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Survey on - Crop Damage Prevention from Animals

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ABSTRACT: Crops in farms are many times ravaged by local animals or wild animals. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on fields 24 hours and guard it. So here we proposed automatic crop protection system from animals. It uses a TensorFlow API with coco dataset. The coco dataset can maintain all types of images and large dataset is supported. The SSD model which h is used for the object detection with coco dataset. This SSD is works faster than CNN. In this system, when the animal is detected it sends alert to the farmer through GSM modem (SMS) and sounds an alarm to move the animals away from the field. This ensures the complete safety of crops from animals thus protecting the farmer's loss.

KEYWORDS: R-CNN, SSD Model, GSM Modem, Machine Learning.

I. INTRODUCTION

Agriculture meets the food demands of the population and provides various raw materials for different industries. Interference of animals in agricultural lands causes a huge loss of crops. Crop damage due to raiding wild animals has become a major issue of concern these days. Animals like wild boars, macaques, porcupines, deer, monkeys and bears are extremely destructive and have also caused human casualties in certain occasions. Small farmers can even lose up to half of their yield to animals and they cannot take any harsh measures due to the strict wildlife laws. Human elephant conflict is rising intensely as elephants are a highly conflict prone wildlife species, especially in India. Thus, there is need for a system to detect any intrusion which can help the farmers to drive away these animals as soon as they learn about their intrusion. There are two types of mainstream object detection algorithms. Algorithms like R-CNN and Fast(er) R-CNN use a two-step approach. First to identify regions where objects are expected to be found and then detect objects only in those regions using convnet. On the other hand, algorithms like YOLO (You Only Look Once) and SSD (SingleShot Detector) use a fully convolutional approach in which the network is able to find all objects within an image in one pass (hence 'single-shot' or 'look once') through the convnet. The region proposal algorithms usually have slightly better accuracy but slower to run, while single-shot algorithms are more efficient and has as good accuracy.

The core of SSD is predicting category scores and box offsets for a fixed set of default bounding boxes using small convolutional filters applied to feature maps.
– To achieve high detection accuracy, we produce predictions of different scales from feature maps of different scales, and explicitly separate predictions by aspect ratio.
– These design features lead to simple end-to-end training and high accuracy, even on low resolution input images, further improving the speed vs accuracy trade-off.

Some measures are taken by the farmers by installing electrical fences to the farms, big flood lights in the farm and hiring guards. Installing an electrical fence is much costlier to equip huge farms 3 and kills so many animals, which is even illegal in certain places and affects the biodiversity. Other existing techniques also are not effective due to several reasons, cost being one of them. In this project, we proposed a new and cost-effective solution for agriculture security from animals. It is a proactive solution which gives alerts to the farmers when animals come near to the farms. It also causes certain siren to be played whenever any animals are detected and is directed towards the animal to scare them away. Here, we are implementing a solution that recognizes animals when it is captured on camera. If it is a wild animal GSM module send alert to the nearest forest area officers or cops. Even it is the night-time the animals can be detected by using Auto Day/Night on and off protocell LDR sensor switch.

II. LITERATURE SURVEY

1.In 2022 July 13th, Agnes, T. AntoTheepak, advised Animal movement detection along with differentiation and alert processing in farmlands. They said that every life on land depends on food for living. The source of major availability of food is agriculture. Farmers and agricultural lands are exposed to lot more difficulties currently. One among them is intruders in farm fields. Animal intruders cause a tremendous amount of destruction to crops on field. The proposed system helps in detecting large animal movements using frame differentiation in OpenCV. Motion detection algorithm helps in detecting the movements of animals. OpenCV deals with computer vision operations. Frame differentiation is used to fetch differences between still and movable frames. Working on with Movidius Neural compute stick connected to raspberry Pi which used to fetch the category of animal approaching using image classifier and corresponding actions could be taken on time. Once motion is detected and alert sound is generated and hence the owners could be made aware of happenings. Movidius stick is used to learn artificial intelligence at the edge. Other applications involve, motion detection in military boundaries.

2.In the year 2022 July 26th, K. Makanyadevi, M. Aarthi, P. Kavyadharsini, S. Keerthika& M. Sabitha proposed A Survey on Wild Creatures Alert System to Protect Agriculture Lands Domestic Creatures and People. In this paper wild animal ready for framework in ML is utilized to secure the property, fringe, and runway from wild creatures with enormous information study of a hazardous wild monster. Checking the exhibition of wild animals is utilized to secure the farmlands. In old ways of spotting creatures in paddy fields and residences embody crafted by regular eyes to notice the creature movement. It is not feasible for men to watch creature developments ceaselessly for the duration of the day. From where a desire of specific discovery of animals which penetrate appreciably in the rice fields and the agricultural lands of the individuals. The ways utilized for the prevalence of the creatures encapsulate division and item discovery strategies. This result requires difficulties in the development of returns and causes the ranch failure. This tosses back to ranchers destroying the land on account of incessant monstrosities by wild animals.

3. In the year 2022 march, Sathesh K. Vishnu; A. Yuvaneshwar; V. Vellaisamy; K. Gowthami Proposed Image Processing based Protection of Crops from wild animals using Intelligent Surveillance. Surveillance plays a major role in home, hospitals, schools, public places, farmlands etc. It helps us to monitor and prevent theft. To prevent unauthorized peoples, surveillance is important in farmlands. Traditional methods like human itself monitoring the whole field for long time to prevent the animals and it is difficult. So, there is a need for specialized detection of animals particularly like include segmentation and object detection process. Main intruders of agriculture are birds and animals, but most of the work is based on human intruders. So, object recognition-based intrusion detection is proposed in this work. Already predefined images and features of some animals are stored in image processor. When animal is intruding to the land the camera fixed at various places will capture it and send it to the processor for further processing. Feature extraction and matching of predefined and new image will be done through yolo based regression algorithm after that alarm will be produced and SMS will be sent to the owner of the land. So, this proposed system will really be helpful for the agriculture to increase yield.

4.In the year 2022 July 13th, Agnes, T. Anta Theepak published an article on Animal Movement Detection along with Differentiation and Alert Processing in Farm Lands.
    Every life on land depends on food for living. The source of major availability of food is agriculture. Farmers and agricultural lands are exposed to lot more difficulties currently. One among them is intruders in farm fields. Animal intruders cause a tremendous amount of destruction to crops on field. The proposed system helps in detecting large animal movements using frame differentiation in OpenCV. Motion detection algorithm helps in detecting the movements of animals. OpenCV deals with computer vision operations. Frame differentiation is used to fetch differences between still and movable frames. Working on with Movidius Neural compute stick connected to raspberry Pi which used to fetch the category of animal approaching using image classifier and corresponding actions could be taken on time. Once motion is detected and alert sound is generated and hence the owners could be made aware of happenings. Movidius stick is used to learn artificial intelligence at the edge. Other applications involve, motion detection in military boundaries.

5.Agriculture, the science and art of cultivating plants, plays a pivotal role in the evolution of a primary agricultural economy.
    More than 50% of the population in India depends upon farming. Hurdles concerning agriculture have significantly retarded the growth in this sector. The most significant obstacle incurred by the farmers is inefficient crop

management and crop raiding by external sources, especially the human-wildlife conflict. A cumulative approach including the application of "Internet of Things" and traditional farming techniques, along with methods to barricade crop destruction has been elaborately highlighted by way of integrated systems. Hence this proposed module targets at making agriculture smart by proposing a device detects the presence of any living being by using either PIR Sensor or Ultrasonic Sensor, especially animals around the land to be cultivated, along with smart irrigation control and real-time data analysis which is also inclusive of smart warehouse management parameters like- temperature, humidity and pressure measured by using (DHT22 Sensor and BMP180 Sensor). This data may either be visualized by using the Blynk Software or received in the form of messages through the GSM Module. To combat the ruckus caused by animals, detection of their presence along 6 with a laser security system has been provided in the proposed system. In the year 2022 may 31st ,HarneetNarula, Dr.Ajita Pathak says Efforts have been made to help the farmer in rectifying multiple issues at once in IOT Based Smart Agriculture and Animal Detection System.

6. In the year 2022 may, Soundharya M, Sri Raga Priya G, VejayaDurga V, Sushmitha M, Dr. N Kalpana had written an article "Farm protection from animals through Intelligence surveillance".

Monitoring plays a major role in many areas such as home, hospitals, schools, community centres, farms etc. It helps us to be careful where we are and to avoid theft and to provide evidence. In the case of lands or agricultural fields surveillance is very important to prevent unauthorized persons from entering the area as well as to protect the area from wildlife. Traditional methods of preventing paddy field include the use of an electric fence. It is impossible for humans to monitor the movements of animals continuously throughout the day. There is therefore a need for special discovery of animals especially entering paddy fields and farms. The methods used for animal husbandry include the process of classification and acquisition of property. The destruction of the paddy field and agricultural area leads to poor crop production and significant financial losses to owners. This system helps us to avoid such wildlife in rural areas and to provide operational monitoring.

7.Tushar Atkare, SnehalKhalkar, PallaviMandekar, Ganesh Kolhe and Anita Gawali had Proposed an article Wild Animal Detection in Farm using Image Processing and Machine Learning in the year 2022 November. The state-of-the-art technique for animal detection and alerting for crop protection with the goal of achieving high precision with a real-time performance in addition to overcome the disadvantages of the traditional system this computer vision based system will add more efficiency. In earlier, traditional system consists sensors and registers to identify the movement of object. Some human interventions are required to handle the traditional system; overcome those problems this Image processing-based system will work efficiently. The resulting system is fast and accurate, thus aiding those applications which require animal detection.

8.Nagashree K, DevadigaVarshiniVasantha, Deekshitha, Mehnaz, Aishwarya D Shetty Proposed Animal detection in farm.

AREA in the year 2021 July. In this article Animal attack in the farm area is considered as the major threat, which will reduce the amount of crop. The main reason for this is the expansion of cultivated land. Human-wildlife conflicts occur through crop raiding which is common in these days. The farmers in India face huge loss through natural calamities, animal attacks etc. The age-old methods practiced by the farmers are not efficient. It is practically impossible to appoint guards to monitor the farm area. The main aim of the project is to help the farmer to save the crops without harming the animals. The steps performed here is to protect the crops from animal attack by taking appropriate measure to keep the animal away by producing appropriate sound without killing or harming the animals. Thus, to reach our goal and solve the problem, we make use of machine learning technique to detect the animal entering into the farm area using convolutional neural network. Here, the entire farm area is monitored at regular interval of time through the camera, which helps to record the entire surrounding of the farm. Machine learning model is designed to detect the animal entering the farm and plays the appropriate sound to shoo an animal away from the farm such that the crops are prevented from damage. Different types of packages and concepts of the convolutional neural network is used to design the model to achieve the desired aim in the project.

9.In the year 2021 August, KBalakrishna, FazilMohammed, C.R. Ullas, C.M.HemaS .K.Sonakshi Proposed Application of IOT and machine learning in crop protection against animal intrusion.

Animal intrusion is a major threat to the productivity of the crops, which affects food security and reduces the profit to the farmers. This proposed model presents the development of the Internet of Things and Machine learning technique based solutions to overcome this problem. Raspberry Pi runs the machine algorithm, which is interfaced with the ESP8266 Wireless Fidelity module, Pi Camera, Buzzer, and LED. Machine learning algorithms like region-

based Convolutional Neural Network and Single Shot Detection technology plays an important role to detect the object in the images and classify the animals. The experimentation reveals that the Single Shot Detection algorithm outperforms than Region based Convolutional Neural Network algorithm. Finally, the 8 Twilio API interfaced software decimates the information to the farmers to take decisive action in their farm field.

10. Mr. Rajesh Kumar Bhavani proposed Animal detection in forms using open-source computer vision in the year 2021 July. In this paper an AI based surveillance system to detect and monitor the presence of any animal. A camera can be placed conveniently at location(s) where any possible animal might enter from. The system uses computer vision using OpenCV to process the feed from the camera. Pre-trained model Mobile Net SSD (Single Shot Detector) is used to detect the animals in the farms. The model is trained on MS COCO image dataset. A siren is fired on detecting an animal which can act as a deterrent to the animal. It can also notify the farmer so that he/she can take the concerned action as required in time.

III. REVIEW FINDINGS

1. A survey on IOT based Farm intrusion detection and prevention system, Application of IOT and machine learning in crop protection against animal intrusion, IOT based smart agriculture and animal detection system, Review of animal intrusion detection system, IOT based wild animal intrusion detecting system, all these proposed systems are IOT based and uses the sensors-It is difficult to place the sensors in the large field, all the farmers cannot afford the cost of the sensors so, in this system we are using cost effective methods.
2. Animal moment detection along with differentiation and alert processing in farm lands, Wild animal detection in farms using image processing and machine learning, A smart farm land using Raspberry Pi crop prevention and animal intrusion detection system- in these above existing systems the technologies used are time taking for image processing and classification so we are using single-short detector which produces the output fast and accurately, it also includes GSM modules and alerting system.
3. Wild animal detection in farm lands using SVM- in a system it takes shots in a regular interval of times it leads to miss the chances of detection of some animals. So that we added the live monitoring system.

IV.PROPOSED WORK WITH METHODOLOGY

We propose an AI based surveillance system to detect and monitor the presence of any animal. A camera can be placed conveniently at location(s) where any possible animal might enter from. Pre-trained model Mobile Net SSD (Single Shot Detector) is used to detect the animals in the farms. A siren is fired on detecting an animal which can act as a deterrent to the animal. It can also notify the farmer so that he/she can take the concerned action as required in time. The SSD approach is based on a feed-forward convolutional network that produces a fixed-size collection of bounding boxes and scores for the presence of object class instances in those boxes, followed by a non-maximum suppression step to produce the final detections. The early network layers are based on a standard architecture used for high quality image classification (truncated before any classification layers), which we will call the base network.

Single-Shot Detector (SSD): SSD has two components: a backbone model and SSD head. Backbone model usually is a pre-trained image classification network as a feature extractor. This is typically a network like ResNet trained on ImageNet from which the final fully connected classification layer has been removed. 18 We are thus left with a deep neural network that is able to extract semantic meaning from the input image while preserving the spatial structure of the image albeit at a lower resolution. For ResNet34, the backbone results in a 256 7x7 feature maps for an input image. We will explain what feature and feature map are later on. The SSD head is just one or more convolutional layers added to this backbone and the outputs are interpreted as the bounding boxes and classes of objects in the spatial location of the final layer's activations.
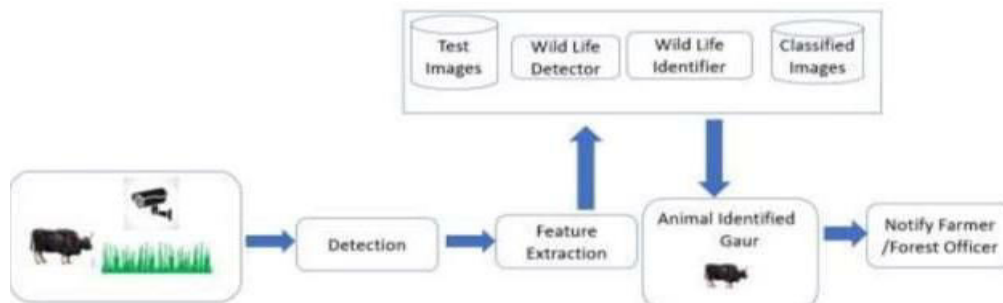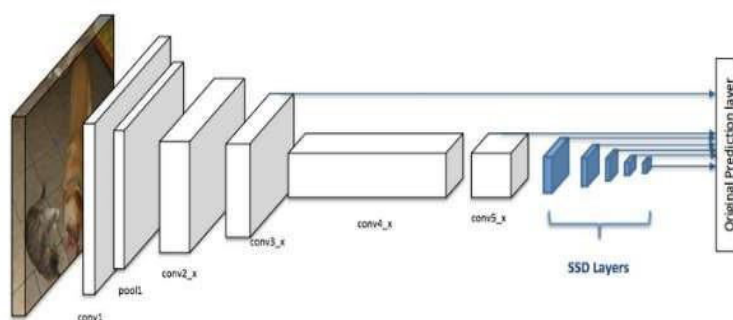
Fig. 1. Architecture Diagram of System

Fig-2 Architecture of a SSD detector

The auto on/ off LDR assist to capture the animals in night-time also. This sensor works based in the sunlight. If the light intensity is more the LDR sensor automatically turn off. When the outside light intensity decreases then the LDR will turn on light.

The images trapped based on moment. The images are sent to pre-processing. It is important to remove the noise and image segmentation can have done the clear image formation from any type of image. Image segmentation clean, filter the pictures and assign

labels to background and all the foreground regions.

V. COMPARISON WITH EXISTING SYSTEM

1. Although in the existing system alert message is present but no night time monitoring is done.
2. In the proposed system night time monitoring is done with the help of LDR sensor.
3. In the existing system images are captured in time intervals but in the proposed system continuous live monitoring is performed.
4. In the traditional system no live monitoring is present but in the proposed system continuous live monitoring is present.
5. In the traditional system alert message is sent to nearest forest area officers where as in the proposed system the alert message is send to farmer as well as nearest forest area officer.

VI.CONCLUSION

We have presented a smart farmland system for the wild animal detection and recognition. An efficient and accurate object detection has been an important topic in the advancement of SSD model. With the arrival of deep learning techniques, the accuracy for object and animal detection has increased extremely. The project aims to include state-of-the-art technique for animal detection and alerting for crop protection with the goal of achieving high precision with a real-time performance. In addition to overcome the disadvantages of the traditional system this computer vision-based system will add more efficiency. The resulting system is fast and accurate, thus aiding those applications which require animal detection. The experimental setup covers farm with LED fence connected to

Arduino. When any wild animal approaches the fence, the alarm is set off and image is captured. Python is used for wild animal recognition.

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