IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, December 2023

Wild Animal Intrusion Detection

Prof. Umesh B. Pawar[1], Pandore Saiprasad[2], More Pallavi[3] , Surashe Sharda[4], Unwane Priyanka[5]
Assistant Professor, Department of Computer Engineering[1]
Students, Department of Computer Engineering[2,3,4,5]
SND College of Engineering and Research Center , Yeola, India
hodcomputer@sndcoe.ac.in[1] , saishpandore@gmail.com[2], pallavimore7928@gmail.com[3],
shardasurashe2@gmail.com[4], priyankaunwane80@gmail.com[5]

Abstract: *Animal Vehicle Collision, commonly called as roadkill, is an emerging threat to humans and wild animals with increasing fatalities every year. Amid Vehicular crashes, animal actions (i.e. deer) are unpredictable and erratic on roadways. This paper unveils a newer dimension for wild animals' auto-detection during active nocturnal hours using thermal image processing over camera car mount in the vehicle. To implement effective hot spot and moving object detection, obtained radiometric images are transformed and processed by an intelligent system. This intelligent system extracts the features of the image and subsequently detects the existence of an object of interest. The main technique to extract the features of wild animals is the Histogram of Oriented Gradient transform. The features are detected by normalizing the radiometric image and then processed by finding the magnitude and gradient of a pixel. As human populations expand and encroach upon natural habitats, conflicts between humans and wildlife become increasingly common. To mitigate the risks associated with wild animal intrusions into human settlements, an intelligent and proactive intrusion detection system is essential. This study proposes a novel approach to wild animal intrusion detection using deep learning techniques. The proposed system leverages Convolutional Neural Networks (CNNs) to analyze images captured by surveillance cameras placed in strategic locations. The deep learning model is trained on a diverse dataset of wildlife images to enable accurate identification and classification of different species. Transfer learning is employed to fine-tune the model for specific regions and scenarios, enhancing its adaptability and performance. Furthermore, the system integrates real-time image processing and edge computing to minimize latency and enable swift response to potential intrusions. The use of edge devices ensures that the intrusion detection system operates autonomously, reducing the need for constant human intervention. The effectiveness of the proposed approach is evaluated through extensive testing in real-world environments, including wildlife reserves, suburban areas, and agricultural landscapes. Performance metrics such as accuracy, precision, recall, and F1 score are employed to assess the system's ability to reliably detect and classify wild animal intrusions. The findings of this study demonstrate the feasibility and effectiveness of employing deep learning for wild animal intrusion detection. The proposed system not only enhances the safety of human populations but also contributes to wildlife conservation efforts by minimizing negative interactions between humans and animals. The scalability and adaptability of the system make it suitable for deployment in various geographic regions, thereby addressing the global challenge of human-wildlife conflicts.*

Keywords: Wild Animal Intrusion Detection System, Smart Protecting, Animal Detection , Precision Farms from Animals , Protection of Animals

I. INTRODUCTION

The Asian elephant aka Elephas maximus has been threatened over the time by several factors such as conflicts with humans, loss and fragmentation of habitat. Over of this breed of elephants lives in India, of which about 6300 elephants are found in the southern regions of India. Around two-third of them are located within or close to areas of high human interaction . This is due to the propulsion of industrial and agricultural developments impacted by the growing population and conversion of forest areas into human settlements .With the continuous expansion of human populations and urban development encroaching upon natural habitats, the interactions between humans and wildlife have become

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, December 2023

more frequent and often conflict-prone. Instances of wild animals intruding into human settlements pose significant risks to both human safety and the well-being of the animals involved. Traditional methods of addressing such issues often fall short in providing timely and accurate detection of these intrusions. In this context, the integration of advanced technologies, specifically deep learning, presents a promising solution for the development of an efficient Wild Animal Intrusion Detection System..The primary objective of this research is to harness the capabilities of deep learning, specifically Convolutional Neural Networks (CNNs), to create an intelligent and proactive system capable of identifying and classifying wild animals in surveillance imagery. By leveraging the power of deep learning, the system aims to overcome the limitations of traditional methods, offering a more accurate and adaptive approach to wildlife intrusion detection.

II. LITERATURE SURVEY

1.Paper Name:- Distributed Relay Pairing for Bandwidth Exchange Based Cooperative Forwarding.
Author Name:- Sang Hyun Lee.
Abstract:- This letter develops a distributed algorithm for relay pairing in bandwidth exchange (BE) based cooperative forwarding scenarios, where each node can delegate a fraction of its allocated resources to a neighboring node as an incentive for relaying. Determining the relay pairs that maximize the overall network utility yields a non-bipartite matching problem, which incurs a considerable computational load when implemented in a centralized way. To resolve this challenge, we use a message-passing framework to develop an efficient distributed solution. Simulation results verify that the proposed algorithm outperforms existing approaches

2. Paper Name:- Internet of Things based Wild Animal Infringement Identification, Diversion and Alert System.
Author Name:- Muneera Begum H, Janeera.D.A.
Abstract:- In places with high population and human mobility, intrusion of wildlife is lethal for humans as well as the animals. Due to the diverse nature of movement and physical sizes of wild animals, it is a challenging talk to track these animals or perform surveillance. As a solution to this issue, this paper proposes a system that can help in identification of intrusion of wild animals at agricultural farms by means of Internet of things and a Wi-Fi based wireless microcontroller unit. Prototyping is performed using Energia IDE for transmission of information to the forest officer from the transmitter node. Pillars consisting of an electronic unit with buzzer, vibration sensor, laser detector, laser diode, RF transceiver and ultra low power microcontrollers are placed at the corners of the field. On infringement, an alert message is transmitted by the Wi-Fi module. An animal database is used for testing of the proposed system. The forest officer is alerted by means of a Python server. Prevention of casualties in areas where there is a higher rate of interaction between humans and wild animals is enabled through this system.

3. Paper Name:- Intelligent System for Detection of Wild Animals Using HOG and CNN in Automobile Applications**.**
Author Name:- Yuvaraj Munian
Abstract:- Animal Vehicle Collision, commonly called as roadkill, is an emerging threat to humans and wild animals with increasing fatalities every year. Amid Vehicular crashes, animal actions (i.e. deer) are unpredictable and erratic on roadways. This paper unveils a newer dimension for wild animals' auto-detection during active nocturnal hours using thermal image processing over camera car mount in the vehicle. To implement effective hot spot and moving object detection, obtained radiometric images are transformed and processed by an intelligent system. This intelligent system extracts the features of the image and subsequently detects the existence of an object of interest (i.e. deer). The main technique to extract the features of wild animals is the Histogram of Oriented Gradient (HOG) transform. The features are detected by normalizing the radiometric image and then processed by finding the magnitude and gradient of a pixel.

4. Paper Name:- Animal Web: A Large-Scale Hierarchical Dataset of Annotated Animal Faces
Author Name:- Muhammad Haris Khan1, John McDonagh2, Salman Khan1
Abstract:- Several studies show that animal needs are often expressed through their faces. Though remarkable progress has been made towards the automatic understanding of human faces, this has not been the case with animal faces. There exists significant room for algorithmic advances that could realize automatic systems for interpreting animal faces.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, December 2023

Besides scientific value, resulting technology will foster better and cheaper animal care. We believe the underlying research progress is mainly obstructed by the lack of an adequately annotated dataset of animal faces, covering a wide spectrum of animal species.

5. Paper Name:- Estimating the Population of Large Animals in the Wild Using Satellite Imagery: A Case Study of Hippos in Zambia's Luangwa River..
Author Name:- John M. Irvine1 , Joshua Nolan1 , Nathaniel Hofmann1 , Dale Lewis2
Abstract:- Degradation of natural ecosystems as influenced by increasing human activity and climate change is threatening many animal populations in the wild. Zambia's hippo population in Luangwa Valley is one example where declining forest cover from increased farming pressures has the potential of limiting hippo range and numbers by reducing water flow in this population's critical habitat, the Luangwa River. COMACO applies economic incentives through a farmerbased business model to mitigate threats of watershed loss and has identified hippos as a key indicator species for assessing its work and the health of Luangwa's watershed. The goal of this effort is to develop automated machine learning tools that can process fine resolution commercial satellite imagery to estimate the hippo population and associated characteristics of the habitat. The focus is the Luangwa River in Zambia, where the ideal time for imagery acquisition is the dry season of June through September. This study leverages historical commercial satellite imagery to identify selected areas with observable hippo groupings, develop an-image-based signature for hippo detection, and construct an initial image classifier to support largerscale assessment of the hippo population over broad regions. We begin by characterizing the nature of the problem and the challenges inherent in applying remote sensing methods to the estimation of animal populations. To address these challenges, spectral signatures were constructed from analysis of historical imagery. The initial approach to classifier development relied on spectral angle to distinguish hippos from background, where background conditions included water, bare soil, low vegetation, trees, and mixtures of these materials. We present the approach and the initia

III. PROBLEM STATEMENT

This research aims to address the critical gap in existing wildlife intrusion detection methods by harnessing the potential of deep learning. By doing so, we seek to develop a system that not only enhances human safety but also contributes to wildlife conservation efforts by minimizing harmful interactions and promoting coexistence. The proposed solution aims to overcome the limitations of traditional approaches, providing a scalable and adaptable framework for deployment in various geographical contexts. Through this study, we aspire to pave the way for a more effective, autonomous, and technologically advanced approach to mitigating human-wildlife conflicts, ultimately contributing to the sustainable cohabitation of human and animal populations in our evolving landscapes. The problem at hand is the need for a proactive and intelligent system capable of swiftly detecting and responding to wild animal intrusions. The limitations of existing methods include a reliance on human vigilance, which is prone to error and delay, and an inability to adapt to the dynamic nature of wildlife behaviors and habitats. The urgency of this problem is further compounded by the continuous expansion of urban areas, increasing the likelihood of encounters between humans and wildlife. Through this study, we aspire to pave the way for a more effective, autonomous, and technologically advanced approach to mitigating human-wildlife conflicts, ultimately contributing to the sustainable cohabitation of human and animal populations in our evolving landscapes.

IV. PROPOSED SYSTEM

Multiple Detection Scales: YOLOv3 divides the input image into a grid and performs object detection at three different scales. This allows it to detect objects of various sizes effectively. Darknet-53 Architecture: YOLOv3 uses a neural network architecture called Darknet-53 as its backbone. This architecture is a deep convolutional neural network that helps in feature extraction. Anchor Boxes: YOLOv3 utilizes anchor boxes to improve localization accuracy. Anchor boxes are predefined bounding boxes of different sizes and aspect ratios, which helps the model predict the dimensions and positions of objects more accurately. Feature Pyramids: YOLOv3 incorporates feature pyramids to handle objects at different scales. This helps in detecting small and large objects within the same image. Improved Training: YOLOv3 benefits from improved training techniques, which makes it more accurate and reliable in object detection tasks

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, December 2023

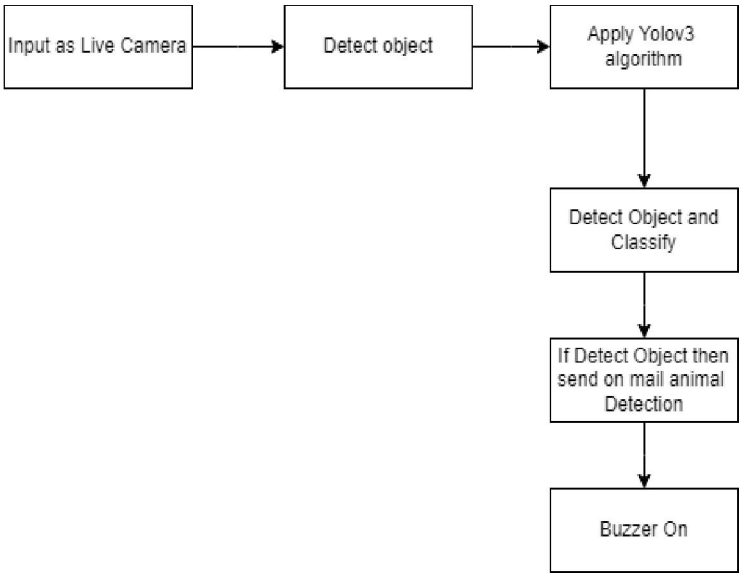

Fig. Wild Animal Intrusion Detection

V. ADVANTAGE

1. Wildlife Conservation :
The primary advantage is in wildlife conservation. The system helps in monitoring and protecting wildlife habitats by detecting and preventing potential threats from human activities, poachers, or other disturbances.

2. Early Warning System :
Provides an early warning system to alert authorities or wildlife conservationists when there is a potential intrusion. This allows for timely intervention to prevent harm to both animals and humans.

3. Reduced Human-Wildlife Conflict :
Helps in reducing incidents of human-wildlife conflict by identifying the presence of animals near human settlements. This enables authorities to implement proactive measures to avoid conflicts.

4. Efficient Monitoring :
Offers a more efficient and automated method of monitoring large areas, which might be challenging or impractical to cover manually. This is especially crucial for remote or vast wildlife reserves.

5. Real-Time Data and Alerts :
Provides real-time data and alerts, enabling quick response times. This is crucial for addressing immediate threats or emergencies in wildlife habitats.

VI . CONCLUSION

We introduce a large-scale, hierarchical dataset, named AnimalWeb, of annotated animal faces. It features faces from diverse animal species while exploring different orders. Each face is consistently annotated with landmarks around key facial features. Benchmarking AnimalWeb under two novel settings for face alignment, employing current method, reveals its challenging nature. We observe that methods for human face alignment relatively underperform for animal faces. This highlights the need for specialized and robust algorithms to analyze animal faces. We also show the applications of the dataset for face detection and fine-grained recognition. Our results show that it is a promising experimental base for algorithmic advances.

REFERENCES

[1] Peter N Belhumeur, David W Jacobs, David J Kriegman, and Neeraj Kumar. Localizing parts of faces using a consensus of exemplars. IEEE Transactions on Pattern Analysis and Machine Intelligence, 35(12):2930–2940, 2013. 2

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, December 2023

[2] Alain Boissy, Arnaud Aubert, Lara Desir ´ e, Lucile ´ Greiveldinger, Eric Delval, Isabelle Veissier, et al. Cognitive sciences to relate ear postures to emotions in sheep. Animal Welfare, 20(1):47, 2011. 2
[3] Adrian Bulat and Georgios Tzimiropoulos. How far are we from solving the 2d & 3d face alignment problem?(and a dataset of 230,000 3d facial landmarks). In Proceedings of the IEEE International Conference on Computer Vision, pages 1021–1030, 2017. 2, 6
[4] Xavier P Burgos-Artizzu, Pietro Perona, and Piotr Dollar. ´ Robust face landmark estimation under occlusion. In Proceedings of the IEEE International Conference on Computer Vision, pages 1513–1520, 2013. 2, 3
[5] Xudong Cao, Yichen Wei, Fang Wen, and Jian Sun. Face alignment by explicit shape regression. International Journal of Computer Vision, 107(2):177–190, 2014. 2
[6] Timothy F Cootes, Gareth J Edwards, and Christopher J Taylor. Active appearance models. In European Conference on Computer Vision, pages 484–498. Springer, 1998. 2
[7] Jia Deng, Wei Dong, Richard Socher, Li-Jia Li, Kai Li, and Li Fei-Fei. Imagenet: A large-scale hierarchical image database. In 2009 IEEE Conference on Computer Vision and Pattern recognition, pages 248–255. Ieee