



A Survey on Object Detection for Animal Detection and Prevention in Agricultural Field Using IoT

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ABSTRACT –

Today animals are the major cause of crop damage and farmer losses. This proposed model describes how this issue can be addressed through further research into and implementation of deep learning and Industrial IoT. Utilizing a network of sensors and buzzer substances, we hope to determine animal attacks on farmland. The YOLOv3 object detection method relies on a convolutional neural network powered by deep learning. When animals are spotted on agricultural land, the cameras and sensors send an alert to the farmers. In addition, you can clear the farm of animals by making a noise; this noise will be unique for each species. The noise level is proportional to the amount of agricultural damage caused by the animal and size of land. The animal that causes attacks in agricultural land is spotted by a sensor, recognized using pre-loaded large datasets in Arduino, and then a specific sound is produced using audio playback recorder module. This can be silenced remotely or via the farmer's smart phone app.

Keywords: Animal recognition, Animal detection, Arduino, Deep learning.

I. INTRODUCTION

The IoT platform is an essential component of a large IoT ecosystem that supports and connects all components within the system. An IoT platform is a multi-layer that permits straight forward provisioning, management, and automation of devices inside the Internet of Things universe. It principally connects hardware, however diverse, to the cloud by using resilient connectivity options, enterprise-grade security mechanisms and broad data processing powers.

The IoT platform confers a set of ready- to-use features that very much speed up the improvement of applications for devices in addition to contend with scalability and cross- tool compatibility. It is generally referred to as middleware when IoT platforms originated in the form of IoT Middleware, where principal goal become to function as a mediator among the software layers and hardware. Its principal movement incorporates collection of data from the devices over diverse network protocols and topologies, device management, remote device configuration and control, and over-the-air firmware. In real-world IoT ecosystems, IoT middleware is anticipated to assist harmony with almost any connected device and combination with third-party applications used by the device. This freedom from the underlying hardware and overhanging software program lets in a IoT platform to deal with any type of connected device in easy way.

Deep learning algorithms are a subset of machine learning algorithms, which aim at discovering multiple levels of distributed representations. Recently, several deep learning algorithms had been proposed to clear up conventional Artificial intelligence problems. It first offers an outline of diverse deep learning strategies and their current developments, after which in brief describes their applications in various tasks. The sensors deployed in the Internet of Things (IoT) produce gigantic amounts of image data for facilitating a wide range of applications. Deep Learning plays a role in generating valuable inferences from this massive volume of data and hence this will assist in creating smarter IoT. Exploring the capability of DL for IoT data analytics becomes exceptionally crucial. Deep Neural Network (DNN) and its different architectures give potential benefits that deep learning will bring to the IoT.

Animal intervention in farming land could lead to a severe shortage of plants, threatening the economic backbone of agriculture. Elephants and other animals that interact with humans can have a negative impact in several ways. This includes the destruction of crops, water supplies, homes, and other assets as well as the injury and death of humans. Protecting both people and animals is crucial. Therefore, a system to detect animals is essential in agricultural settings. India relies heavily on agriculture. India's primary industry throughout its history has been agriculture. Even though the majority of Indians depend on agriculture for their livelihood, the country's farmers face significant challenges.

Animal-human conflicts are a major source of disruption because they put people and their possessions in danger. Today there are more of these quarrels than ever before. Therefore, the area must be constantly monitored to prevent the entry of animals of this type. Illegal hunting cause living person conflicts because humans move into wildlife habitats in search of food and shelter and because animals wander for water in the long term of the summer time for

reasons of desiccation in the large body of water. When electric fencing is used to protect a farm's livestock, the animals in the area may exhibit strange behavior.

The Things which are connected to the network are managed by the IoT (Internet of Things), which also transmits data between them. Through the use of detectors and other electronic parts, IoT technology paves the way for real-time data gathering in the agricultural field. This paper introduces a novel service to the field through its coordination of a Arduino, camera, and APR module communicating via the internet. The edge components integrated Wi-Fi and other telecommunication connectivity to communicate with the core infrastructure through a sophisticated IoT gateway. The primary goal of this work is to create a species of animal that is harmful to farmland. The safety of both humans and animals has been prioritized in the design of this system, which also serves to safeguard farms. To keep birds and animals from eating the plants on agricultural land, then set up video cameras in the area to stop animal attacks from the outside and transmit the message to the dairy farmer. And what needs to be done right away to stop the living creatures from attacking and to stop hurting them physically.

As a result, the number of conflicts between humans and animals is growing as a result of animal intervention in human settlements, which threatens human lives and economic resources. Animal intervention in farming land could lead to a severe shortage of plants, threatening the economic backbone of agriculture. Elephants and other animals that interact with humans can have a negative impact in several ways. This includes the destruction of crops, water supplies, homes, and other assets as well as the injury and death of humans.

II. DISCUSSION

In reference [1] report explains the methodology to overcome the problem of human and animal injury and mortality due to the straying of untamed animals out of the countrywide parks and natural world sanctuaries through using automated monitoring and alert system. Automatic monitoring and alert device have been implemented through incorporating GSM and GPS technology through device that is connected to the animal and could be constantly used to track the position of the animal with respect to the GPS defined boundaries set up inside a country wide parks and In case an animal strays out of the GPS described zone, an alarm system that will be set up in a human-populated quarter will go off, informing humans about the upcoming danger.

According to source [2], One serious problem that all the developed nations are facing today is death and injuries due to road accidents. The collision of an animal with a vehicle on the highway is one such big issue that leads to such road accidents. This paper gives a simple and low-cost way for automatic animal detection at highways for preventing animal-vehicle collisions using computer vision techniques. A approach for locating the distance of the animal in real-world units from the camera attached vehicle is proposed. The system is trained with more images consisting of both positive and negative images and tested on various video clips of animals on highways with varying vehicle speeds. As per the two-second rule, this can alert the driver when the vehicle speed is up to 35 kmph.

In reference [3], the goal of the project is to track the location of Animals in the zoo or national parks. This system would include a temperature sensor and a PIR sensor. The temperature sensor senses the temperature of each animal and the PIR sensor senses the human presence inside the animal boundaries or restricted areas. Generally, every animal has a particular range of body temperature. If the animal has any wounds or fever, the body temperature will be automatically increased. To track this, we use temperature sensor. It constantly monitors the animal's temperature. If any variation in temperature is detected, it is displayed on the LCD. The PIR sensor is used to monitor human action in restricted areas or animal boundaries. When the human presence is detected, the voice processor will give an alert to the people through the pre-recorded voice. The GPS receiver sends the location and animal temperature to the controller and it is interfaced with the IoT, it will give the all information to the website on PC or laptop.

According to source [4], the animal intrusion detection system is incredibly essential in several fields like villages near forests, roads through forests and agricultural fields. A system is created with victimization sensors to notice the tress passage of those animals. It enables to result in aware about the encroaching of wild animals and birds. The system for birds is that the acoustic sounds area unit made within the encompassing area factor of the agricultural fields wherever the arrival of bird's area unit detected and therefore the birds are unbrokenly removed from the realm. Once the associate degree animals arrive or trespass an alert message is provided to a few individuals within the needed space who will lead the individuals around from destruction and they can also take necessary actions to stop attacks of the trespassers. Applications that area unit vital area unit preventing animal bumping to a vehicle on roads.

In reference [5], Ultrasonic (US) and infrared (IR) sensors are broadly used in mobile applications for distance measurements. In this project, an obstacle detection system is constructed primarily based totally on two sorts of sensors. The system is meant to be used by the aged people and those with vision impairment. The prototype to detect obstacles shows accuracies of 95% to 99% for distance measurements if the sensor circuits are well calibrated and output is linearized. The system additionally demonstrates excellent detection for specific obstacle materials (e.g., plastic, mirror, wood, concretes and plywood) and colors.

According to reference [6], Moving object detection under a moving camera is a challenging question, especially in a complex background. This paper proposes a background orientation field reconstruction technique primarily based on Poisson fusion for detecting moving objects under camera. As enlightened by the optical flow orientation of a background is not dependent on the scene depth, this paper reconstructs the background orientation through Poisson fusion based on the modified gradient. Then, the motion saliency map is calculated by the difference between the original and the reconstructed orientation field. Based on the similarity in appearance and motion, it proposes a weighted accumulation enhancement method. It highlights the motion saliency of the moving objects to improve the consistency within the object and background region. Furthermore, the proposed method

incorporates motion continuity to reject false positives. The experimental consequences acquired via way of means of using publicly available datasets suggest that the proposed technique can gain high overall performance as compared with current state-of-the-art methods.

According to reference [7], the increase in the integration of animals into family lifestyles, animal care management becomes crucial as animals have an immediate effect on human mental and physical health. Even though there are a lot of solutions, maltreatment of animals and risks to animal health are increasing as indicated in the newspapers and statistics. In addition, many identification techniques aren't user-friendly and efficient. An RFID-based mobile monitoring system (RFID-MMS) is designed in helping users to manage the animals in dynamic information retrieving, location tracking, and behavior analysis over a wireless network. The proposed system, which is suitable for use in all animal unities, enhances the companionship between humans and animals.

According to source [8], Passive Infrared Sensors (PIR) are inexpensive devices widely used as motion detectors. The standard sensor provides just a trigger signal for movement detection. This paper aims to extend the standard usage of the sensor from motion detection to motion recognition and activity classification. In applications where motion detection based on video surveillance is not possible due to regulations or high costs smart PIR sensors could be the only solution. This publication starts the topic of PIR-based motion classification with analyses of hardware requirements and hardware selection for the smart sensor.

III. RELATED WORKS

Approach using GSM and GPS techniques

By using an automatic real-time monitoring and alert framework, the issue of wild animals getting out of nature reserve sanctuaries and hurting or killing people and other animals can be solved. By putting GSM and GPS techniques into a device that would be connected to a common animal, a fully automated tracking and alert framework has been set up. The smart phone would keep track of the animal's role in comparison to the GPS-defined boundary lines set up within a nature reserve or nature reserve. If an animal leaves the GPS-defined area, an audible alarm that will be put in the place where people live will go to warn them of the danger. This process is scalable, doesn't cost much, and is easy to set up. It can be useful for keeping an eye on wildlife problems like poaching, road and rail collisions, train delays, damage to plants, and threats to human life when wild animals wander out of their territory.

Approach using PIR sensor

The objective of this work is to find out where animals are in zoos and national parks. A temperature probe and a PIR sensor would be part of this system. The temperature probe can tell what each animal's temperature is, and the Sensor module can inform when a person is in an animal's closed area. In general, each animal's body temperature is in a certain range. If the animal is hurt or has a fever, its body temperature will go up on its own. We're using temperature readings to keep an eye on this. It checks the animal's heat all the time. If the temperature changes in any way, it will be shown on the LCD. The Sensing element is used to see if people are in confined spaces or close to where animals live. When a person is found, the voice CPU will use the pre-recorded voice to warn the people nearby. The GPS receiver tells the controller where the animal is and what its heat is. Since the controller is connected to the Internet of Things, the website on a PC or laptop will be able to get all of this information.

Moving object detection approach

Detection and tracking research can be used in many different ways in the real world. Animal detection methods can be used to study how a specific animal moves, and they can also keep dangerous animals from getting into residential areas. Animal detection is studied in many different ways. Animal research in image analysis has been an interesting aspect for many different uses. People have made a lot of algorithms and methods to learn more about how animals act. Aside from that, these apps can also be used to warn people when dangerous wild animals are coming close so they can take early precautions. These uses can be broken down into three main categories: finding animals, following them, and figuring out.

Detecting moving objects is an interesting topic of research in machine learning and post processing. Background extraction is a method in the process of switching object recognition premised on background removal. The second step is to find the moving object. A better way to get a background color based on the common area is described. The basic idea is to take a series of video images of the scene at regular intervals. Each picture is split into micrometers blocks, and the assumption and variability of each block are determined by calculating to define the vector-relevant data of the province. When the moving object is taken out, a new method for getting the threshold is put forward. The original methodology used an arithmetic mean, but the new method uses a set of weights mean instead, and the average grey of the center of the frame is taller than the normal grey of the background. Then, the limit is also raised a little bit. By adding the smoothing coefficient, the change in the current threshold can be stopped. The tests revealed that the scheme works well for detecting moving objects and has a high level of detail.

Fingerprint mobile surveillance approach (RFID- MMS)

Animals are becoming more and more a part of family life, making animal care leadership an important topic. This is because animals get a direct effect on people's health. But there are still a lot of ways to help, news organizations and data show that animals are being mistreated and their health is at risk more than ever. Also, many ways to identify someone are not effective or easy to use. In this paper, a Fingerprint mobile surveillance system (RFID-MMS) is meant to help users effectively manage animals by trying to retrieve dynamic features, monitoring their location, and analyzing their behavior over a wireless connection. The system that is being proposed can be used in all animal units.

IV. CONCLUSION

Providing the images of the crop field for knowing the unauthorized persons or animal's entry helps in taking necessary measures to protect the crop. The message alert is sent to the farm owner to know about the action that took place on the farmland. The buzzers help to prevent the land from birds and animals but there is an absence of animal classification and there is no individual sound for each respective animal. Deep learning in the form of Convolutional Neural Networks (CNNs) to perform animal recognition might not work due to power failure. The PIR and ultrasonic sensor detect the presence of the animal and send an input signal to the controller. Immediately, the APR board will be turned on and the sound is played to divert the animal but there is an absence of sending an alert to the farmer.

V. REFERENCE

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