INTELLIGENT ANIMAL DETECTION SYSTEM USING IOT AND DEEP LEARNING

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ABSTRACT

One of the foremost requirements for livelihood is agriculture. Low productivity of crops is one of the issues faced by the farmers in our country. Crops destroyed by wild animals is a major issue in low productivity. The agricultural fields must be protected from any undesirable interruption from animals. In traditional methods, farmers use crackers, electrical fences, etc., to keep animals away from their fields but it is a risk factor that harms both humans and animals. Our proposed system detects the presence of animals using PIR and LDR sensors. If the sensor starts to detect, the camera is turned on to active mode to capture the image of the environment. The captured image is then compared with the already stored images of animals using image processing techniques. After the animal is identified, the ultrasonic sensor is used to calculate the distance between the animal and the agricultural field. Once the distance reaches a threshold value, a GSM module that is integrated with the system is used to send an alert message to the authorized person. The sound buzzers are turned on to keep the animals away from the field. Agricultural yield can be increased by introducing IoT technologies. It enables a convenient way of keeping records about animal detection.

Keywords: Animal Detection, Sensors, Security monitoring, GSM.

I.   INTRODUCTION

Traditional methods of detecting animals from the certain distance close to the paddy fields and farms include the use of human eyes to witness animal movements. It is not possible for human beings to monitor animal movements continuously throughout the day. So there is a need for specialized detection of animals particularly which enter the paddy fields and farm land of human beings. Due to the unavailability of any detection system these attacks kill villagers and also destroy their crops. The methods used for the recognition of the animals include Image Processing technique. Animal attacks are a common stories in nowadays. Due to the unavailability of any detection system these attacks kill villagers and also destroy their crops. Therefore a proper detection system could help save their lives and also to the preservation of crops. Also the crops of villagers are destroyed due to frequent interference of animals. By using Image Processing we can protect the field and the lives of people. This project is also used in tourist places. Its main objective is to detect the presence of the animal using sensors. It compares the image with the pre – stored image using image processing techniques. It send alerts to the authorized person about their entry and in addition it starts a sound buzzer to deny their entry. In this system the animals are composed of automotive electric fence using light sensor and Thermal sensor. The light sensor will activate the fence when the sun goes down and the thermal sensor will detect the elephant and activate the fence during the daytime. When the elephant breaks the fence and enter, laser sensor will activate the siren. By geo point location system (GPS) technology, control room officer can view the exact place where the fence was breached. The electric fence was not controlled by any external factor so a high voltage of electric current is passed in the electric fence it may lead wild animals to dead. The farm fields are protected from elephants only. The electric current passed in the fence makes the animals drive to the unconscious state. The farm fields are protected from all kinds of wild animals. It consumes less power compared to other systems. It provides Security to the farm with the safety of animal. It does not harm the animal in any ways.

II.   DATASET AND METHODOLOGY

A.   Dataset Description

The dataset has various images of a animals in different angles since the camera captured can be of any

angle(Shown in Figure 1 and Figure 2). It is used for animal identification. Since it is a self-made dataset any number of images can be included in that. It almost has 50-100 images for a animal.

Figure 1. Images of Elephant in different angles.

Figure 2. Images of Horses in different angles.
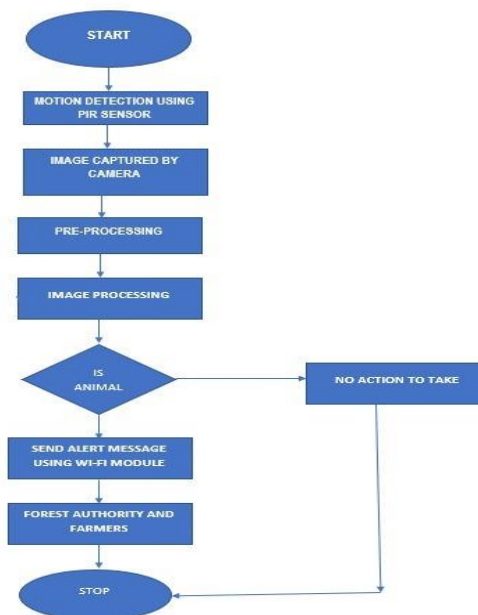
B.   METHODOLOGY

Figure 3. System Architecture.

Our proposed system is comprised of three main modules: Animal detection and identification (to detect the animal's presence and identify them), Alarm (to switch on the buzzer to keep the animal away from the field) and GSM module (to send alert messages to the authorized person). When an animal enters the field its presence is detected using the sensor. It starts calculating the distance and sends the signal to the camera to start capturing pictures. This picture is then compared with the pre stored dataset and the animal is identified. When the distance crosses the threshold value the buzzer is turned on and the alert message is sent to the authorized persons.

III.   EXPERIMENTAL MODEL

A.   Image Capturing

High goal camcorder is utilized for catching the picture of creatures in the foundation of nature. Both picture and video pictures can catch and send the signs to the equipment framework. Determinations and highlights of the camera are 1). 16MP introduced Resolution 2).High quality CMOS sensor 3). Clear, sharp actually picture and movement video 4).Support outside amplifier 5). Auto white equilibrium and openness 6). Customizable focal point 7). 640×480; 352×288; 320×240; 176×144; 160×120; picture goal Frame rate upto 30 Fps 8). AC power recurrence: 50Hz, 60Hz 9). Core interest distance: 4cm~infinity and 10). USB 2.0 I/O interface.

B.   Image Processing

The caught signals from the camera are prepared in offered succession to identify the sort of creatures. Yield signal from the camera isn't appropriate to measure and thus the signals are permitted to go through pre-handling framework. At that point the picture signals are handled in profound convolution neural organization based calculation living in raspberry pi equipment framework.

C.   Convolutional Neural Network

The engineering of convolutional neural organization for creature discovery is appeared in figure 4. The CNN is same as in engineering of unique Le Net (Convolutional Neural Organization in Python) and characterizes the given picture into different classes. Perceptron AI rationale is utilized in CNN with regulated learning mode for investigation of information. Further CNN is chiefly built by utilizing three layers a) Convolutional b) sub-inspecting and c) completely associated layer
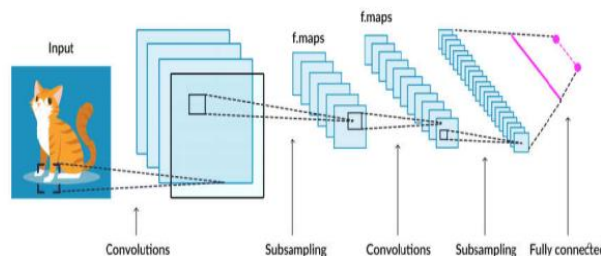

Figure 4. Architecture of convolutional neural network for animal detection

Convolutional Layer:

The Convolution layer is utilized as first layer of CNN comprised of learnable channels put spatially along width and tallness of information layer. Convolution is prepared by sliding each channel across tallness and width of the info volume and compute spot result of channel coefficient and contribution at any position. At the same time for whole info volume, two dimensional initiation amp is created which is reaction from the channel at each position. Instinctively, a different 2D actuation guide will be produced for each channel. Toward the end, all the whole initiation map are assembled and considered as the yield of convolution layer.

Pooling Layer:

Pooling layers are useful to diminish the amount of boundaries when the size of picture is gigantic. Max pooling is applied where the best component is considered from the component map. Measurement of the picture is decreased by down testing procedure. Normally channel size of 2x2 is applied for pooling over both tallness and

width and measurement is diminished by 75% while 25% is held.

Fully Connected Layer:

Completely Connected Layers are explicit sort of covered up layer which should be utilized inside the CNN. This is utilized to join the highlights into more credits that foresee the yield all the more precisely. In completely associated layer every one of the neurons are associated with past layer. This is like regular neural organization.

Network increase is applied to decide the actuation of neurons.

D.   Raspberry pi 2

The Raspberry Pi is an ease, little estimated PC that connects to a PC screen, and uses a standard console and mouse. Furthermore, it contains Broadcom BCM2837 64bit ARMv7 Quad Core Processor fueled Single Board PC running at 1.2GHz. Normal board with its interfacing gadget is appeared in figure 5.
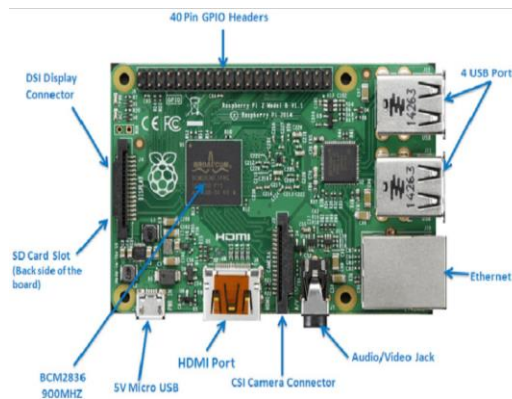

Figure 5. Raspberry pi 2 board

IV.   RESULTS AND DISCUSSION

The proposed creature discovery calculation is created utilizing convolutional neural organization and carried out utilizing raspberry pi installed framework. Python coding is utilized to build up the calculation and customized the microcontroller of raspberry pi. Calculation is executing in two stages as preparing and testing to distinguish the creatures. Preparing is completed utilizing enormous informational collection containing 13412 pictures arranged through 6 cases for various creatures. Informational collection and its cases are yielded table 1. Preparing section shows that number of pictures utilized for preparing for each case and Validate column shows the quantity of pictures tried effectively for identification.
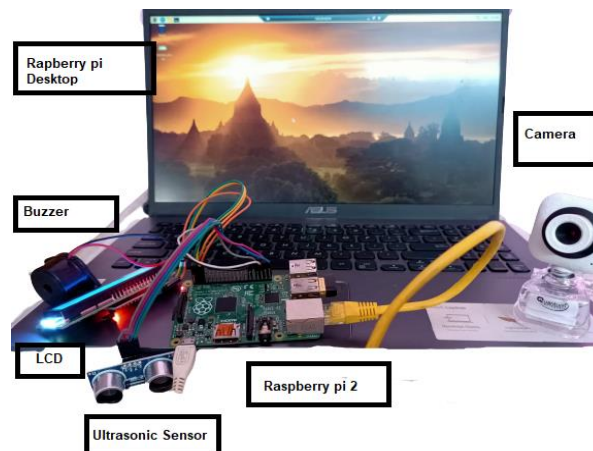

Figure 6. Experimental set up of animal detection system using Raspberry Pi

Trial set up utilizing Raspberry pi2 board, web camera and framework with Remote desktop is appeared in figure 6. Figure shows web camera is associated with raspberry pi board which is associated with PC. Informational index pictures can be given straightforwardly from PC or through camera.

Hardware results are yield according to the obstacle detection. Figure 7 shows the Output for checking the LCD Display. Figure 8 shows the hardware output of Fence detected using the ultrasonic sensor and Figure 9 shows the animal detected and its distance from the sensor.

Figure 7. Hardware Output for LCD test code

Figure 8. Hardware output for Fence Detection

Figure 9. Hardware output for Animal Detection

V.   CONCLUSION

Convolution neural organization based picture handling calculation is created to recognize the sort creature appeared in the information picture. CNN can characterize the information picture into classifications. CNN is a particular sort of counterfeit neural organization that employments perceptron's, an AI unit calculation, for managed learning, to examine information. A straightforward CNN is an arrangement of layers and basically utilizes Convolutional Layer, Pooling or sub-inspecting Layer, and Fully-Connected Layer. Stacking of these layers gives full Convolutional neural organization design. Calculation is produced for preparing of informational index pictures and testing of info pictures. More number of informational collection pictures are utilized for preparing to give better outcomes. Testing calculation is approved utilizing set of information pictures and all are accurately distinguished. Calculation is effectively tried for incomplete picture of creatures which is caught generally in camera utilized for creature recognition reason. Discovery calculation is executed in inserted equipment framework Raspberry Pi utilizing python programming with set of interfacing gadgets. Remote desktop connection is utilized to control the raspberry pi board. Almost certainly the discovery framework is a lot of accommodating to the general public to shield people, creatures and horticulture terrains of our Nation and world.

VI.   REFERENCES

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