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Survey and Monitoring of Forest by the Classification of Various Animal Species

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Abstract: Computers are now an essential part of people's lives, as they are used to accomplish all of human job with greater accuracy and efficiency. Visual scene analysis is a high-level computer vision task that acquires knowledge from videos or digital images. Object detection is a branch of computer vision and image processing concerned with detecting items of various classes (animals, humans, and automobiles) in photos and movies. Car detection, face detection, picture retrieval, and video surveillance are some of the well-researched applications of object detection. This study focuses on the many image and video-based object recognition technologies that can be used to support varied contexts. This review focuses on examining the many image and video-based object identification technologies that can be used to serve varied contexts. The primary goal of this study is to investigate various picture and video-based objects. Detection methods for detecting and addressing object detection difficulties in photos and videos. This publication contains information on extensive information about numerous object detection algorithms in a variety of situations. Finally, there are analogies drawn for In diverse picture and video settings, different object detection approaches are used. Lives of animals are valuable. As global citizens, we must work to ensure the survival and development of animals in order to maintain the ecosystem's balance and stability. Wildlife monitoring collects data on wildlife species, numbers, habits, quality of life and habitat conditions to aid researchers in understanding the status and dynamics of wildlife resources and to serve as a foundation for effective wildlife resource protection, sustainable use and scientific management. Continuous hunting has resulted in the extinction of many animal species and the government has enacted legislation and is undertaking surveys to conserve certain species. Conducting surveys is a difficult undertaking, especially if don't have the necessary resources are not available. Conducting a survey is a difficult task, especially without the help of technology. The implementation of a Species Classification wireless camera is being done to address this. The smart camera is used in conjunction with phython-based programming that incorporates a Tensor Flow model that has been pre-trained. Some species are difficult to locate, and even when they are, determining their classification can be difficult. Varied species present in various locations appear in various sizes, forms, colours, and angles from a human perspective. In order to better conserve and preserve species, a better choice of technique for identifying and classifying them must be made.

Keywords: LIDAR, FSP, SVM, CNN, Forest stand,UWB,SIFT,SURF.

I. INTRODUCTION

Animal habitat utilization, population, demography, poaching occurrences, and migration patterns all require wildlife monitoring. Motion-sensitive camera traps, radio tracking, wireless sensor network tracking, and satellite tracking have all been introduced to monitor wild animals. Currently, animal identification and recognition remain a difficult task, and there is no single method that can provide a study and effective answer in all instances [1].

Due to their commercial availability, equipped features, and ease of deployment, camera traps are popular for monitoring wild animals. The rapid development and widespread availability of essential information technologies, along with the availability of portable devices such as digital cameras and smart phones, led in a multitude of articles proposing. However, machine learning software is becoming increasingly user-friendly, allowing users without a strong expertise in computer science to apply the latest algorithms to their own issues and datasets. However, a fundamental understanding of the applied technologies, as well as some effort to familiarize with them, is still essential.

Endangered species protection necessitates ongoing monitoring and information regarding their presence, location, and behavioral changes in their habitat. A framework for automated animal species recognition using image categorization is urgently needed. However, because to a considerable number of intra-class variability, viewpoint change, lighting illumination, conclusion, background clutter, and distortion, species recognition from gathered photos is a difficult task.

Manual data processing from massive volumes of photos and video captured is time-consuming and costly. It can also assist us in understanding animal behavior as well as the growth and flow of vegetation and animals in the forest.

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Figure 1: Animal species classification [1].

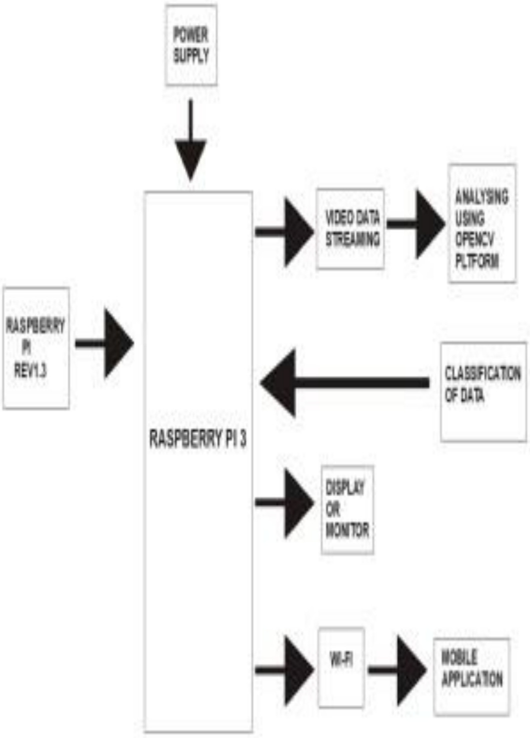

Figure 2: Block Diagram for animal species classification [2].

The Block diagram for classification of animals is as shown in the figure 2. The camera captures the video, the video is converted into frames and the moving object is detected from the frames. Using the animal detection algorithm animals are detected from the frame. The detected animal is classified to find which animal was present in the frame. The classified images are as shown in figure 2.

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Computer analysis and interpretation of visual scenes is one of the tasks. Visual scene analysis, which falls under the subject of computer vision, is a high-level activity that acquires knowledge from videos or digital images. Image data (such as digital images, a sequence of photos, multi-view images, and so on) and information are used in computer vision to make choices. Object detection from multiple scenes is a key need for many computer vision applications. The human visual system is an example of a system that can easily distinguish one class of object from another. Object detection is frequently utilised in applications such as autonomous data analysis, Human-Computer Interaction (HCI), automated processes, smart vehicles, and wild animal identification. Object detection has applications in the areas of car detection, face detection, image retrieval, and video surveillance, according to several studies. This paper's main contribution is an examination of various object identification systems in varied situations. Due to a vast variety of real-life applications, animal identification is a major and evolving field. Different methods of detection for the animal and warning systems will be used to demonstrate animal welfare on roadways or in residential areas. Preventing animal vehicle collisions on roads, preventing dangerous animal invasions in residential areas, and being aware of targeted animal locomotive behaviour are all requirements that are extremely important in real life. Animal detection, tracking, and identification are the three fields that all of these technologies can be reduced to. The initial area of animal detection was used in a variety of real-world applications.

II. Literature Review

Using global patterns of pixel motion, Fang, Y., et al. [1] proposed a method for moving animal detection. The motion vectors of every pixel in the dataset, where animals move against the background, were computed using optical flow algorithms. Using a pixel velocity threshold, a coarse segmentation removes the majority of the background. Another threshold was used to the divided regions to filter out bad candidates who could be from the background.

G. Jasko et al. [2] demonstrated a system that can detect a variety of large wild animals in traffic scenarios. A camera with monocular colour vision was used to collect visual data. The goal was to evaluate the traffic scene image, detect the regions of interest, and appropriately classify them in order to find animals on the road who could cause an accident. Using intensity, colour, and orientation data, a saliency map was created from the traffic scene image. The map's prominent areas were thought to be areas of interest. A database was created using a vast number of photos of different four-legged wild creatures. From them, relevant features were selected and used to train Support Vector Machine (SVM) classifiers.

H. Nguyen et al. [3] explored a major impediment to scientists and ecologists monitoring animals in open spaces.A framework was introduced to build automatic animal recognition in the wild, with the goal of an automated wildlife monitoring system, based on current breakthroughs in deep learning algorithms in computer vision.

In a computer vision-based animal recognition system, Parham, J., et al. [4] presented a 5-component detection pipeline. This method yielded a set of novel annotations of interest (AoI) with labels for species and viewpoints. The goal of this method was to improve the accuracy and automation of animal censusing investigations while also providing better ecological data to conservationists.

S. Matuska et al. [5] proposed a new object recognition method based on hybrid local descriptors. This method combines several techniques (SIFT - Scale-invariant feature transform, SURF - Speeded Up Robust Features) and is divided into two parts. On a few photographs from the dataset, the usefulness of the provided hybrid approaches was proved. The wolf, fox, brown bear, deer, and wild boar are among the major animals found on Slovak territory.

For intrusion detection, Xue, W., et al. [6] used a wireless sensor network based on UWB technology. A convolutional neural network (CNN) was used to automatically learn the features of Ultra-wide band (UWB) signals by studying their characteristics. For human classification, the SVM or Softmax classifier was used.

C. Zhu and colleagues [7] proposed a two-channeled perceiving residual pyramid network for automatic wild animal detection in low-resolution camera-trap images. This paper employed a two-channeled perceiving model as input to train a network and extracted depth cue from the original images. For integrating the complete information and creating full-size detection results, three-layer residual blocks were used. In addition, employing dataset design principles, a new high-quality dataset with the complicated natural habitat was created.

I Boon Tatt Koik et al. (2012) Survey proposed to detect, track and recognize animals in some of these branches. Research based on animal detection is helpful for many real life applications. Animal detection methods are useful in researching the targeted animal's locomotive behavior and also in preventing hazardous animal intrusion in residential areas. First is the issue of lighting, where a sudden shift of lighting impact can influence the efficiency of identifying the presence of

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animal intrusion mostly in indoor applications. In addition, the detection may also be affected by the luminance issue with day-to-night modifications in the natural environment at the outdoor monitoring scheme. Furthermore, the algorithms may read a moving background, such as wind leaves, as a foreground image, whereas sedentary animals that remain fixed for an extended length of time may be regarded as a background image. Visual descriptors were utilised to create object representations, and SVM was used to classify them (SVM).

The device input for the Convolutional Neural Network was proposed by Tibor TRNOVSZKY et al. (2017). (CNN). In comparison, well-known image recognition techniques such as Primary Binary Pattern (LBPH) Histograms and System Valve (SVM) Linear Discriminate Analysis are used in this approach (LDA). The main goal is to compare the general recognition accuracy of PCA, LDA, LBPH, and SVM to that of the current CNN approach. The wild animals database is generated for the experiments. There are 500 different subjects in this database (5 classes/100 photos each class).

People can better understand, manage, and use forests if they have timely and accurate stand distribution, according to Haoming Wan et al., [4], who describe about the curve matching-based method called the fusion of spectral image and point data (FSP) algorithm design is explored to fuse high spatial resolution images, time series images, and LiDAR data for forest stand classification using the flow chart given in figure 3.

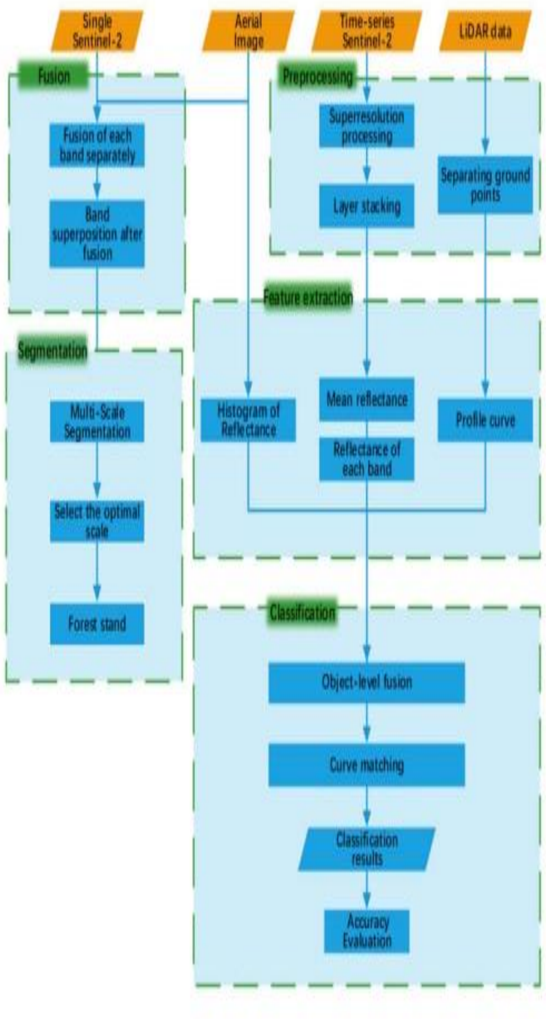

Figure 3: Flow chart of fusion Spectral image and point method [4].

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Eric T. Psotaet al. (2019) developed a fully convolutional neural network that can detect the location and orientation of numerous pigs in a group. The network's purpose is to present an image space for each part of the pig, as well as a way f or linking them together to construct entire instances. The network is trained using a new dataset with 2000 pictures and 24,842 pig cases. The dataset is separated into two parts: a training set and a testing set, with the testing set divided into two parts: one with photographs portraying the same surroundings as the training set, and the other with images depicti ng new environments not represented in the training set.

III.METHODOLOGY

Within a natural reserve or forest region, cameras are placed in a grid at specific spots. The images are sent into the Raspberry Pi module as input. These photos are passed through the layers of a convolutional neural network. CNN learns the essential aspects of the photos in the dataset that can be used to identify them. When compared to the photos provided in the dataset, each layer filters out a probable outcome. Finally, the animal is identified, and an alarm is sounded if the detected animal is harmful.

The algorithm for species detection has following steps, Image/video acquisition from the camera algorithm. Make a frame-by-frame conversion of a video. Store each animal's image in a database that will be utilised as a training set for our algorithm. Compare the collected frames from the camera to the database. The image is read using the imread function, and then preprocessing is applied to it. Perform Blobs are detected on the frame and matched with photos from the training database. Also, see if it matches or not. Whether or not that animal's identity is wanted. For each animal to be identified, an array is formed and a software is written. We use if statements to increment count when it is identified to get the count. Step 9: We get the results of the Livestock Identification and Reckoning. Figure 4 shows the Raspberry pie interface for the species detection.

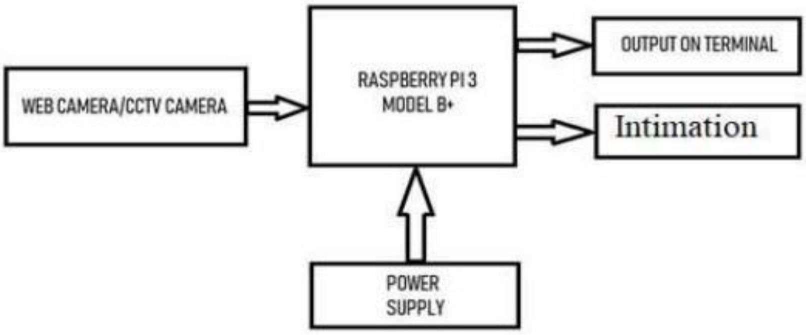

Figure 4: Raspberry pie interface for the Species detection.

RESULTS AND DISCUSSION

The results of identified species are as shown in the figure 5 a,b.

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Figure 5 a,b: Results of animals species detection.

CONCLUSION

The Wild Animal Detection and Counting System depicted in the block diagram is used to detect and count wild animals. Small and big scale livestock farmers can use the Raspberry Pi to make the system portable and economical. The flowchart depicts the process of detecting specific animals and counting them in accordance with the results. The image is first recorded with a camera and then transformed to a grey scale image so that it can be compared to the values in the current data set. Existing solutions such as bar code scanners and manually counting animals are inefficient and costly. To overcome these obstacles, we created a real-time system that executes such a task efficiently and at a low cost. With advancements in portable computers like the Raspberry Pi in terms of memory, processing speed, and networking capabilities, the accuracy and performance of this system can be significantly improved. For example, with the current specifications of the Raspberry Pi 3 b+, the deep learning algorithm uses a lot of resources, which slows down performance and reduces accuracy to a certain level, and the temperature on the processor reaches a certain level.

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REFERENCES

[1] Al-Araj, R.S.A., Abed, S.K., Al-Ghoul, A.N. and Abu-Naser, S.S., 2020. Classification of animal species using neural network. International Journal of Academic Engineering Research (IJAER), 4(10).
[2] Fang, Fang, Brenden E. McNeil, Timothy A. Warner, Aaron E. Maxwell, Gregory A. Dahle, Earl Eutsler, and Junli Li. "Discriminating tree species at different taxonomic levels using multi-temporal WorldView-3 imagery in Washington DC, USA." Remote Sensing of Environment 246 (2020): 111811.
[3] Jaskó, György, Ion Giosan, and Sergiu Nedevschi. "Animal detection from traffic scenarios based on monocular color vision." In 2017 13th IEEE International Conference on Intelligent Computer Communication and Processing (ICCP), pp. 363-368. IEEE, 2017.
[4] Nguyen, Huong Thi Thanh, Trung Minh Doan, Erkki Tomppo, and Ronald E. McRoberts. "Land Use/land cover mapping using multitemporal Sentinel-2 imagery and four classification methods—A case study from Dak Nong, Vietnam." Remote Sensing 12, no. 9 (2020): 1367.
[5] Biewer, Jacob N., Jorge Velez-Juarbe, and James F. Parham. "Insights on the dental evolution of walruses based on new fossil specimens from California." Journal of Vertebrate Paleontology 40, no. 5 (2020): e1833896.
[6] Matuska, S., Hudec, R., Benco, M., Kamencay, P., Zachariasova, M.: A novel system for automatic detection and classification of animal. In: 2014 ELEKTRO, pp. 76–80 (2014)
[7] Wu, Zhiqiang, Xianwen Ren, Li Yang, Yongfeng Hu, Jian Yang, Guimei He, Junpeng Zhang et al. "Virome analysis for identification of novel mammalian viruses in bat species from Chinese provinces." Journal of virology 86, no. 20 (2012): 10999-11012.
[8] Xu, Beibei, Wensheng Wang, Greg Falzon, Paul Kwan, Leifeng Guo, Guipeng Chen, Amy Tait, and Derek Schneider. "Automated cattle counting using Mask R-CNN in quadcopter vision system." Computers and Electronics in Agriculture 171 (2020): 105300.

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[9] Koik, Boon Tatt, and Haidi Ibrahim. "A literature survey on animal detection methods in digital images." International Journal of Future Computer and Communication 1, no. 1 (2012): 24.
[10] Psota, Eric T., Mateusz Mittek, Lance C. Pérez, Ty Schmidt, and Benny Mote. "Multi-pig part detection and association with a fully-convolutional network." Sensors 19, no. 4 (2019): 852.
[11] Wan, Haoming, Yunwei Tang, Linhai Jing, Hui Li, Fang Qiu, and Wenjin Wu. "Tree species classification of forest stands using multisource remote sensing data." Remote Sensing 13, no. 1 (2021): 144.