WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Smart Wildlife Alert System Using Hybrid Deep Learning to Monitor Animal Activity

[1]M. Siranjeevi, [2]R. Praveen, [3]A. Kathiravan, [4]Mrs. R. Saranya (AP/CSE)

[1]Computer Science and Engineering, Paavai Engineering College (Anna University Affiliated) Namakkal, India
DOI: https://doi.org/10.55248/gengpi.5.0524.1129

ABSTRACT:

The Smart Wildlife Alert System (SWAS) is a sophisticated solution designed to mitigate human-wildlife conflicts and conserve biodiversity by leveraging advanced technology. Human-wildlife conflicts pose significant challenges globally, leading to economic losses, property damage, and threats to both human and animal safety. SWAS integrates various technologies such as sensors, cameras, and artificial intelligence to detect and monitor wildlife activity in vulnerable areas. The system employs a network of sensors strategically placed in wildlife habitats to detect movement and sound patterns associated with animal presence. These sensors are equipped with environmental monitoring capabilities to collect data on factors like temperature, humidity, and vegetation density, providing valuable insights into wildlife behaviour and habitat conditions. Upon detecting wildlife activity, the sensors trigger cameras to capture images or videos of the animals, which are then analysed using machine learning algorithms to identify species and behaviour. The Smart Wildlife Alert System represents a significant advancement in wildlife management and conservation, offering a proactive and technology-driven approach to mitigate human-wildlife conflicts. By facilitating early detection and response to wildlife activity, SWAS aims to minimize negative interactions between humans and animals while promoting coexistence and sustainable biodiversity conservation.

Keywords Smart, Wildlife, Alert System, Hybrid Deep Learning, Animal Activity

I. INTRODUCTION:

Human-wildlife conflicts have become increasingly prevalent as human populations expand into natural habitats, leading to habitat fragmentation, loss of biodiversity, and threats to human safety and livelihoods. Traditional approaches to wildlife management often rely on reactive measures, resulting in significant challenges in mitigating conflicts effectively. To address these challenges, the Smart Wildlife Alert System (SWAS) represents a pioneering solution that harnesses the power of technology to proactively detect and respond to wildlife activity in real-time. SWAS leverages a combination of sensor networks, artificial intelligence, and communication systems to monitor wildlife habitats and detect signs of animal presence. By deploying motion sensors, acoustic sensors, and camera traps strategically across vulnerable areas, SWAS continuously collects data on wildlife movements, behaviours, and habitat conditions. These sensors are equipped with advanced capabilities to detect subtle cues such as movement patterns, sounds, and environmental changes associated with wildlife activity. The Smart Wildlife Alert System not only provides early warning of potential conflicts but also facilitates proactive interventions to mitigate risks and prevent negative interactions between humans and wildlife.

II. EXISTING SYSTEM:

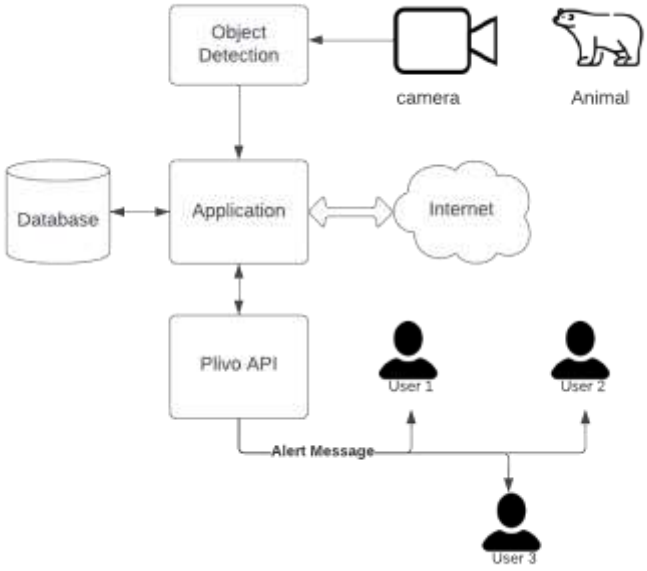
The existing system for wildlife activity monitoring often relies on manual observation, camera traps, or basic sensor networks. Manual monitoring is labour-intensive and may not cover extensive areas effectively. Camera traps and sensors, while automated, may lack the difference between various animal behaviours accurately. The need for a more intelligent and automated system becomes crucial, especially in areas where human-wildlife conflicts are prevalent.

Camera trap networks are widely used in wildlife monitoring and alert systems. These systems consist of motion-activated cameras deployed in strategic locations to capture images or videos of passing wildlife. Acoustic monitoring systems use specialized microphones or sensors to detect wildlife vocalizations, such as calls, chirps, or roars. By analysing acoustic data in real-time, these systems can identify species-specific vocalizations and generate alerts when target species are detected. GPS tracking and telemetry systems enable the tracking and monitoring

III. PROPOSED SYSTEM:

The proposed system suggests using a smart technology called Hybrid Deep Neural Networks, which is like a super smart computer program. It learns a lot about how animals behave by looking at a ton of pictures and data. This smart system would work in real-time, quickly recognizing if animals are doing something unusual and sending instant alerts to keep people informed and safe. By combining artificial intelligence and sensor technologies, the proposed system aims to significantly improve the precision and responsiveness of wildlife activity monitoring, contributing to enhanced safety measures and conservation efforts.

One of the primary advantages of the proposed system is its ability to detect wildlife activity at an early stage. By using advanced sensor technologies and real-time data processing algorithms, the system can identify wildlife intrusions as soon as they occur, allowing for timely intervention and mitigation of potential risks. The use of sophisticated data analysis techniques, such as machine learning and pattern recognition algorithms, enables the system to achieve high levels of detection accuracy. By distinguishing between different typeswildlifeand environmental factors, the system minimizes false positives.



Block Diagram of Proposed System

COMPONENTS REQUIRED:

- Alert System
- Real Time Detection
- Data Collection
- IoT Devices
- Camera System
- Training Data

IV. PROJECT DESCRIPTION:

1. CAMERA

The Nest Cam Indoor is a versatile and reliable indoor security camera designed to provide peace of mind and enhanced surveillance capabilities for your home. With its high-definition video recording capabilities, you can enjoy clear and crisp footage of your indoor spaces. Whether it's day or night, the camera's night vision feature ensures that you can monitor your home even in low-light or dark conditions.

- High-Quality Video
- Night Vision

- Motion and Sound Detection
- 24/7 Live Streaming
- Integration with Nest Ecosystem

Fig.No.1.1 Monitoring Camera

2. APPLICATION PROGRAMMING INTERFACE (API)

Wildlife Insights API: Wildlife Insights is a platform developed by Google Cloud and several conservation organizations. It offers an API that provides access to a vast database of camera trap images and associated metadata for training machine learning models to detect and identify wildlife.

Azure Cognitive Services: Microsoft's Cognitive Services include computer vision APIs that can be used to analyse images and detect objects within them, including wildlife. By integrating these APIs into a custom application, you can build a wildlife alert system that automatically detects and alerts when certain species are detected in images or videos.

Fig.No.2.1 SYSTEM API(PLIVO)

3. DATABASE MANAGEMENT

Effective data collection lies at the core of a smart wildlife alert system database management system. It begins with strategic deployment of sensors, cameras, and GPS collars in wildlife habitats, considering factors such as species behaviour and habitat characteristics. These sensors, ranging from motion detectors to environmental monitors, capture data at predetermined intervals, ensuring a comprehensive view of the ecosystem. Data quality control measures, including sensor calibration and remote monitoring, guarantee the reliability of the collected information

- Data Collection
- Data Organization
- Real-time Processing
- Alerting Mechanisms
- Security, Security

4. PYTHON

Python is an ideal choice for developing a smart wildlife alert system using deep learning due to its versatility, ease of use, and robust ecosystem of libraries such as TensorFlow and Porch. Deep learning algorithms, particularly convolutional neural networks (CNNs), excel at extracting intricate patterns from large datasets, making them well-suited for tasks like wildlife detection and classification**.**

Python enables seamless integration of various deep learning frameworks such as TensorFlow and PyTorch, allowing researchers to efficiently train sophisticated models on vast amounts of data. With Python, developers can easily preprocess large datasets, implement state-of-the-art neural network

architectures, and fine-tune models to detect and classify animals in real-time footage. Moreover, Python's vibrant community fosters collaboration and innovation

Fig.No.4.1 PYTHON

5. OBJECT DETECTION

A smart wildlife alert system leveraging object detection techniques is a vital tool in the conservation arsenal, offering real-time monitoring and protection for endangered species and their habitats. This system begins with the collection and annotation of diverse datasets, capturing various wildlife species in different environmental conditions

Through preprocessing and augmentation, the data is prepared for training, where a chosen object detection model undergoes fine-tuning on this curated dataset. The trained model is then integrated into a monitoring framework, continuously analysing live video feeds or images to detect and classify wildlife species. Alerts are triggered when specific animals are identified or when unusual behaviours are observed, enabling swift response from conservationists or park rangers. Through iterative improvement and deployment, this system evolves to meet the challenges of safeguarding wildlife populations, contributing to their conservation efforts with precision and efficiency.

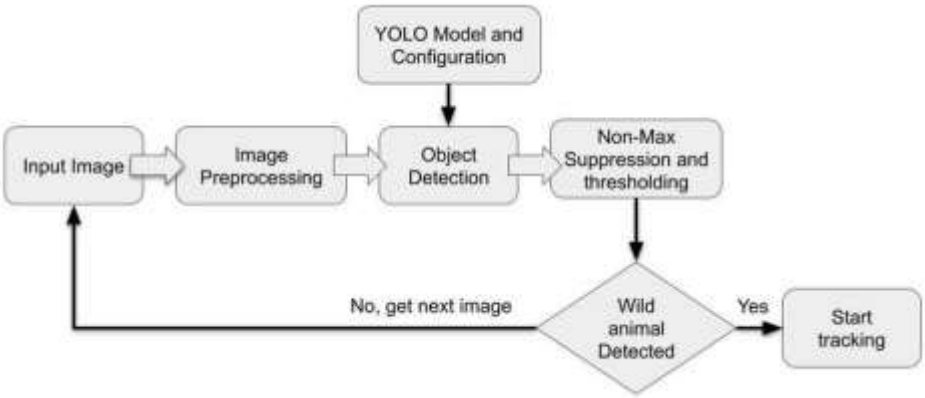


Fig.No.5.1 OBJECT DETECTION PROCESS

V. RESULT AND DISCUSSION:

- Data Collection: Describe the dataset(s) used, including the sources, size, and characteristics of the data.
- Model Architecture: Present the architecture of your hybrid deep learning model, including any pre-processing steps, feature extraction techniques, and the integration of different deep learning approaches.
- Performance Metrics: Define the evaluation metrics used to assess the performance of your system. These may include accuracy, precision, recall, F1-score, etc
- Experimental Results: Provide the results obtained from training and testing your model. Include tables, graphs, or visualizations to illustrate the performance across different metrics
- Performance Analysis: Interpret the results obtained from your experiments. Discuss the strengths and weaknesses of your model in terms of its ability to accurately detect and classify animal activity.
- Comparison with Baselines: If applicable, compare the performance of your hybrid deep learning model with other existing approaches or baselines. Highlight any improvements or areas where your system outperforms others.

- Robustness and Generalization: Evaluate the robustness of your system by discussing its performance under different conditions, such as varying lighting conditions, weather, or types of wildlife.
- Limitations: Identify any limitations or challenges encountered during the development and testing of your system. This could include issues related to data quality, model complexity, or computational resources
- Future Directions: Suggest potential avenues for future research or improvements to your system. This could involve refining the model architecture, incorporating additional data sources, or exploring alternative deep learning techniques.
- Real-world Applications: Discuss the practical implications of your research and how the smart wildlife alert system could be deployed in real-world scenarios to benefit conservation efforts and wildlife management

VI. FUTURE SCOPE:

The development of a smart wildlife alert system leveraging hybrid deep learning techniques for the detection and monitoring of animal activity presents an innovative solution with significant potential for conservation efforts and ecosystem management. Grounded in extensive research and data collection on wildlife behaviour patterns, habitats, and environmental variables, this project aims to pioneer a novel approach to wildlife monitoring. By defining clear objectives, including the identification of target animal species and the specific activities of interest such as feeding, mating, and migration, the project lays a solid foundation for the subsequent phases. The core of the endeavor lies in the design and implementation of a hybrid deep learning architecture, seamlessly integrating various neural network models to effectively capture the complexity of animal behaviour. Extensive data preprocessing techniques, encompassing noise removal, format standardization, and feature extraction, ensure the optimization of the collected data for model training. Through iterative model training and optimization, employing diverse architectures, hyperparameters, and optimization strategies, the project strives to achieve superior accuracy and performance in animal activity detection. Integration with sensor networks deployed across wildlife habitats enables real-time data acquisition, feeding into a sophisticated monitoring and alert system. This system, empowered by deep learning algorithms, analyzes incoming sensor data to detect and classify animal activities, providing timely alerts to wildlife researchers, conservationists, and park rangers. A user-friendly interface facilitates data visualization and interpretation, empowering stakeholders to make informed decisions for wildlife conservation and management. Rigorous testing, validation, and continuous improvement efforts ensure the reliability, scalability, and effectiveness of the smart wildlife alert system in diverse environmental conditions. Ultimately, this project represents a pioneering endeavor at the intersection of artificial intelligence and conservation science, poised to revolutionize wildlife monitoring practices and contribute significantly to the protection and preservation of global biodiversity.

VII. CONCLUSION

The proposed Smart Wildlife Alert System using hybrid deep learning has the potential to revolutionize wildlife monitoring. This innovative system offers several key advantages:

- Enhanced Monitoring: Continuous, large-scale monitoring with minimal manpower.
- Improved Accuracy: Reduced human error through high-accuracy animal detection and classification.
- Real-time Response: Faster response times to critical situations due to immediate alerts.
- Scalability: Easy adaptation to different monitoring needs.

By leveraging the power of deep learning, this system can significantly contribute to:

- Mitigating Human-Wildlife Conflict: Real-time alerts can prevent potential conflicts between people and animals.
- Combating Poaching: Early detection of suspicious activity can aid in curbing poaching attempts.
- Informing Conservation Efforts: Valuable data on animal populations and behaviour can guide effective conservation strategies.

The successful implementation of this system can pave the way for a future where humans and wildlife can coexist more harmoniously, ensuring a healthier planet for all. The Smart Borewell Child Rescue System holds immense pledge in mollifying pitfalls associated with borewell incidents, offering a comprehensive and intelligent result to enhance child safety. As technology continues to evolve, the proposed system exemplifies the transformative eventuality of integrating wireless monitoring and AI in securing lives, particularly in critical situations that demand nippy and informed responses. Its perpetration has the implicit to save lives and significantly ameliorate the issues of borewell-related extremities, contributing to a safer and further secure terrain for children and communities.

VIII. ACKNOWLEDGEMENT:

Certainly, acknowledging the support and contribution of Paavai College of Engineering, particularly the teaching and non-teaching staff of the Department of Computer Science and Engineering, is essential. Additionally, expressing gratitude to our parents, friends, and all those who have provided direct or indirect support for this research is imperative.

IX. REFERENCE:

[1] N. Banu Priya, S. Saranya, Rashmi Jayakumar, Rashmi Swaminathan, Sanchithaa Hari Kumar, Sukitha Palanisamy “Animal Detection Using Deep Learning Algorithm”, JCR 2020.

[2] S Jeevitha, Dr. Venkatesh Kumar, "A Review of Animal Intrusion Detection System", May-2020.

[3] Prethveraj, Lecturer Umayal, Senior Lecturer Saravana Selvan, Prethveraj, Lecturer Umayal, Senior Lecturer Saravana Selvan, 2021.

[4] Aibin Abraham, Bibin Mathew, Devika Panikkar, Jaya John, "Wild Animal Intrusion Detection System using YOLO", IJISRT 2023.

[5] Naveen Kumar R, "Iot Based Wild Animal Intrusion Detection System And Early Forest Fire Detection", IRJMETS 2022.

[6] Mindaugas Knyva, Darius Gailius, Gintautas Balciunas, Darius Pratašius, Pranas Kuzas, Aiste Kukanauskaite, "IoT Sensor Network for Wild-Animal Detection near Roads", 2023.

[7] M N Rithvik, Pragati Agrawal, Mrs. Mona, "Wildlife Detection System using Deep Neural Networks", IRJET 2022.