Field Protection and Plant Health Monitoring System using IoT

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Abstract: *Agriculture is one of the most leading sectors in anyone's life. Crop damage caused by animals and insects possess a serious threat to farmers, one of the major aspects is that it reduces crop yield. Mainly animals like buffalos, pigs, monkeys, birds are some which is the main reason for crop damage. This output leads to loss to the farmers and animals and birds puts up challenge for the farmers for crop protection. IoT based framework is one smart technology that can be used for crop protection. The process follows as when the animal enters the field it captures the movement of the animal and segregates into frames, identifies what animal it is and produces a buzzer sound of another animal that current animal is afraid off. The plant health monitoring is also done using comparison algorithm in machine learning and it sends a warning message to the farmer regarding the plant is healthy or not. This ensures that developed system will not be harmful to animals and as well as human beings and overall crop protection is being done. Various machine learning techniques are used in combination with IoT technology.*

Keywords: Image processing, Machine Learning, Internet of Things (IOT)

I. INTRODUCTION

India is an agricultural land. Agricultural land. Farming is seen as the demanding sector and is also referred to as the most critical sector. Crop Protection during growth of crops and after the culture of crops is a really important process for the growers. To eliminate the losses that are caused for farmers regarding crop protection the solution defined is the automated system which identifies the crops which are attacked by various animals and health monitoring of the plants is also done.

There are some current methods which are used in protecting the farm such as the electrical fences but this solution is claimed as cruel which causes harm to animals and is ineffective. Another technique that can be used is the chemical products which are used and causes cost per hectare which farmers could not afford and is harmful to animals. Technology in various cycles of agriculture brought some changes which can lead to effective crop yield and protection of farms or crops from threats. Our proposed system is animal friendly and does not affect any animals or humans.

Our system uses the best usage of mobile communication technology (GSM) which provides short messages to farmers, cameras sensors for video capturing of animals and Image processing in machine learning for animal detection and producing animal fearing sounds using buzzer and Raspberry Pi 3 used for whole functioning of the system and for the plant health detection the farmer is sent a message regarding that the plant is stable healthy or not. The whole combination of Machine learning and IoT based technologies are used in this proposed system method.

II. BACKGROUND

Crop yield is one major aspect which leads to contribution towards India's economy. Prevention of the crops from animals and insects which eats up the whole crop leads to crop damage and reduces crop yield. The IoT based technology in hand with the machine learning techniques finds an effective usage in crop protection from damage.

The Image processing of machine learning ensures a great way in finding out and distinguishing of animal and production of fear sound via buzzer that animal runs away from the field without any human or farmers intervention takes place. Raspberry pi camera module 5mp is used for video capturing in the farm, the use of Mobile Net of OpenCV provides high accuracy in object detection process, the mobile communication technology GSM is used to send information to the farmers mobile. The whole process takes place whether the farmer is present in the farm or farmer is away from the field.

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III. RELATED WORK

Srikanth N et al.,[1] 2019, developed a model in which the PIR sensor detects movement when animals approach it. After receiving the first input signal, it is forwarded to be processed further. The microcontroller will then be given it. The system will be turned on, and it will send an SMS and make a phone call to the owner at the same moment. The PIR and Smoke sensor inputs are read using the Microcontroller Block. The microcontroller is in charge of the entire procedure. When movement or smoke is detected, the GSM module sends SMS and makes a phone call to the farmer. When smoke is detected, it also activates the motor. It notifies the farmer that certain animals are attempting to access the farm. For SMS, our LCD data will be displayed.

Keerthi Raju et al.,[2] 2020 presented a model which is an automatic crop protection system from animals and fire. This is an Arduino Uno based system using a microcontroller. This system uses a motion sensor to detect the wild animals approaching near the field and smoke sensor to detect the fire.

Tharun Vignesh N et al.,[3] in 2020, Camera, GSM Module, PIC Micro Controller, Buzzer, and PIR Sensor were proposed as part of a system. In the forest, a PIR sensor detects human movement, and the system then triggers a camera, which uses a PIC microcontroller and a built-in machine learning algorithm (OpenCV algorithms and Background Subtraction algorithm are used for image processing) to detect the person and give an alarm when an unauthorized person is present in the forest, as well as sending an SMS to the officials. Finally, when someone enters the forest in a prohibited zone, the forest ranger receives an alarm.

Mr.P.Venkateswara Rao et al.,[4] 2019, They employed an Arduino uno board, a camera module, a GSM modem, and buzzer speakers in the suggested system. Animals destroy crops, which is a major threat to farmers, so they installed cameras around the field to protect the crops from animals. The camera then sends the input images to the micro controller (Arduino uno board), which processes the given input data according to the programmed stored in the processor. If an animal is detected in the crop, the buzzer will ring to attract the animal's attention, as well as sending an alert SMS to the owner's mobile phone.

N. Banupriya et al.,[5] 2020, have proposed a system and suggested a system in which animals are identified, numbered, and described using deep learning and a template matching algorithm technique that which involves identifying a small section of an image with the template image. A deep convolutional neural network was used to train the dataset which based on the behavior of 48 breeds from distinct camera captures is used in animal detection.

Navaneetha P et al.,[7] 2020, have suggested a system that detects the presence of an animal using a PIR and ultrasonic sensor and sends an input signal to the controller. The APR board will be turned on, and music will be played. The flash light will be turned on at night, and a message will be sent to the forest department, as well as a phone call to the farmer. Solar panels or a controlled power supply will be used to provide power. The presence of an animal is displayed on the LCD. The GSM module is used to deliver SMS to farmers and make phone calls to them. As a result, it can be inferred that the design system is both practical and affordable for farmers

K. Mohana Lakshmi et al.,[8] 2019, have proposed a technology for creating virtual fencing for animals that works similarly to physical fencing. A virtual fence is an impenetrable barrier that sounds an alarm if an object approaches it. It's a good way to keep wild animals out of farmed regions. For example, we've seen a lot of elephants, cheetahs, tigers, lions, wild boars, and bears enter villages in recent years, destroying agricultural grounds, buildings, and even putting villagers lives in jeopardy. The suggested is used to confine animals to the forest and create virtual control boundaries for the animals.

Mr D. Meganathan et al.,[9] 2020, proposed system is suggested when there is movement in the farm, the motion sensor detects it and it also employed LDR, which detects and analyses the intensity of light and concentrates the light on any animal identified if the intensity of light is low.

Vignesh Dhandapani et al.,[10] 2018, These suggested works are more focused on using Android to detect sickness on plant leaves. To begin, take a picture with your digital camera (mobile camera). Most likely, the camera will be considered with some constraints and requirements. One of the aforementioned algorithms like the K-means, SVM classifier will be used to extract additional features from the obtained image. There are several image features that must be extracted, but we will only consider a few of them in our suggested method. The system architecture shown below depicts the actual work flow of the concept we're developing. The major goal of this planned project is to assist farmers who are suffering from losses as a result of inaccurate disease information. As a result, the notion should be made more user-friendly.

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IV. CONCLUSION

Early stages of detection of animals and insects or any kind of actions which causes threats to the farm or fields is very much important as it reduces the crop damage and reduces the loss to the farmers and help in growth of crop yield.

The conclusion drawn from this survey is that techniques like the Internet of Things in agriculture, Machine learning tools like the Image processing can be used to detect the animals or insects or any kind of hazard which can be used for crop protection.

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