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SMART CROP PROTECTION SYSTEM

[1] Mr. Ch. Mahesh Babu, [2] Jella Saikiran,[3] Gantla Meghana, [3] Gollapally Srujan,[5] Pagadala Vishal
[1] Assistant Professor, Department of CSE, Sreyas Institute of Engineering and Technology, Telangana, India.
[1] maheshbabu.ch@sreyas.ac.in
[2,3,4,5] Department of CSE, Sreyas Institute of Engineering and Technology, Telangana, India
[2] saikiranjella0507@gmail.com , [3] meghanagantla2002@gmail.com ,[4] srujangsk1@gmail.com ,[5] Vishalkumarpagadala@gmail.com

Abstract
Crop damage caused by animal attacks is one of the major threats in reducing the crop yield. Crops in farms are many times ravaged by local animals like buffalos, cows, goats, birds etc. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. The existing systems mainly provide the surveillance functionality. They also need to take actions based on the type of animal that tries to enter the area, as different animals from entering such restricted areas. The other commonly used methods by the farmers in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous methods. Also, the farmers resort to the other methods by erecting human puppets and effigies in their farms, which is ineffective in warding off the wild animals, though is useful to some extent to ward off birds. So here we propose an AI based Scarecrow that protects the crops from wild animals with the help of scanning using camera, it detects the stray animals or birds and when it detects the stray animals or birds then it produces a sound of animal extermination. We make a program with the help of live video detecting object using yolov3, coco names, cv2 modules. This ensures complete safety of crops from animals causing damage to it.

Keywords: Webcam, Image acquisition module, Animal detection, Animal Tracking, Calculate Weight CFG, Animal Detection

INTRODUCTION

In agriculture one of the major social Problems that is existing in the present is the damaging of the crops by the wild animals. Some of the animals in South India that act as a threat to crops are deer, monkey, elephant and others. This problem must be attended immediately and an effective solution must be created and accomplished. Thus, this project aims to address this problem. Animal attacks in India are a common story nowadays. Due to the unavailability of any detection system these attacks destroy their crops. Due to lack of proper safety measures, these villagers are left helpless to their fate. Also the crops of villagers are destroyed due to frequent interference of animals. The crops and paddy fields cannot be always fenced. So the possibility of crops being eaten away by cows and goats are very much present. This could result in huge wastage of crops produced by the farmers. Animals such as deer, wild boars, rabbits, moles, elephants, monkeys, and many others may cause serious damage to crops.

LITERATURE SURVEY

Langarizadeh, M., & Moghbeli, F. (2016). Applying Naive Bayesian Networks to Disease Prediction: a Systematic Review. Acta Informatica Medica, 24(5), 364.This paper aims to review published evidence about the application of NBNs in predicting disease and it tries to show NBNs as the fundamental algorithm for the best performance in comparison with other algorithms. PubMed was electronically checked for articles published between 2005 and 2015. For characterizing eligible articles, a comprehensive electronic searching method was conducted. Inclusion criteria were determined based on NBN and its effects on disease prediction. A total of 99 articles were found. After excluding the

duplicates (n= 5), the titles and abstracts of 94 articles were skimmed according to the inclusion criteria. Finally, 38 articles remained. They were reviewed in full text and 15 articles were excluded. Eventually, 23 articles were selected which met our eligibility criteria and were included in this study.

- MachineLearningTechniquesforClassificationofDiabetesandCardiovascularDiseases.BerinaEtAl.
- The overview of machine learning techniques in classification of diabetes and cardiovascular diseases (CVD) using Artificial Neural Networks (ANNs) and Bayesian Networks (BNs). The comparative analysis was performed on selected papers that are published in the period from 2008 to 2017. The most commonly used type of ANN inselected papers is multilayer feed forward neural network with Levenberg-Marquardt learning algorithm.
- Automatic Diagnosis of Diabetic Retinopathy,Dinu A.JEtAl.
- DME is one of the largest causes of visual loss in diabetes. There are various machine learning algorithms that can be used to improve the accuracy of diagnosis of diabetic retinopathy

EXISTING SYSTEM

The existing system for crop protection against animal intrusions predominantly relies on traditional and often labor-intensive methods that, while widely employed, have notable limitations. In many agricultural settings, the absence of efficient and automated protection mechanisms leaves farmlands vulnerable to a variety of animal threats, including buffalos, cows, goats, birds, and other wildlife. Among the most common practices is the physical fencing of fields, which can be costly to install and maintain, particularly in vast agricultural areas. Electric fencing is another approach, but it poses safety risks and can be impractical in certain locations. Manual surveillance, where farmers or guards must be stationed on the fields around the clock, is a resource-intensive method, often fraught with human error, fatigue, and potential lapses in monitoring.

To further exacerbate the issue, these traditional methods offer little in terms of automated deterrence. They can signal the presence of animals, but they do not provide a proactive response to discourage intrusions. Effigies and scarecrows, though widely used, are largely effective against birds but have limited utility in deterring larger animals. The lack of a comprehensive system that combines real-time monitoring, automated detection, and proactive deterrence results in substantial crop damage, leading to significant economic losses for farmers and threatening food security in many regions.

This existing system is marked by its inefficiency, high maintenance costs, and, in some cases, a negative impact on the environment. To address these limitations and provide a more holistic and effective approach to crop protection, the "AI-Based Scarecrow for Crop Protection" project aims to revolutionize existing methods by introducing a technology-driven solution that leverages artificial intelligence, computer vision, and audio deterrence. This innovative system not only enhances crop protection but also offers a more cost-effective and sustainable alternative to the challenges posed by traditional approaches. In recent times, researches are taken to solve this problem using Artificial Intelligence. Limitations of Existing System

- Electric fences are dangerous to animals and humans.
- IOT based Sensor monitoring doesn’t provide accurate results

Drawbacks

- Fences causes damage to human also
- Electric fences are dangerous to animals
- Arranging fences is consumes more power
- Construction takes more time
- Fences occupies more place for construction

PROBLEM STATEMENT

In contemporary agricultural landscapes, one of the most pressing and ubiquitous social issues facing rural communities across South India is the relentless assault on crops by wildlife. The adversaries in this ongoing battle are as diverse as they are formidable, ranging from the agile deer and cunning monkeys to

the awe-inspiring giants like elephants. Their relentless foraging wreaks havoc on the livelihoods of countless farmers, prompting a sense of urgency and a call for an effective and immediate solution to this profound problem

The plight of rural communities is particularly dire, as they grapple with the destructive onslaught of these wild animals on their precious crops. This situation has grown increasingly dire, with frequent stories of animal attacks reverberating through the agricultural heartland of the country. This wave of destruction is fueled by the lack of a robust and comprehensive detection and deterrent system that could protect the crops and, by extension, the very livelihoods of these communities.

Tragically, the absence of a reliable and proactive defense mechanism leaves these vulnerable villagers at the mercy of these animal intruders. The impact of these attacks extends beyond the physical destruction of crops, as they symbolize a broader issue of food security and economic stability for the farming communities. The absence of proper safety measures and an inability to counteract these threats further intensifies the challenges faced by the affected villagers.

Fencing, although a conventional means of protecting crops, is not always a feasible solution for every farmer. The vast expanse of crops, including expansive paddy fields, cannot be comprehensively shielded, rendering the possibility of losses due to livestock interference a looming threat. As a result, the agrarian landscapes are fraught with potential wastage, rendering the toil and sweat of farmers futile and leading to significant economic losses.

The perpetrators of this agricultural turmoil are a diverse cast of animals, each contributing to the collective challenge in its unique way. While deer exhibit remarkable agility, foraging through fields and causing considerable harm, monkeys employ their dexterity to wreak havoc with a keen sense of cunning. The giants of the animal kingdom, such as elephants, pose a different dimension of the challenge, with their sheer size capable of obliterating vast tracts of crops in a single foray. Other culprits, including wild boars, rabbits, moles, and an array of mischievous creatures, further compound the problem.

In the face of this multifaceted agricultural crisis, the project at hand seeks to provide a beacon of hope. It aims to address this urgent issue by developing an effective, technologically advanced, and humane solution to safeguard the crops and livelihoods of the affected communities. Through innovative approaches, such as smart crop protection systems, the project strives to offer respite to the beleaguered farmers and chart a course toward a more secure and sustainable agricultural future. As we embark on this mission, we hold in our hearts the conviction that progress can indeed be achieved when humanity and technology converge to protect and nurture the fields that sustain us all.

AIM

The aim of the "Smart Crop Protection" project is to address the persistent and economically devastating issue of crop damage caused by animal and bird intrusions in agricultural settings. The primary objective is to provide an innovative, humane, and efficient solution that leverages the power of artificial intelligence and computer vision to safeguard crops and, by extension, the livelihoods of farmers.

The overarching goal is to significantly reduce the losses incurred by farmers due to animal damage, thereby enhancing food security and economic stability for agricultural communities. As traditional methods of protection, such as physical barriers and manual surveillance, often prove impractical and expensive, this project aims to offer a cost-effective and scalable alternative.

The project's specific objectives include the development of an AI-based system capable of real-time animal and bird detection using the YOLOv3 model and the COCO dataset. This system is designed to operate with the aid of a webcam, continuously monitoring the farmland and responding to intruding creatures. When an animal is detected, the system generates and plays deterrence sounds, creating an environment that discourages further incursions.

By providing a comprehensive solution that combines advanced technology with real-world agricultural challenges, the project seeks to not only protect crops but also empower farmers with a tool that is environmentally friendly and sustainable. In doing so, it aims to contribute to the well-being and prosperity of farming communities, ultimately promoting a more secure and resilient agricultural future.

In summary, the aim of the "AI-Based Scarecrow for Crop Protection" project is to revolutionize crop protection methods by harnessing the capabilities of artificial intelligence, computer vision, and audio deterrence, with the ultimate objective of minimizing crop damage, reducing financial losses, and improving the quality of life for farmers facing the persistent threat of animal intrusions.

PROPOSED SYSTEM

The proposed system, the "Smart Crop Protection," represents a cutting-edge and holistic approach to safeguarding agricultural crops from animal and bird intrusions. It is designed to overcome the limitations of existing methods and introduce an innovative, efficient, and humane solution that leverages advanced technology to protect farmlands.

The core of the proposed system revolves around real-time monitoring and proactive deterrence. The system uses a webcam as the "eyes" of the farmland, capturing live video feeds continuously. These video feeds are then processed in real-time by an "Object Detection Software" that employs the YOLOv3 model and the COCO dataset to detect and classify animals and birds. This dynamic and automated detection mechanism allows for swift identification of intruding creatures.

Once an intruding animal is detected, the system activates an "Animal Tracking Software" that monitors and tracks the animal's movements within the field of view. This tracking mechanism is crucial for a real-time response to the animal's actions.In response to detected animal intrusions, the "Audio Generation Software" generates and plays deterrence sounds. These audio cues, designed to resemble sounds of animal extermination, are emitted through "Speakers" installed in the farmland. This audio deterrence serves as a proactive measure to discourage animals from approaching the crops further.

The proposed system aims to offer several advantages over traditional methods. It is cost-effective, scalable, and environmentally friendly. By integrating technology with agriculture, it enhances crop protection, minimizes losses due to animal damage, and contributes to the economic stability and food security of farming communities.

In summary, the proposed system represents a significant advancement in crop protection methods. It addresses the limitations of existing approaches by introducing an AI-driven solution that combines real-time monitoring, automated detection, and proactive deterrence. This holistic system is designed to revolutionize the protection of farmlands and empower farmers with a more effective and sustainable means of safeguarding their crops.

Advantages

- Efficient detection
- Proactive deterrence
- Real-time monitoring
- Cost-effective
- Scalable
- Environmentally friendly
- Reduced labor dependency

- Enhanced food security
- Economic stability
- Technology integration
- Customization
- Environmental conservation

IMPLEMENTATION

YOLOv3 ALGORITHM:

YOLOv3, short for "You Only Look Once, Version 3," stands as a formidable advancement in real-time object detection, revolutionizing computer vision applications. It achieves this by promptly identifying and localizing specific objects within videos, live feeds, or images. This game-changing algorithm has its roots in the work of Joseph Redmon and Ali Farhadi, who were the masterminds behind Versions 1 to 3 of YOLO. The journey began with the inception of the first version in 2016 and culminated in the release of YOLOv3 in 2018, the focal point of this discussion.

YOLOv3 is much more than just an evolution of its predecessors; it represents a significant leap in the realm of object detection. By leveraging the power of deep learning, YOLOv3 employs a Deep Convolutional Neural Network (CNN) to extract and learn intricate features, enabling it to discern objects with remarkable precision and speed. Unlike its predecessors, YOLOv3 brings several enhancements, including improved accuracy, a larger number of classes it can recognize, and refined detection capabilities.

One of YOLOv3's defining characteristics is its capacity for handling a diverse array of objects simultaneously. This is achieved through an object detection process that partitions the input image into a grid, and each grid cell predicts bounding boxes and the probability of an object's presence within its boundaries. These predictions are refined with the help of anchor boxes, which further boost detection accuracy. Such multi-class detection is especially valuable in scenarios demanding the identification of various objects within a single frame, such as traffic surveillance and robotics.

Speed is another hallmark feature of YOLOv3, making it an ideal choice for real-time applications. This efficiency arises from its ability to process images or video streams swiftly, rendering it suitable for use in autonomous vehicles, surveillance systems, and any context where timely object detection is critical. The model's rapid performance ensures that it can keep up with dynamic scenes and provide immediate feedback to the system it serves.

In practice, YOLOv3 finds extensive application in numerous real-world scenarios, including the automotive industry, industrial automation, and security systems. Its versatility, stemming from pretraining on comprehensive datasets like the COCO dataset (short for "Common Objects In Context"), empowers it to identify an extensive range of objects across different domains. COCO dataset, renowned for its high-quality and challenging datasets, serves as a benchmark for state-of-the-art neural networks. As a result, YOLOv3 is celebrated for its role in pushing the boundaries of computer vision capabilities and is an indispensable tool for countless computer vision projects and applications.

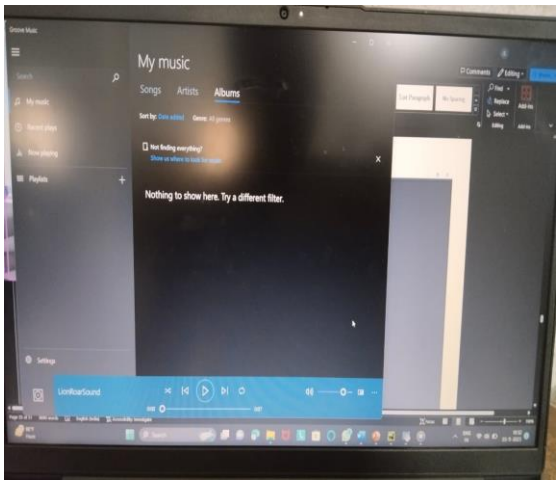
In summary, YOLOv3's legacy extends beyond its predecessors as it combines the power of deep learning with real-time efficiency and multi-class object detection. Its wide-ranging applications make it a cornerstone in the field of computer vision, enabling innovative solutions in a multitude of industries.

Coco. Names Dataset: The COCO dataset, which stands for "Common Objects In Context," is a highly regarded collection of challenging and high-quality datasets designed for computer vision tasks. It is widely recognized for its comprehensive and diverse content, which serves as a valuable

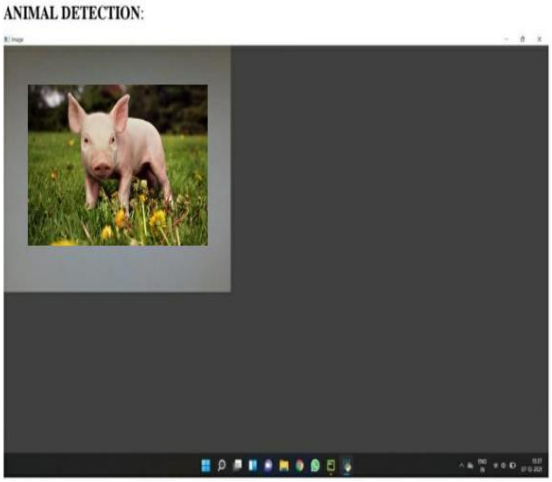
resource for training and evaluating state-of-the-art neural networks. The name "COCO" is not only associated with the dataset itself but is also used to denote the specific format in which datasets are organized and presented. COCO has become a standard benchmark for the development and assessment of computer vision models and algorithms, contributing significantly to advancements in object recognition, image segmentation, and related fields of research.

RESULTS

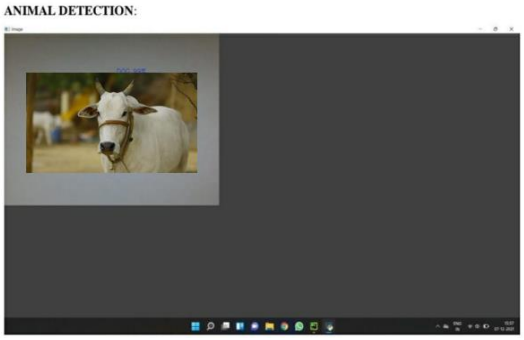
Dog Detection by camera



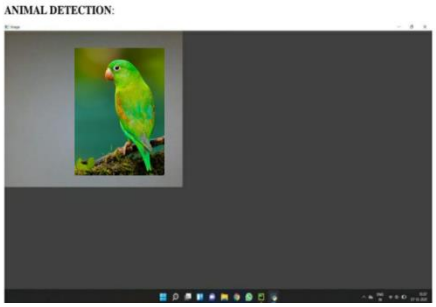
Producing Lion Roar Sound



Pig Detection by Camera



Cow Detection by Camera



Parrot Detection by Camera

CONCLUSION

In conclusion, the persistent problem of crop damage by wild animals in South India presents a complex challenge, but the proposed module offers a multifaceted and holistic approach to address it. The module's diverse components, including deterrents, fencing, wildlife corridors, and farm guarding practices, emphasize the importance of adaptability to different contexts and species-specific behaviours. Moreover, the integration of early warning systems and modern technology enhances the timeliness and efficiency of responses to potential threats.Community collaboration and government

support are integral to the success of these measures, as the burden of solving this issue cannot rest solely on farmers' shoulders. Encouraging knowledge-sharing and cooperation within the farming community is essential, as it empowers individuals to adopt best practices and collectively protect their crops. Additionally, government support through financial assistance and the establishment of wildlife management programs demonstrates a commitment to rural livelihoods and wildlife conservation. Education and research are pivotal components, as informed farmers can make more effective decisions regarding wildlife management and conservation. Gaining insights into animal behaviour and ecology is crucial for designing tailored solutions that minimize harm to both crops and wildlife. Lastly, promoting crop insurance as a risk mitigation strategy not only safeguards farmers against losses but also encourages the adoption of sustainable practices. By combining these efforts, we can significantly reduce the economic losses caused by animal attacks, foster coexistence between humans and wildlife, and contribute to the long-term conservation of local wildlife populations.

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