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Wild Animal Detection and Crop Protection Using System Using IoT

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Abstract -The Embedded Technology is now in its prime and therefore the wealth of data available is mind-blowing. Embedded technology plays a serious role in integrating the varied functions related to it. This must traffic jam the varied sources of the Department during a closed-loop system system. This proposal greatly reduces the manpower, saves time and operates efficiently without human interference. With the arrival in technology, the prevailing systems are developed to possess in built intelligence. Wildlife monitoring and analysis are a lively research field since last many decades. In this paper, we specialize in wildlife monitoring and analysis through animal detection from natural scenes acquired by camera-trap networks. We have designed animal detection model using self-learned Deep Convolutional Neural Network (DCNN)features.

KeyWords:AnimalDetection, ImageProcessing, GSMModule, InternetOfThings, Cameras, Sensors.

1. INTRODUCTION

Agriculture is a backbone of our country. About 70% of India's revenue comes from agriculture. In this project we are proposing the model which prevents spoilage of crops due to heavy and uneven rainfall. This objective is achieved with Embedded System design using GSM technology. The actual concept of this project is protecting the crops from heavy rainfall by covering the field automatically and also to save the collected rain water. The saved water can be used for other purposes such as feeding animals, washing, drinking, cooking etc.To achieve this we are interfacing bidirectional dc motor and GSM module with ARDUINO. Wild animation detecting and monitoring has always been a challenging topic and an active research area. Most of the present wild animation detecting and monitoring processes believe commercial wild camera trap to require wild animal pictures which are triggered by some kind of sensor techniques (e.g IR sensors). However, those taken images still need human to gather and obtain analyzed with tremendous amount of effort. In a wild environment, the value for deploying+collecting+analyzing is sort of significant. With the recent progress of AI technique, there are mature tools that we will use to research the collected images. However, there are still no good stories of how we can utilize the AI output to really solve the wild animal detecting and monitoring problem.

In this project, We are trying to propose an end-to-end solution which could potentially solve some basic problems in wild animal detecting and monitoring process. The idea is straightforward yet powerful: run AI on Raspberry Pi Zero locally to detect a wild animal then send the detected result (could be just a few bytes) through Hologram Cellular with no need of internet connection.The local AI computation and cellular connection are the keys to this project.In this project we are proposing a system which prevents the spoilage of crops due to abundance rainfall.This objective is achieved with embedded system design using GSM technology.

2. RELATED WORK

In [1],Proposed a paper deals with the design and Implementation of Smart surveillance monitoring system using Raspberry pi and CCTV camera. This design is a small portable monitoring system for home and college security[1]. This system will monitor when motion detected, the Raspberry Piwill control the Raspberry Pi camera to take apicture and sent out image to the user according tothe program written in python environment. The proposed home security system captures information and transmits it via a Raspberry towards PC. Raspberry pi operates and controls motion detectors and CCTV camera for remote sensing and surveillance, streams live records it for Future playback. Python software plays an important role in this project.. Crop residues protect the soil against erosion and reduce agrochemicals in runoff water.

In [2], Proposed a paper deals with Crop residues and soils are spectrally different in the absorption features associated with cellulose and lignin. Our objectives were to: (1) assess the effects of soil and crop residue water contents on the remotely sensed estimates of crop residue cover and (2) propose a method to mitigate these effects. Reflectance spectra of diverse crops and soils were acquired in the laboratory and the analyses was extended to agricultural fields with different crop residue covers and a wide range of moisture conditions. The slope of the linear relationship with the Cellulose Absorption Index was very sensitive to moisture conditions, whereas the slope of the Shortwave Infrared Normalized Difference Residue Index was altered in a lesser extent. Water indices that provided reliable estimates of the water content could be used to estimate crop residue cover corrected by moisture conditions.In this paper we proposed a system that helps in both agriculture, forest, and wild animals. In this system we use the IoT and Wireless Sensor Networks (WNS) for preventing the wild animals attack on forming lands that are nearer to the forest.

3. METHODOLOGY

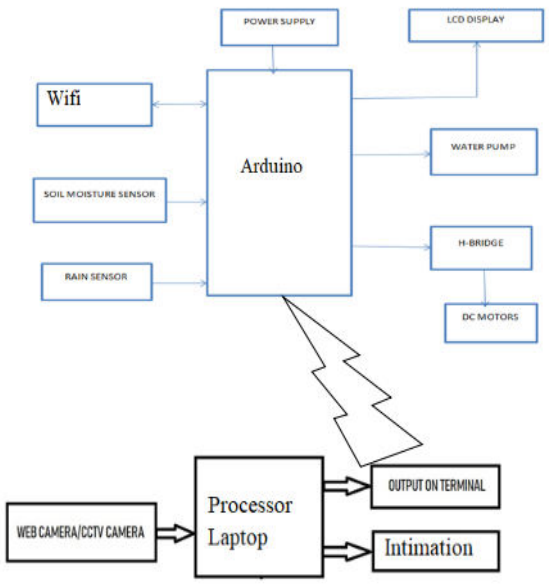

Fig -1: Block Diagram of the system.

- **Working of animal detection**

To detect motion we first have to capture live images of the area to be monitored and kept under surveillance. This is done by usingcamera

CAMPARING PHASE:

Comparing the current frames captured with previous frames to detect motion: for checking whether any motion is present in the live images, we compare the live images being provided by the web cam with each other so that we can detect changes in these frames and hence predict the occurrence of some motion.

PRE-PROCESSING:

Pre – Processing Is heavily dependent on feature extraction method and input image type. Some common methods are :

Denoising: applying a Gaussian or simple box filter for denoising.

Contrast enhancement: if gray level image is too dark orbright.

Down sampling to increase speed.

Morphological operations for binary images.

Scaling by some factor.

Image Segmentation:

In the images research and application, images are often only interested in certain parts. These parts are often referred to as goals or foreground (as other parts of the background). In order to identify and analyze the target in the image, we need to isolate them from the image. The image segmentation refers to the image is divided into regions, each with characteristics and to extract the target of interest in the process.

The image segmentation used in this is a threshold segmentation. To put it simply,the threshold of the grey scale image segmentation is to identify a range in the image of the compared with the threshold and accordingly to the results to the corresponding pixel is divided into two categories, the forground and background.

Threshold segmentation has two main steps:

Determine the threshold T

Pixel value will be compared with the threshold value T

In the above steps to determine the threshold value is the most critical step in partition. In the threshold selection, there is a best threshold based on different goals of image segmentation. If we can determine an appropriate threshold, we can correct the image for segmentation.

Hardware Implementation:

Camera is used to collect database either video and image of the livestock in real-time for training set data and testing data which are used during the image processing techniques.

Software Implementation:

The image that is sentby the camera is received bythe PCfor classification ofanimal. Database is created and the set of sample images are stored in it. The program consists offunctions such as index Image, image Set and retrieve Image. The Image Set is used to hold a collection of images. Index Image is used to create an image search index. Index Imageis used with the retrieved image function to search for images. The captured image is given as a query image to the processing system. The retrieve image function takes two arguments, a query image and the image stored in the database. The resultant is the indices corresponding to images index that are visually similar to the query image.The image ID's output contains the indices in ranked order, from the most to least similar match. The value match range is from 0-1. If the value is 0, then the image is not matched. If it is 1, then the query image is same as that of the stored image. If the value is between 0-1 then the query image falls under the category of the stored image i.e., the contents in the query imageare same as that of the stored image. If the name of the image matches with that of the regular expression of the image then the animal is our livestock otherwise it is an intruder animal. If the score is in the range of 0.1 to 0.9, then the image is matched with that of the stored image.

- **Working of crop protection**

In case of heavy rainfall the farmer will be sent with a signal or a message to start the operations. We have used various sensors such as humidity sensor, rain sensor, temperature sensor, moisture sensor ,light sensor, motion detection sensor which will be initially set to default values suitable for the cultivation.The first operation of Raspberry Pi is to activate the dc motor which works on Flemming's left hand rule in such a way that it starts rotating in clockwise direction to cover the double coated polythene/foaming sheets over the crops. The motor can even operate in anti clockwise direction with the help of Hbridge.

Hence the crops are covered by the double coated polythene sheet over the agricultural land and the crops are protected. The required protection is fabricated by four adjustable poles which enables the adjustment of height. The microcontroller is used to

control this operation using SMS technology which enables the farmer to control the operations from the remote place.The system works in automatic mode by default i.e. when farmer doesn't respond to the request , it checks the moisture content of the soil using moisture sensor and initiates appropriate action required to protect the crop else the farmer can manually make changes as per his requirements.Liquid Crystal Display(LCD) is being employed in the project to display various values of all the sensors. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format.

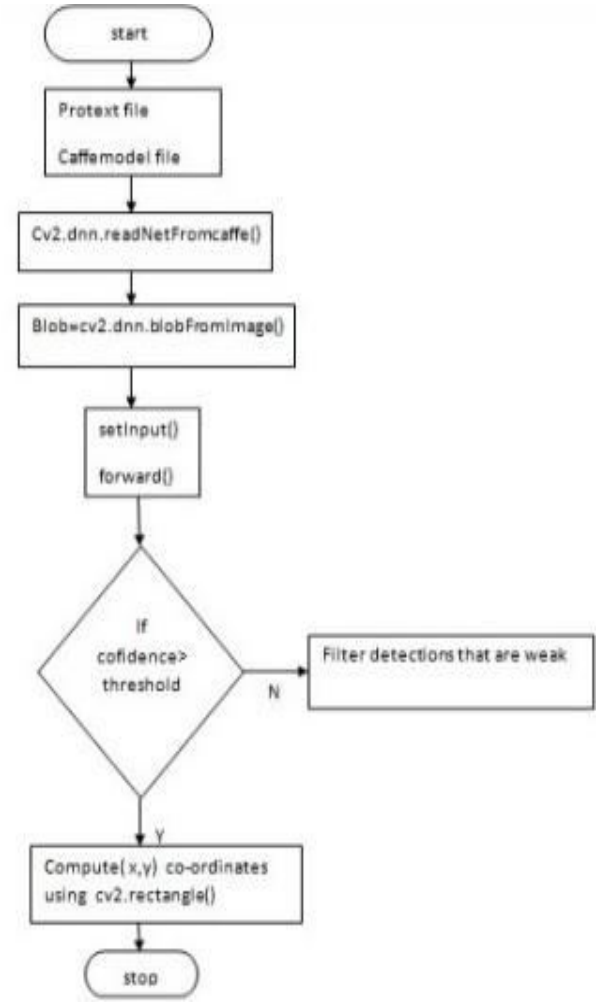

Fig -2: The algorithm for animal detection.

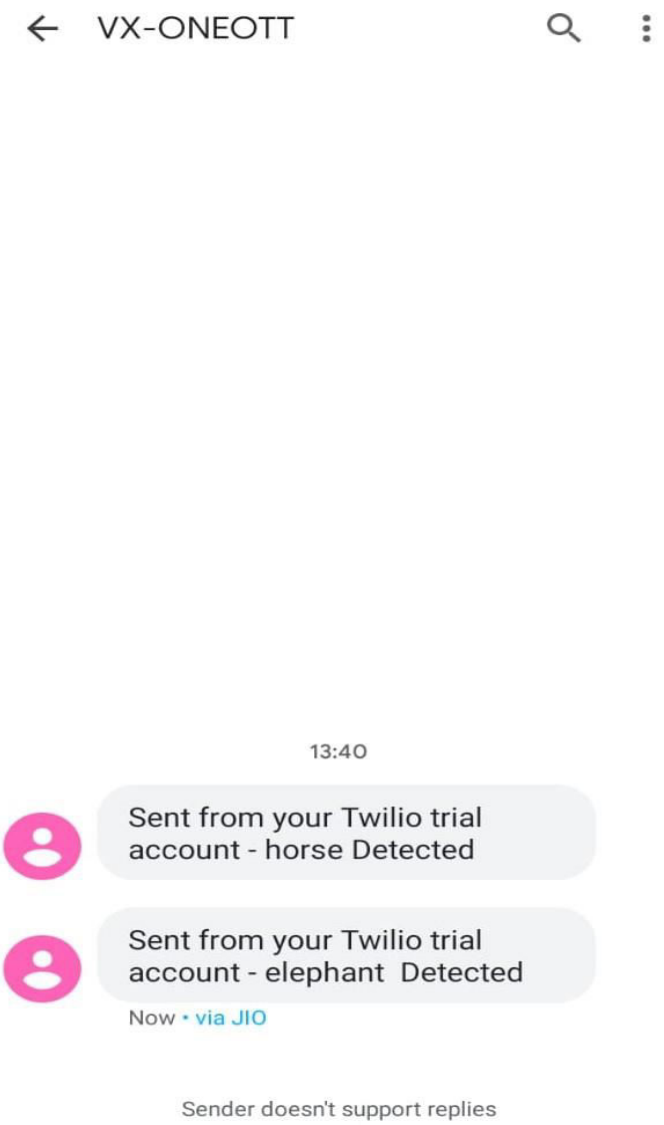

Fig -3:Output of the message of the animal detected

Fig -4:The auto mode of the crop system

4. RESULTS AND DISCUSSION

Once the animal is classified to be a threat,necessary actions are SMS notification will be sent to the farmer and the type of animal has been trying to intrude the farm using WiFi.

As you can see in fig 4 it shows the moisture level of the soil when the pump is on and auto mode is selected ,the rain is detected and the panel will be closed and the humidity and temperature will be displayed on the LCD display

5. CONCLUSION

The crop protection system can be further upgraded in many ways and can be used in wide agricultural applications. It can be placed and operated in any of the environmental conditions to grow any kind of vegetation. Non-conventional energy sources such as solar panel can be used for further enhancement. Soil-less farming can be performed to further improve the nutritional value. Integration of farming with additional IOT functionality can make it much more efficient and profitable activity. Crop protection will create a revolution in the way the agriculture is carried out in India.
Renewable energy solutions are becoming increasingly popular. Photovoltaic or solar systems are one good example of this. In order to maximize power output from the solar panels, one needs to keep the panels aligned with the sun. Rainwater harvesting provide the independent water supply during regional water restrictions, and in developed countries, is often used to supplement the main supply. It also helps in the availability of potable water, as rainwater is substantially free of salinity and other salts. Applications of rainwater harvesting in urban water system provides a substantial benefit for both water supply and waste water subsystems by reducing the need for clean water in water distribution systems, less generated storm water in sewer systems, and a reduction in storm water runoff polluting freshwater bodies.
A large body of work has focused on the development of life cycle assessment and its costing methodologies to assess the level of environmental impacts and money that can be saved by implementing rainwater harvesting systems.
To conclude, this project turned out well and met the original requirements and functionality. Overall it was an enjoyable experience completing this project. This technology in future will enable the cultivators to control & view farming direction from home through various methods like internet, mobile. The farm can be protected from animals, fire and any anonymous person entering the field. Insects can be detected and avoided. Growth of crops can be informed to the cultivators.

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