IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 4, April 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

9940 572 462 | 6381 907 438 | ijircce@gmail.com | www.ijircce.com

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104105 |

Animal Detection in Forest using Yolo Algorithm

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ABSTRACT: Over the last few years, there has been a steady rise in number of reported human-animal conflicts. While there are several reasons for increase in such conflicts, foremost among them is the reduction in forest cover. Animals stray close to human settlements in search of food and often end up raiding crops or preying on cattle. There are at times human causalities as well. Proficient, reliable and autonomous monitoring of human settlements bordering forest areas can help reduce such animal-human conflicts. A broad range of techniques in computer vision and deep-learning have shown enormous potential to solve such problems. In this paper, a novel, efficient and reliable system is presented which automatically detects wild-animals using computer vision. The proposed method uses the YOLO object detection model to ascertain presence of wild animals in images. The model is fine-tuned for identifying different entities – humans, and different types of animals (elephant, zebra, giraffe, lion and cheetah etc). Use of deep learning methods to classify images that contain entities of interest are gaining popularity. Deep Convolutional Neural Networks (DCNN) are known to be accurate, and outperform all other existing methods in the task of image classification. Once detected, based on the perceived in-formation, notifications are sent to alert the concerned authorities. The design of a prototype for the proposed solution is also described, which uses a computer system device equipped with cameras. The proposed method achieves an accuracy of 98.8% and 99.8% to detect animals and humans respectively.

I. INTRODUCTION

There have been increasing reports of wild animals entering villages or towns, especially in settlements surrounding forest areas, endangering human lives. Intrusions by animals cause huge losses, be it in terms of crop loss or cattle being attacked. Increasing human population leading to decreasing forest cover is one-off the leading causes for rise in human animal conflicts. Current methods to reduce such conflicts include installation of electric fences or have sentries watch for animals through the night. Electric fences cause severe injury to animals. Moreover, they require enormous initial investment and additionally have high maintenance costs. Recent developments in the field of computer science enables use of technology to create low-cost solutions to such problems. Computer vision is one such technology which could potentially solve most of the associated problems.

Hrushevsky et al. who submitted the winning entry for the ImageNet classification challenge, introduced a Deep Neural Network based solution for image classification. It is now considered a landmark achievement in computer vision, and has contributed to increased research in the field.

The main intent of this paper is to describe the design for a computer vision system, capable of detecting wild animals and tracking their movement. DCNNs could be leveraged to detect the presence of animals in the captured images.

In addition to detecting the presence of an animal, in order to effectively track them and monitor their actions, it is also necessary to localize the animals within the image. This is the task of object detection. Object detection systems predict regions of interest within images, and in addition classify entities within these regions. Thus object detection is the ideal choice for the system proposed in this project.

II. LITERATURE SURVEY

The section is organized into two categories – some systems for animal detection have been reviewed, followed by methods of animal intrusion detection and prevention.

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3.1.Animal Detection using Computer Vision

Describe a system for segmentation of animals from images captured through camera traps. The procedure employed uses a multi-level it-ergative graph cut to generate object region proposals and accurately recognize regions of interest. This is especially useful when the animal blends together with the background and is difficult to identify. These proposals segmented into background and foreground in the second stage. Feature vectors are extracted from each image using AlexNet architecture, and combined together with the histogram of oriented gradients (HOG) to generate Fisher vectors. The system obtained an accuracy of 82.1% for animal and species detection.

Use the Snapshot Serengeti dataset and apply deep-neural networks to detect and identify animals in camera trap images. The system consists of multiple parts a) detection stage (whether there is an animalia the image), b) species identification stage, c) information stage, where the network reports additional data such as the count and attributes of the animals(standing, resting etc.). An ensemble of nine models is used, and obtains a top-1accuracy of 99.4% for the species identification task, and the overall pipeline accuracy was around 93.8%.

A multi-stage pipeline for animal detection and recognition. The fundamental steps include animal classification, animal local-inaction and predicting animal characteristics, such as orientation. Animal local-inaction is based on the YOLO object detection model. The proposed system achieves an overall detection accuracy of 76.58% over 6 species.

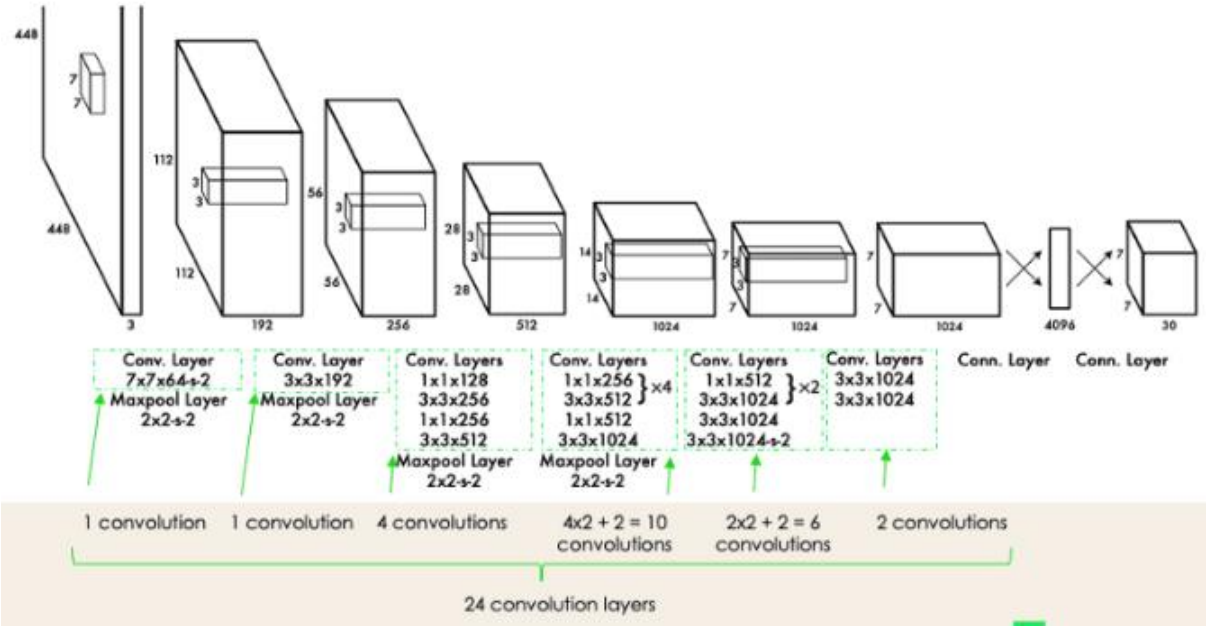

Fig1 Yolo Object Detection Process

Object detection is one of the classical problems in computer vision where you work to recognize *what* and *where* — specifically what objects are inside a given image and also where they are in the image. The problem of object detection is more complex than classification, which also can recognize objects but doesn't indicate where the object is located in the image. In addition, classification doesn't work on images containing more than one object.

YOLO is popular because it achieves high accuracy while also being able to run in real-time. The algorithm "only looks once" at the image in the sense that it requires only one forward propagation pass through the neural network to make predictions. After non-max suppression (which makes sure the object detection algorithm only detects each object once), it then outputs recognized objects together with the bounding boxes.

- YOLO is extremely fast
- YOLO sees the entire image during training and test time so it implicitly encodes contextual information about classes as well as their appearance.
- YOLO learns generalizable representations of objects so that when trained on natural images and tested on artwork, the algorithm outperforms other top detection methods.

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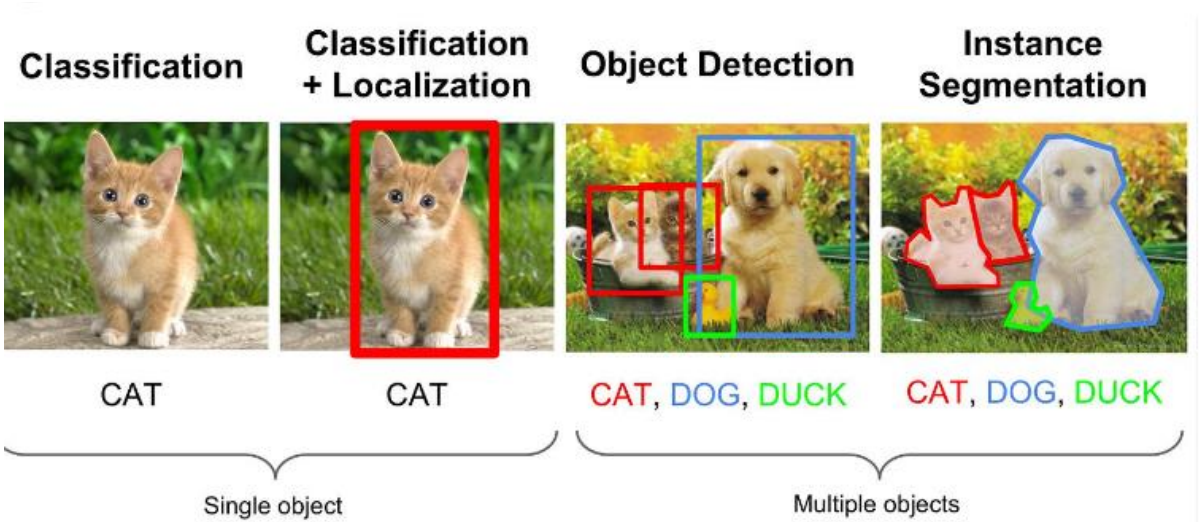

Fig2 Working of Deep Learning Algorithms in Image Processing

Methodology:

The model consists of three phases:

1) Capturing

First a trained dataset will be prepared, which consist of images in several thousand later using camera an image will be captured the captured image will be undergoing several process at first we would have image segmentation and background subtraction.

2) Filtering

Next the image will be undergoing 3x3 matrix for deeper analysis using CNN architecture YOLO perform image processing operation and recognition.

3) Displaying

As soon as the detection process starts the labeling box will be formed on the recognized image and accuracy rate will be provided.

The digital camera would capture the image whereas the capture image is also determined to be digital image available at digital format where the capture image which is in digital formats will be further send to analysis section which basically involves YOLO and CNN technology whereas YOLO and CNN is an image processing software built on higher level algorithms which involves image segmentation technology undertaken along with image extraction techniques performing analysis by comparing with trained dataset later after all this process animal classification and detection will be done and output is generated.

Implementation Details

The implementation of this project mainly works with the help of python language with deep learning algorithms deep learning has several layers for higher analysis are this layer are installed for identification process training using various API's, the kernel matrix will have a highest feature with regard to performing 3x3 image matrix formation we Here the image matrix formation is taken for further analysis which is consider to be the input which brings proper perspective view for the software algorithm to the better analysis which plays a vital role in deeper analysis for CNN to perform its operation.

Today internet has lot of open-source API like Open CV to perform image processing operation this will read the input image and generate certain details so we need to import certain lib for perform effective operation and provide the output.

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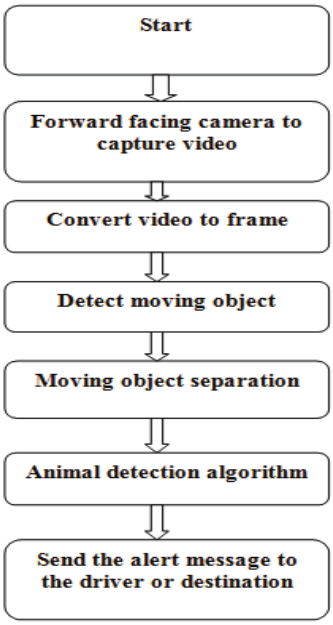

Fig 3: Flow Diagram

III. RESULT

Fig 4 Animal Detection System identifying Horse Image

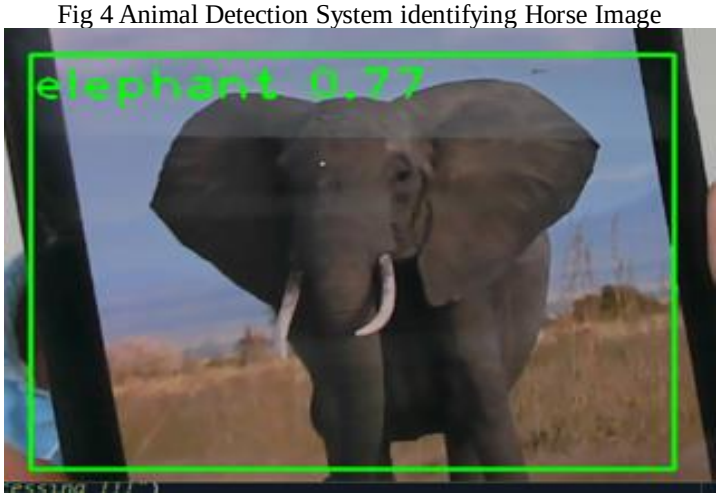

Fig 5 Animal Detection System identifying Elephant Image

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IV. CONCLUSION

The proposed system attempts to reduce human-animal conflicts by continuous and automatic monitoring of vulnerable areas using computer vision to detect animal intrusions. The intrusion detection pipeline consists of three stages – animal detection, animal tracking and user alerts and notifications. The proposed system is cost-effective and highly efficient, with an average accuracy of 98.8% in detecting and identifying animals in images. Although the prototype described in this paper is trained to recognize five different species of animals, it is easily extendable to detect and track other types of animals with sufficient training data. The choice of species can also be region specific, there by providing a unique edge over other existing solutions. Such a system if implemented on a large scale has potential to largely reduce causalities due to animal intrusions. The issue of yield destroying by wild animals has turned into a significant social issue in the work time. It requires dire consideration and a powerful arrangement.

Subsequently this project conveys an extraordinary social significance as it plans to resolve this issue..Thus we have planned a shrewd installed farmland protection and observation based framework which is minimal expense, and furthermore consumes less energy. This framework will likewise help them in accomplishing better harvest yields consequently prompting their monetary prosperity.

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Impact Factor: 8.379

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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