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Classification of Various Animal Species for Forest Survey and Monitoring - A Review

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Abstract: 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 Survey is the Challenging undertaking, especially without the assistance of technology. To address this, Species Classification wireless camera implementation is carried out. The smart camera is combined with a phython based programming that includes a pretrained Tensor Flow model Some species are rare to find and even when they are, predicting their classification is challenging. From a human perspective, va rious species present in various settings appear in various sizes, shapes, colours, and angles. Superior choice of technique for detecting and classifying distinct species is to be carried out in order to better conserve and preserve them.

Index Terms **- LIDAR, FSP, SVM, CNN, Forest stand.**

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.

Figure 1: Animal species classification[1].

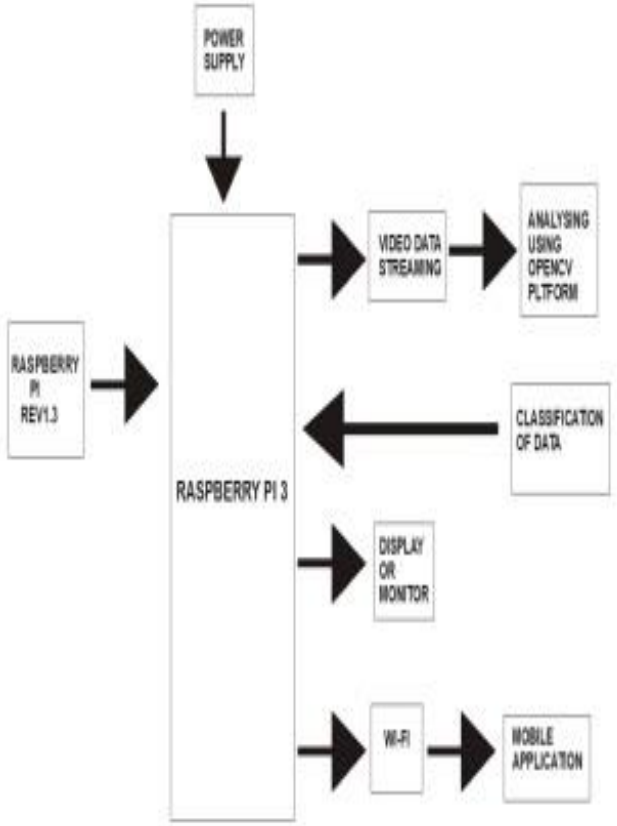

Figure 2: Block Diagram for animal species classification[2].

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.

II. LITERATURE REVIEW

Svetlana Illarionova et al., [3], provide information on how to use the existing library and work with the provided conditions that are relevant to the circumstances." Microsoft's Camera Traps project is the result of the searches. Mega Detector, a pretrained model for detecting whether an animal or person is present in an image, was released as a consequence of data collected from various Wild Life Cameras across the world.

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 2.

Boji, M.M. et al.[5] provide the first comprehensive assessment and standard for light field SOD, which has long been lacking in the saliency community. Previous light field SOD research, comprising ten classical models and seven deep learning-based models, is reviewed, followed by an examination of existing light fields, theory, and data formats.

The present state-of-the-art in automated identification is described by Jana Wäldchen et al. [6] as a starting point for academics interested in adopting fresh machine learning algorithms in the biological research. This document explains computer vision and the tensor flow library that is required to implement it. Here image based classification is also described as shown in the figure 4.

Obtaining and collecting information about species, according to Prof. Pralhad Gavali et al., [7], requires a lot of human labour and is a very expensive method. In this case, a dependable system that can analyse massive volumes of data regarding species while also serving as a helpful tool for researchers, government agencies, and others is required. As a result, knowing which special group an image of an animal belongs to requires species identification. Species identification is the process of determining which species belongs to which group based on a visual representation.

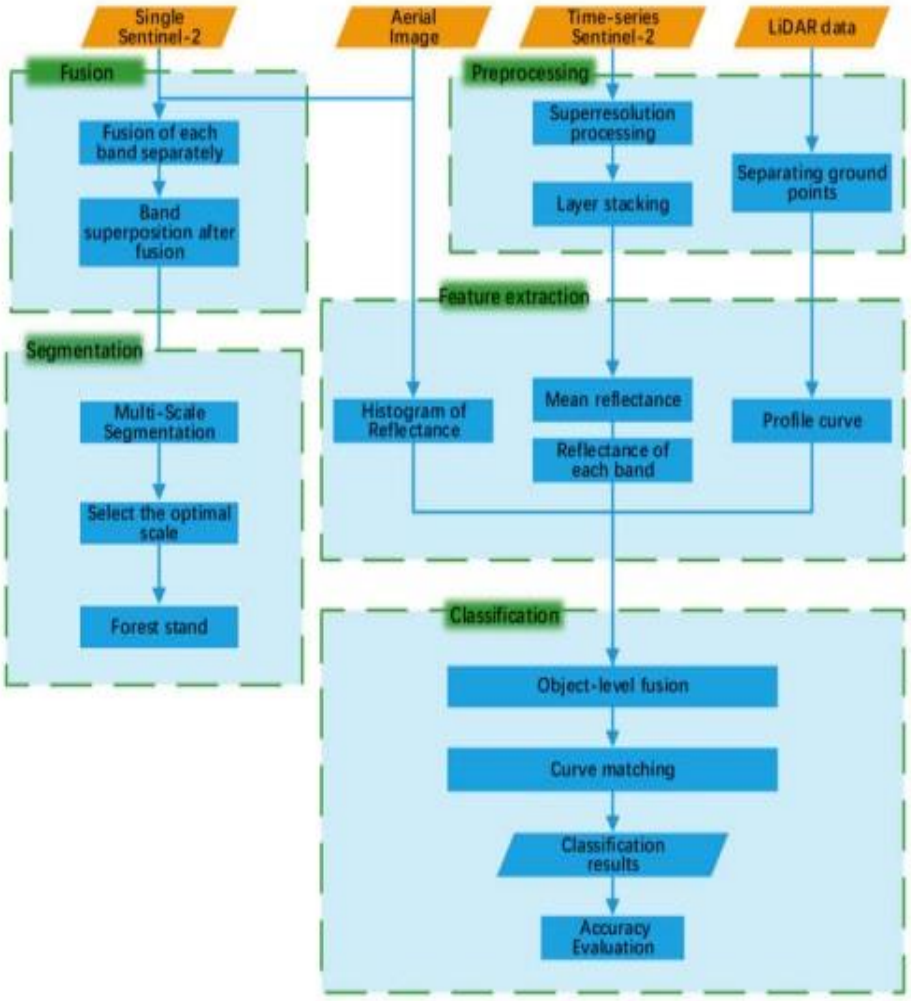

Figure 3: Flow chart of fusion Spectral image and point method [4].

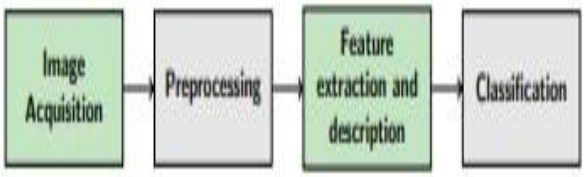

Figure 4: Image based classification[6].

Prof. Vijay Badrinarayanan et al. [8] described SegNet, a convolutional neural network architecture for semantic pixelwise segmentation. The basic trainable segmentation engine consists of an encoder network, a corresponding decoder network, and a pixelwise classification layer.

Using Airbrone LIDAR data and a better resolution satellite image, Hui L, et al. [9] describe CNN Classification of tree species: Spatial data on the tree species composition of forest and urban vegetation is crucial for forest conservation and urban management. The most often used classification techniques for tree species classification using remote sensing data are SVM (Support Vector Machine) and Random Forest.

According to Hooman Latifi et al. [10] for nature conservationists as well as forest and urban managers, spatially explicit information on tree species composition in managed and natural forests, plantations, and urban vegetation is valuable information that is typically required over broad spatial extents.

According to Keerthana et al. [11], the research focuses on the many picture and video-based object identification technologies that can be utilized to serve various situations. The main purpose of this research is to look at several image and video-based object detection methodologies for identifying and solving image and video-based object detection problems. This study examines the various object detection techniques and how they function in various situations.

The majority of the records (60 percent) used inadequate methods for identifying deer species, according to Pedro Henrique de Faria Peres et al.[12] The largest impact on woodland deer species is unreliable identification. More scientific rigour in data collecting is essential for conservation planning.

Iniyaa K K et al. [13], proposed a system based on Convolutional Neural Networks to detect animal species by the farmers so as to prevent the damage of various food crops.
Tinao Petso et al. [14], had described literature on a wide range of regularly used animal identification techniques, ranging from classic to cutting-edge approaches.

III. SUMMARY

The usage of wireless camera mentioned in the various research describes about the cost-effective monitoring and surveillance of the forest for the detection of various species. To detect the picture in frame, the smart camera that employs a python-based code that comprises of pretrained Tensor flow modules to match and map the image in frame with the model trained data is discussed. The module discussed can help researchers better understand animal behaviour and the growth and movement of flora and wildlife in the forest in the well defined method.

IV. CONCLUSION AND FUTURE SCOPE

FSP technique designed to synthesis high spatial resolution multispectral images, timeseries images, and LiDAR data is discussed. The approach for recognizing animal species using an image classification dataset and a Deep Learning algorithm (Unsupervised Learning) is also discussed. The FSP technique recovers significant information in the form of curves from three categories of data. For each stand, the average reflectance is computed for a single band of time series pictures, a reflectance curve is produced by stacking time series bands and a profile curve is generated from the point cloud LiDAR data. The fusion method based on curve matching classifiers is utilized for forest mapping. The performance of KL, CAM, and RSSDA, three curve matching classifiers is evaluated. Different forms of data offer different perspectives.
In the future scope messages to the people can also be sent warning them the presence of various different species so as to protect humans from danger and also to prevent animal species from external disturbance.

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