-POACHING - Conservation of wild life

Dr. K. Venkata Subramanian*[1], A. Gokul Krishna*[2], K. Siva Reddy *[3], M. Susruthi*[4], T. Sai Lakshmi Reeshma*[5]

[*1]Professor, Department of Computer Science and Engineering, *Qis College of Engineering and Technology, Ongole, Andhra Pradesh, India.*

[2,3,4,5]Student, Department of Computer Science and Engineering, *Qis College of Engineering and Technology, Ongole, Andhra Pradesh, India.*

Abstract:

This paper focuses on poaching, which is illegal trafficking and assassinating of wildlife and plants. Thus, poaching leads to biodiversity loss. In order to sustain human and societal needs, it is vital to maintain the Earth's biodiversity balance. It is essential to stop poaching. In order to achieve this, the proposed model can lead to a safer habitat for wild animals if implemented. Our proposed system will collect camera data and then apply a machine learning algorithm to determine whether the image is poacher or animal. This is done by analyzing the data gathered from the video that is captured by a hidden camera. We will train our machine learning model with previous recordings of videos or images. We want to build a model using technologies such as machine learning and artificial intelligence. The foremost purpose of this paper is to preserve wildlife through detailed analysis of video footage that reveals poacher's or animal's identity.

Key Words: **poaching, anti poaching, EfficientDet, object detection, poachers, machine learning, wild life**

Introduction:

One of the primary issues endangering the animal population is poaching. Wild animals are hunted down by poachers and sold on the black market. Government agencies and organizations dedicated to protecting wildlife have made significant efforts to stop poaching. Enforcement of the legislation, surveillance of the conservation area, and setting up video traps in the forest are a few of these.

The integration of an ecosystem depends on wildlife. Since it is crucial to both human existence and health of the ecosystem, animal conservation has gained attention. In order to keep the environment's natural processes stable and in balance, wildlife plays a significant role. Recently, this subject has become more and more pertinent. Even though there are protected areas like wildlife sanctuaries and rules that are followed, certain individuals, such as stalkers or hunters, nevertheless enter these areas, which further reduce the numbers of the endangered species. One of the key factors that have caused animal extinction is poaching. Establishing better preserved and protected areas now necessitates the detection of such intrusions and constant monitoring of the wildlife reserve. The Wildlife Protection Society of India has worked together to compile detailed information and presented case studies of tiger and leopard poaching across the country. According to official records, 110 tigers and 491 leopards died in India in 2019; many of these deaths were caused by poaching. 38 of the 110 tiger deaths in Madhya Pradesh in 2019 were a result of poaching and the theft of body parts. Tiger deaths increased yearly due to poaching, as did leopard deaths.

The process of industrialization, which is causing deforestation and animal hunting for the ivory trade, is raising concerns about the environment's future state. The population of humans and animals will be drastically out of balance by 2050, according to predicted statistics. The population of humans will grow by 0.5 percent more than that of animals. The overuse of resources puts human needs at risk. This is where the idea of wildlife conservation comes into play because anything that is not human or domesticated is considered to be "wildlife."

Modern technology has advanced to the point where we now live in a technologically advanced planet. Machine learning, which automates analytical contemporary building, has been shown to have a significant impact in common with the human brain and computers that learn on their own without utilizing explicit instructions.

Furthermore, the majority of acoustic sensor traps lack the intelligence to detect human presence and simply detect the movement of objects. As a result, there are a lot of false alarms caused by falling branches or swaying foliage. The audios stored in the sensors will only be gathered rarely because the modules are positioned in remote areas and it takes at least half a day to travel there.

Literature Survey

The literature analysis was classified into two anti-poaching approaches, prevention and detection. The two categories of anti-poaching techniques are detection and prevention.

Even though it is practically difficult to satisfy all these mixed requirements without any compromise, an Anti-Poaching System should attempt to comply with the most important factors.

Table 1 summarizes the system requirements for an Anti-Poaching System. **Table 1.** Summary of requirements

Qualities	Description
Energy Efficiency	Energy saving capability of an anti-poaching technology is still up for a debate.
Deployment issues	Deployment difficulties include running power consumption, stealthiness to the surroundings, maintainability, and ease of deployment.
Robustness	An Anti-Poaching System (APS) should be robust to at least common technical faults
Scalability	The capability of an APS to seamless integrate additional number of devices with the system
Coverage	The potential of an APS to monitor full surveillance coverage of a certain protective region
Ethical and legal	The capacity of an APS to deal with moral values and to adhere to rules and laws, particularly those governing wildlife conservation

There are many different human detection algorithms found in literature. Typically, the algorithm detects humans by looking for certain distinctive qualities that humans have. For example, Tathe *et al* proposed a technique to detect person by implementing face and eye detection which are the important biometric features of person. On the other way, Joshi *et al* presented a human detection method based on explicit skin color space thresholding and minor motion detection. The approach is based on combined clue of skin color detection and relatively small human motion.

Sanoj *et al* proposed an automated thermal video surveillance system as vision approach of human detection and tracking. Human detection, tracking, and activity recognition are all part of this thermal imaging-based technique. Hadi *et al* proposed human detection technique using a fusion of thermal and depth images for occlusion handling. Thermal image bounding box coordinates are used to determine the region of interest.

Sensor types	Pro's	Con's
Radar	Radar Has a greater range and doesn't need a clear line of sight; monitoring the target and estimating its speed	because of its dynamic nature, lacks stealth; is susceptible to obstructions like precipitation and foliage; Radar signature can be decreased by intruders; costly
Magnetic	metal item detection, such as for vehicles or guns	Very short range
Acoustic	Long range; economical	various acoustic properties present in various environments; extensive vocal repertoire
Ultrasonic	Long range; affordable	Clothing and vegetation often absorb ultrasonic sound.
Optical	Long range; target recognition	Require line of sight; expensive
Infrared and Thermal	potential for nighttime target detection	Target detection is challenging in hot situations
Radio Frequency	requires no line of sight; excellent stealth	require underground cables along the perimeter and have a small volumetric range.
Motion	Possibility to classify intrusion type on fences or structures; economical	Range limited to physical structure that sensors are attached to
Seismic	High level of stealth	Range and quality of seismic measurements is different for each environment (soil type)
Chemical	It is possible to utilise this to identify targets and track stolen goods.	does not stop the killing of animals and may disturb animals
Animal Sentinels	Large volumetric range and excellent sensitivity,	Numerous sensors are required, and deployment challenges including power utilization and collaring

Table 2: Comparisons between sensor technologies.

Table 2 lists the various types of sensors used for detection along with their benefits and drawbacks.

Besides thermal, infrared and visible cameras, Pyroelectric infrared (PIR) sensor can also be used for human detection such as in the system put forwarded by Linhong *et al.* PIR sensors are widely used in surveillance system due to its minimal cost, reduced power consumption and non-contact characteristics. But PIR detectors are not able to detect stationary human. They are also sensitive to interference by non-human infrared sources and the false alarm rate is high.

For anti-poaching application, the system should be able to work during day and night times. Since there is a large variation in the illumination conditions, the captured images may not be sufficient for the detection of fine details of human characteristics such as eyes, face or skin color. Therefore, this research proposed the use of thermal sensing, infrared imaging and frame differencing to detect moving human or animals.

The thermal sensor is capable of detecting heat released by human. Any abrupt changes in temperature will trigger the infrared camera to capture video frames and activate the image processing algorithm to detect and validate the human presence.

We will use our proposed technique to gather information from the infrared cameras. With the help of previously recorded picture or video frames or by capturing them live, we will train our machine learning model. Therefore, in this paper, we wish to take the initiative to develop a model employing technologies like machine learning and artificial intelligence in order to protect the wildlife from hunters or stalkers. The main contribution of this research is a detailed analysis of live recordings that shows the identity of a human or an animal in order to protect nature.

In this paper, a camera system that can detect people both during the day and at night can be created. The authorities may then be alerted using the identified data that will be delivered through a long-range alarm system.

Existing System:

The Existing System proposes the objective to recognize the foot sounds of various animals and humans in forest. The Existing System proposes a model that analyses the ambient jungle sounds generated by humans which may be foot sounds, vehicle sounds etc. and nature sounds by using machine learning algorithms. It works to examine the hazards to animals by humans in woods and inspect the safety for animals. Appropriate measures may be initiated or alarms may be raised once the presence of human is detected.

Disadvantages:

The Existing system does not work when humans make unreal sounds of animals during poaching.

Proposed System:

We propose an embedded human detection system for anti-poaching application will be used. The system will be equipped with an infrared camera. The infrared camera can capture images even in pitch black environment with the help of an infrared light source. A human detection algorithm based on frame differencing, filtering and validation was proposed in this paper.

Advantages:

- Provides security of the area while preventing and combating crime
- help track people's presence and activity within your facility
- Increased efficiency of security operators
- Detection of a broad diversities of threats
  - Different Intrusion Detection
  - Smart Object Detection

Implementation:

a. Importing required libraries:

The required libraries for this model are:

- tf_slim
- pywin32
- pycocotools
- pandas
- tf-models-official
- openCV
- lvis

All the required libraries are needed to install before the execution of the program.

b. Modules:

1. Image Acquisition
2. Candidate Generation
3. Candidate Filtering
4. Candidate Validation

1. Image Acquisition

In this application image acquisition is one of the main modules to procure the image from the sources.

- **Data Collection and Pre-Processing:**

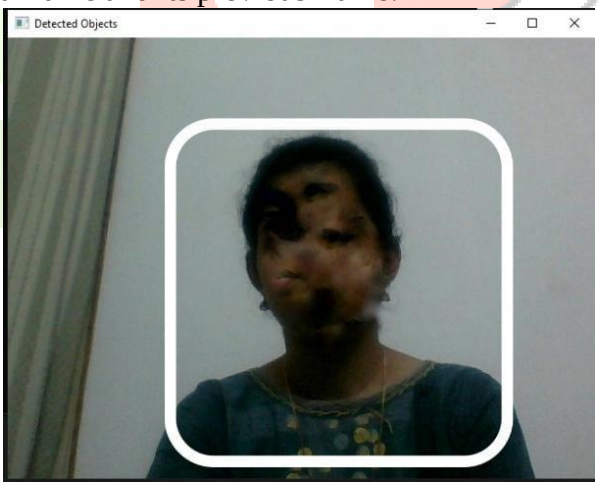
We collected the essential images that are needed to detect the poaching activities happening at that site. We can collect those images either by web scrapping or any image datasets that are available on the net.

After that we need to label or put the bounding boxes around the images. We can use any tools for that. If we download any image datasets that are available on the net then they are already labeled. We have used the tool named labelmg for that. Then we divide our collected data set into training data and testing data. We need to create our own classes by the labels we had given.

2. Candidate Generation

Candidate generating is about plotting bounding boxes around the predefined objects which need to be detected. These can also be used for video analysis because they give a visual representation of the size and shape of objects in video clips

This has done by using frame differencing to identify moving objects in the image frames. The process of candidate generation consists mainly of two steps: frame difference method to identify foreign objects and segmentation by thresholding the image to obtain the hotspots. Frame difference method is a method that finds moving objects such as human by using difference between images of a frame and its previous frame.



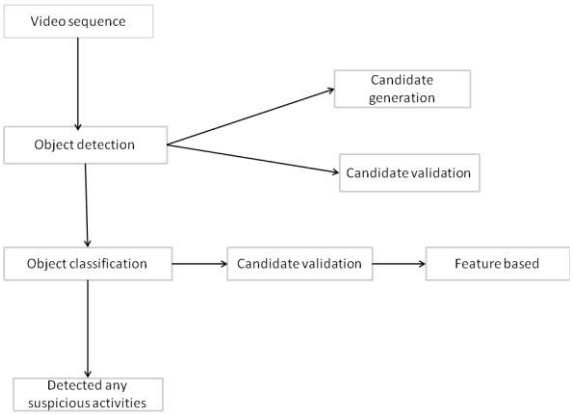
3. Candidate Filtering

The process of candidate filtering consists of removing the unwanted objects and focusing the predetermined objects those need to be get detected.

Figure explaining the orientation property

System Design:

ARCHITECTURE DIAGRAM:



CLASS DIAGRAM

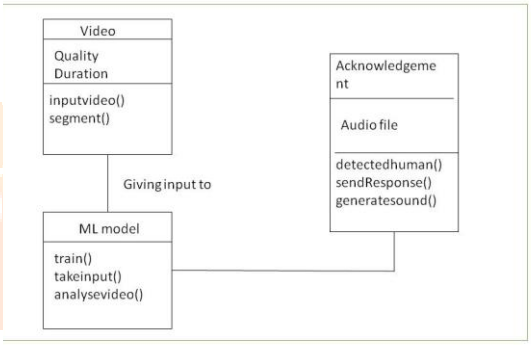


Fig: Class Diagram.

SEQUENCE DIAGRAM

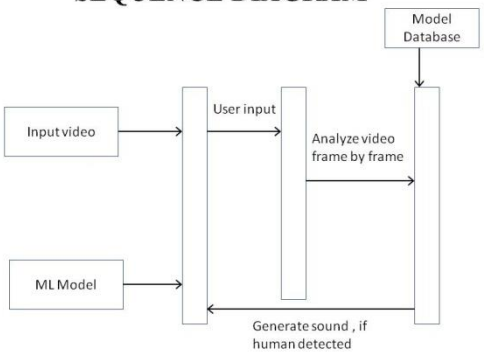


Fig: Sequence Diagram

4. Candidate Validation:

The process of candidate validation is based on machine learning approach whereby EfficientDet object detection algorithm is used. In EfficientDet: Scalable and Efficient Object Detection incorporated a novel bi-directional feature network (BiFPN) and new scaling rules, EfficientDet achieves state-of-the-art accuracy while being up to 9x smaller and utilizing a great deal less computing than earlier state-of-the-art detectors. Generally, object detectors have three main components: a backbone that extracts features from the given image; a feature network that takes multiple levels of features from the backbone as input and outputs a list of fused features that represent salient characteristics of the image; and the final class/box network that uses the fused features to predict the class and location of each object. Human candidates selected from candidate filtering stage are fed to a classifier for final classification into either a human or nonhuman class.

c. Output Response:

The live video camera records all the activities happening at that site and if any such poaching activities or any intruders found, it detects those and immediately acknowledges the concerned officer by ringing the alarm**.**

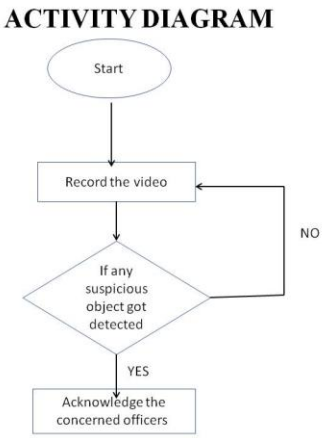
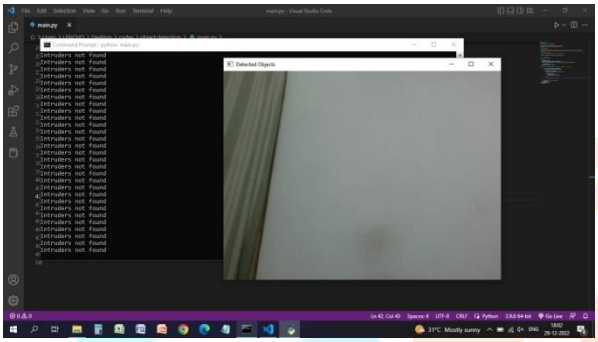


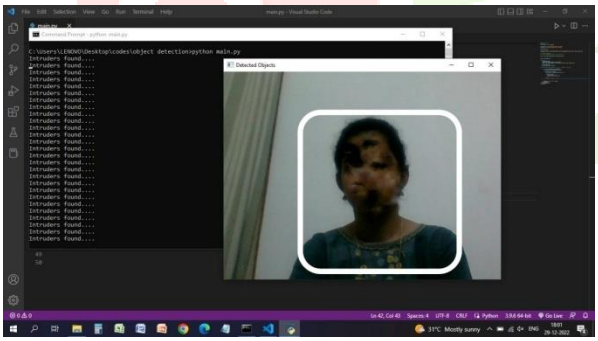
Fig: Activity Diagram

Output Screenshots:

- **Case I:** If no suspicious activity found.



- **Case II:** If any suspicious activity found.



Applications:

This model can also be used for so may object detection tasks like

- Vehicle Detection
- Security Systems
- Image search
- Driver less cars etc.

Conclusion:

If we look at the conventional reasons why wildlife animals are suffering, poaching stands out as one of the key causes that results in an unbalanced chain and contributes to the extinction of species. This is especially true when we consider the fact that wildlife habitat and species around the world are in crisis. To resolve this problem, we are developing a video based anti-poaching application. A human detection algorithm based on frame differencing, filtering and validation was proposed in this paper. Thus, if any human gets detected by the model, then the model immediately acknowledges the patrolling officer by ringing an alarm.

Future Enhancements:

This model uses EfficientDet detection model. We can use better and recent object detection models for faster and accurate results. We can also send messages to the concerned officers instead of ringing the alarm.

References

1. Vijay NS1, Anti-Poaching Detection System For Forests, International Advanced Research Journal in Science, Engineering and Technology, Impact Factor 7.105□□Vol. 9, Issue 3, March 2022
2. ICPAP 2022: 16. International Conference on Poaching and Anti-Poaching, October 27-28, 2022 in Lisbon, Portugal
3. V.Zope, T. Dadlani,A. Matai, P. Tembhurnikarand R. Kalani, "IoT Sensor and Deep Neural Network based Wildfire Prediction System,"2020 4th International Conference on IntelligentComputing and Control Systems (ICICCS),Madurai, India, 2020
4. A divya, T. Kavithanjali, p. Dharshini "IOTenabled forest fire detection and early warningsystem" in 2019 proceeding of internationalconference on systems computation automationand networking (ICSCAN) pondicherry, India
5. Mrs.P.Madhavi, SK. Razeen, SK. Nowshad, Y.Susmitha, M. Sweety" IOT based Anti-poachingalarm system for trees in forests".InternationalJournal of Emerging Technologies and InnovativeResearch (JETIR), ISSN:2349-5162, Volume - 6,Issue 4, April 2019.
6. Jayaram K, Janani K, Jeyaguru R, kumaresh,Muralidharan N " Forest fire alerting system withGPS co- ordination using IOT"in 2019 5thinternational conference on advanced computingand communication systems (ICACCS)combaore, India, 2019 pp.488-491, DIO:10.1109/ICACCS 2019.8728383.

7. N. Shilpa, Ch. Sundharani, "IOT Based Anti- poaching of Trees", International Journal of Engineering and Advanced Technology (IJEAT),ISSN : 2249-8958, volume-8 Issue-5, June 2019,India
8. Sintov, N.; Seyranian, V.; Lyet, A. Fostering adoption of conservation technologies: A case study with wildlife law enforcement rangers. Oryx, 2018
9. Mr. Mr.V. Narasimman Asst.prof, Anand.M,Anandhakumar.c, Krishnan.T. "Design of WSNnode for forest trees against poaching" march2018, IJARSE (International Journal of AdvanceReseaech in Science and Engineering) volumneno.07, special issue No.(02), ISSN:2319-8354,chennai (India)
10. F. Fang, T. H. Nguyen, R. Pickles, W. Y. Lam, G. R. Clements, B. An, A. Singh, M. Tambe, and A. Lemieux. Deploying paws: Field optimization of the protection assistant forwildlife security. In IAAI, 2016.