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PROTECTION OF CROPS FROM WILD ANIMALS USING YOLO

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***ABSTRACT*— Surveillance is used extensively in a variety of settings, including homes, hospitals, schools, public spaces, and farmlands. It assists us in monitoring a certain region and preventing theft, as well as providing proof of evidence. Surveillance is critical in case of farmlands or agricultural fields to prevent illegal persons from entering the area and to safeguard the region from animals. The use of human eyes to see animal movements in rice fields and farms is a traditional method of tracking animals in paddy fields and farms. It is impossible for humans to continually monitor animal movements throughout the day. As a result, specialist detection of animals, particularly those that invade human paddy fields and farmland, is required. Segmentation and the object detection procedure are two ways used to recognize animals. Various approaches focus solely on monitoring, mostly for human invaders, but we often overlook the fact that the biggest adversaries of such farmers are the animals that damage their crops. This results in low crop yields and considerable financial losses for agricultural owners. The problem is so severe that farmers have been known to leave regions barren owing to frequent animal assaults. This technology assists us in keeping wild animals out of rural areas while also providing surveillance capabilities.**

***Keywords*— Surveillance, Monitoring, Farmland, Crops, Animal, Detection**

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INTRODUCTION

Agriculture is the primary source of income for many people in many regions of the globe. Unfortunately, farmers are still dependent on hundreds of years-old practices. Crop yields are decreasing as a result of this. There are a variety of variables that lead to low agricultural yields, and one of them is animal encroachment. Wild animals, such as wild boars, elephants, tigers, and monkeys, have posed a significant threat to farmers all around the world in recent years. Animals such as wild boars, elephants, tigers, and monkeys, among others, have wreaked havoc on crops by trampling them. Farmers face financial difficulties as a result of this. Irrigating big areas of agricultural land is incredibly time consuming for farmers.

Deforestation happens as a result of overpopulation, resulting in a scarcity of food, water, and shelter in forest regions. As a result, animal interference in residential areas is rising on a daily basis, posing a threat to human life and property, resulting in human-animal conflict. However, according to nature's rules, every living species on this planet plays a crucial function in the eco-system. Agriculture is the economy's backbone, yet animal intervention in agricultural regions will result in massive crop losses. Elephants and other animals that come into touch with humans have a detrimental impact in a variety of ways, including destruction of crops, damage to grain reserves, water sources, homes and other assets, and human injury and death. Pests, natural disasters, and animal damage pose severe hazards to Indian farmers, leading in decreased yields. Farmers' traditional tactics are ineffective, and it is not viable to pay guards and keep an eye over crops and keep wild animals at bay. Because both human and animal safety are equally important. As a result, in farm regions, an animal detecting system is required.

Farming methods should be developed to maximize crop and animal management, be suited to local conditions, and decrease pesticide and off-farm input consumption. This may be accomplished by ensuring a high level of biodiversity at the farm gate. However, in order to sustain agricultural profitability and retain traditional rural production, the link with

ecosystem factors apart from crops and animals must be effectively maintained. Wildlife management is an important topic to address. According to statistical statistics, the amount of agricultural loss by wild animal predators has increased significantly over the previous three decades. The proportion of losses in wine production owing to this incentive accounts for 75% of overall losses in Europe. For example, in Italy, yearly output losses in the wine business are projected to reach 13 million euros, with such a government cost of roughly 3 million euros. The total cost of compensating farmers for crop loss due to wild animal attacks is expected to be more than ten million euros. The wild boar (which causes 70% of the damage), roe deer, and deer are the most prevalent species (20 percent of the damages). Damage from wild ungulates can be classified as fatal or non-lethal in a variety of ways. On the one hand, deadly methods (such as shooting and trapping) are inhumane and harmful to the ecosystem. Non-lethal methods, on the other hand, have shown limited effectiveness, environmental pollution effects on both humans and animals, high installation and management costs, and, last but not least, high environmental and landscape impact (e.g., scarecrow, chemical repellents, organic substances, mesh or electric fences). In this article, we describe the infrastructure that has been conceived, developed, and deployed to enable remote monitoring and management of IoT devices, with a particular focus on the monitoring platform, which has been built from the ground up utilising innovative virtualization technologies for animal monitoring.

RELATED WORKS

We have seen a significant multiplicity of applications and services utilising the use of ICT technologies in agriculture in the previous decade, both in literature and industry [7]. However, to our knowledge, there are just a few situations like ours [8] that integrate deep learning, cloud computing resources, and animal recognition device monitoring. The majority of smart agricultural systems rely on the use of cloud monitoring platforms to collect environmental factors that influence crop productivity. According to the authors of [9], agriculture is facing more tough problems than ever before as a result of several technological innovations aimed at increasing production and product quality.

Farmers and large companies working in the "Big Data" field invest through precision agriculture using sensor networks, drones, satellites, GSM, GPS in animal tracking systems, ZigBee, and other wireless devices with an Internet stack built into the device for sensing agriculture parameters and managing data sending to an internet platform. IoT technologies offer a lot of promise for ensuring agricultural product quality and safety. The authors of [10] provide an IoT-based intelligent video surveillance platform framework and system structure for facility agricultural ecosystems. Based on the differences in information exchange processes and job logical processing, the solution is separated into four function layers: sensor layer, transmission layer, monitoring layer, and application layer. The contribution described in [11] explains how IoT sensors can provide information about agricultural lands. It is feasible to boost agricultural yields and avert enormous losses by monitoring, examining, and analysing the data acquired on cloud platforms. Finally, in [12], the authors offer the Intelligent Agriculture design technique and architecture after explaining the idea of agricultural information management and assessing the characteristics of agricultural data.

The conservation of crop fields has been a primary subject and a challenging issue in this work, according to Bindu D and Dilip kumar M D et al. Species from the protected areas [13] have been assaulting the agricultural field for years, and the crop field's protection has become a major worry. The techniques that are currently being used are ineffective; therefore, in this article, we will present a practical procedure to ward them off by developing a system that studies animal behaviour, detects the animal, and generates various sounds that irritate the animal, as well as alerting the authorised person via a message. We also offer a multi-class classification with a low false alarm rate and precise species identification.

Agriculture serves people's dietary needs and generates a variety of raw materials for companies, according to Krishnamurthy B, Divya M, and colleagues. However, there would be a significant loss of harvests due to animal disturbance in agricultural regions. Wild animals pose a threat to crops[14]. As a result, it's critical to keep an eye on the existence of animals in the area. Then numerous gadgets should be activated to repel the dangerous animals. We offer a way for defending farms from wild animals. The majority of the time, operational amplifier circuits are

used to detect animal trespass from the outside of farms. The planned monitoring technique is intended to offer early notice of potential wild animal entry and harm.

The initiative, according to Kshama s.Bhise1, is used to track the position of animals in wildlife reserves and national parks. A RFID (Radio Frequency Identification Device) module as well as a GSM modem are used in this project. These SMS will be sent to a forest officer or a government official who will include the region where the animals are observed. The term "radio frequency identification" (RFID) refers to a system that uses radio waves to wirelessly broadcast an object's or person's identify. It's included under the category of automated identification technologies as a whole. This paper has been used to keep track of where animals are in wildlife reserves and national parks. This study does this with the use of an RFID module and a zig bee. Those certain SMS containing area information will be sent to a forest officer or a government official [15].

PROPOSED METHOD

When the item matches the YOLO algorithm's designated object, the camera will take a photo and send this to the server. The image of trespassing animals will be removed from the server after it is captured. Intelligence surveillance which use the YOLO framework algorithm to detect the animal and delivers an email notification. It also automatically activates the buzzer, which the farmer may manage. We used the YOLO file in animal identification and recognition in this research. It also automatically activates the buzzer, which the farmer may manage. We will use AI OPENCV to locate animals in real time in our suggested system. After the image is captured, it has to be pre-processed and compressed. The model is trained using images. It is learned by extracting the desired pattern from the picture using feature extraction. The picture is then compressed using feature fusion and dimension reduction for dependable and real-time performance.

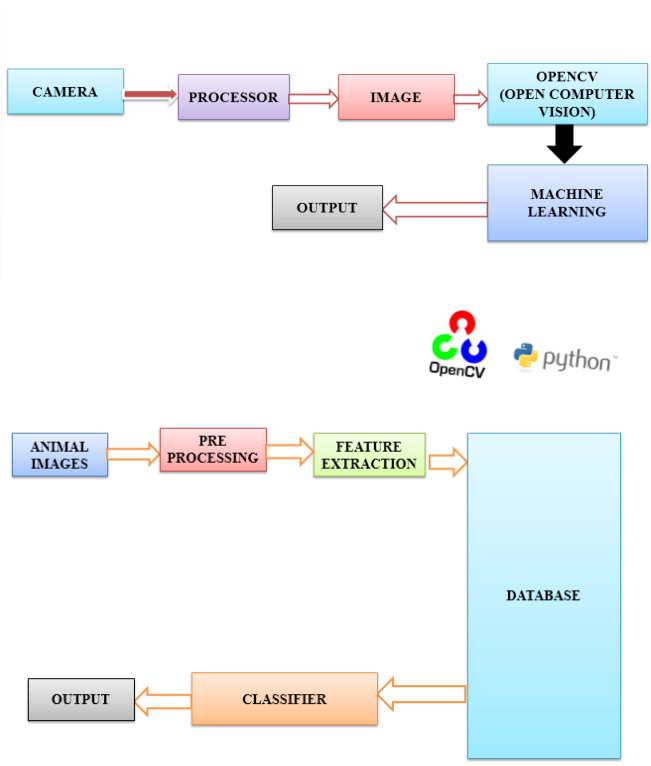


Fig.1. PROPOSED BLOCK DIAGRAM

IMAGE PROCESSOR

Image capture, storage, preprocessing, segmentation, representation, recognition, and interpretation are all performed by an image processor, which then displays or records the generated image. The basic procedure included in an image processing system is depicted in the block diagram below.

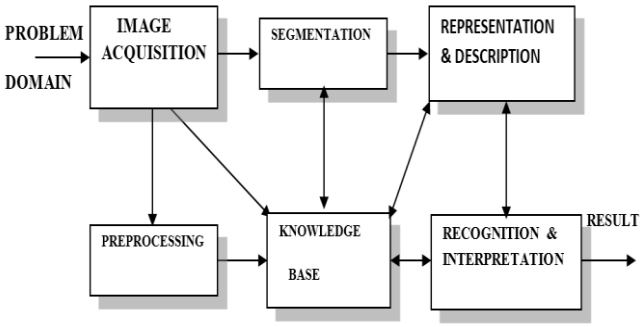


Fig.2 IMAGE PROCESSING SYSTEM BLOCK DIAGRAM OF FUNDAMENTAL SEQUENCE

IMAGE PREPROCESSING:

The input picture in the preprocessing step may be of varying sizes, contain noise, and be in a variety of colour combinations. These settings must be adjusted to meet the process's requirements. Image

noise is especially noticeable in low-signal areas of an image, such as shadows or underexposed photographs. Filtering algorithms are used to eliminate many sorts of noise, such as salt and pepper noise, film grains, and so on. Weiner filter is one of the filters that is utilised. The picture collected will be processed in the preprocessing module for proper output. Some algorithm was used to accomplish the pre-processing. Pre-processing should be carried out on all photographs in order to improve the end outcome.

FEATURE EXTRACTION:

The study of data gathering, organisation, analysis, and interpretation is known as statistics. It covers every facet of this, including data collection planning in terms of survey and experiment design. This is what statistics are all about. Mean, Variance, Skewness, Standard deviation are all statistical features of the picture.

CLASSIFICATION

The link between the data and the classes into which they are categorised must be properly understood in order to classify a piece of data into distinct groups or categories. To do so with a computer, the computer must first be educated. Training is essential for categorization success. Techniques for classification were created in the beginning. Features are qualities of data components that are used to categorise them into different groups. 1). The picture classifier functions as a discriminant, pitting one class against another. 2). Discriminant value is highest in one class and lowest in others (multiclass) 3). Positive discriminant value for one class, negative for another (two class).

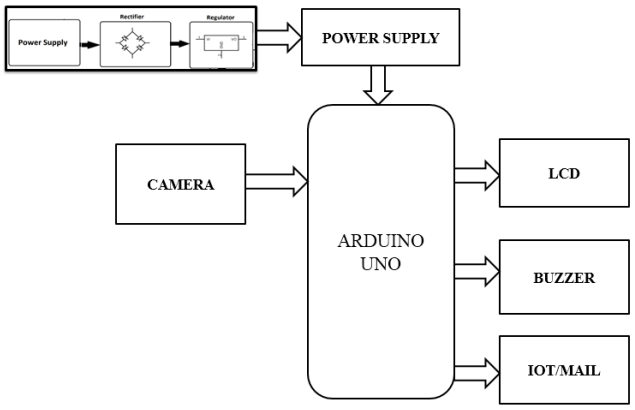


Fig.3. HARDWARE BLOCK DIAGRAM

Farmers all throughout the world have a unique problem in dealing with wild animals. Wild boars, elephants, monkeys, and other animals wreak havoc on crops. This project to protect fields from animals using surveillance and alert system using buzzer. The alert mail is sent through IOT.

METHODS

MODULE LIST

- CAMERA
- PROCESSOR
- OPENCV
- MACHINE LEARNING

MODULE DESCRIPTION

CAMERA

The camera seems to be an optical device that captures images. Cameras are, at their most basic, sealed boxes with a tiny opening (the aperture) which allow light into it to capture the image on a light-sensitive surface . Various techniques exist in cameras to govern how light falls onto the light-sensitive surface. Lenses concentrate the light entering the camera, the aperture may be broadened or narrowed to admit more or less light in, and the shutter mechanism controls how long its photo-sensitive surface is exposed to the light.

PROCESSOR

A logic circuitry that listens to and executes the fundamental instructions that operate a computer is known as a processor (CPU). The CPU is the most important and important integrated circuits (IC) chip in a computer since it interprets the majority of commands. Most fundamental arithmetic, logic, and I/O activities are performed by CPUs, which also allocate commands to other devices and components in a computer.

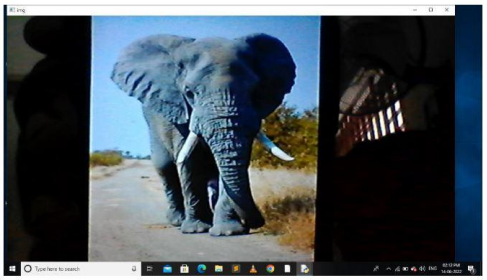
OPENCV

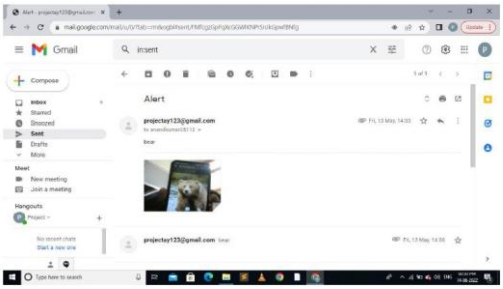
OpenCV, a cross-platform library that allows us to create real-time computer vision apps. It focuses primarily on image processing, video recording, and analysis, including capabilities such as face detection and object detection. One of the most widely used computer vision libraries is OpenCV. A good knowledge of the fundamentals of OpenCV is essential if you want to begin your adventure in the field of computer vision.

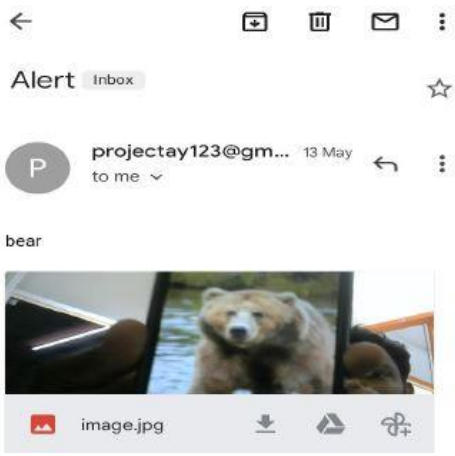
MACHINE LEARNING

YOLO, a single CNN estimates multiple bounding boxes and class probabilities for those boxes all at the same time. YOLO improves detection performance by training on entire photos. Compared to other object detection approaches, this model offers a number of advantages: YOLO is an acronym for "you only live once." During training and testing, YOLO sees the complete image, so it implicitly stores contextual information about classes as well as their appearance.

EXPERIMENTS/RESULTS/DISCUSSION







CONCLUSION

The project "PROTECTION OF CROPS FROM WILD ANIMALS WITH INTELLIGENCE SURVEILLANCE" was conceived and tested successfully. It was created by combining features from all of the processors and software that were utilised and evaluated. Every module's presence has been carefully considered and arranged, resulting in the best possible operation of the unit. The problem of wild animals vandalizing crops has become a big social issue in recent years. It needs immediate attention and a viable remedy. As a result, this initiative has a lot of societal significance because it tries to solve a problem. Smart integrated agricultural security and monitoring system that is both low-cost and energy-efficient. The main goal is to reduce crop loss and to protect the region from intruders and wild animals, both of which constitute a significant threat to agricultural areas. Farmers save money by safeguarding their orchards and fields and avoiding substantial financial losses. They put up with pointless efforts for the sake of protecting their crops, and they put up with it for the sake of protecting their fields.

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