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Neural Networks based image classification for animal Intrusion Detection System

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ABSTRACT

Agriculture plays a major role in the development of a country. Issues concerning agribusiness have been continually thwarting the advancement of the nation. Farmers face a huge number of issues, for example, insufficiency of water for irrigation, harm to crops because of pests and wildlife. In any case, the productivity is decreased by the wild creatures trampling over harvests and eating them. This project provides a solution for these problems without hurting creatures or setting human life at stake. In this project we use Raspberry pi to protect the farmland from animals. Classification of the intruded animals is done using the photos taken utilizing Convolutional Neural Network. This way it is easy to arrive at useful information regarding the intrusions and take measures against it.

Keywords— *Agriculture, Intrusion, Camera, Raspberry Pi*

1. INTRODUCTION

Agriculture is the most important sector of Indian Economy but the issue of damage to crops by wild creatures has turned into a noteworthy social issue in current occasions. So far there is no effective solution to this problem and therefore requires earnest consideration. . This project provides a smart solution to resolve this problem. In this framework, image is captured when an animal intrudes and then image is classified as domestic or wild animal using Convolution Neural Network (CNN) and deep learning technique. This classification helps in alerting the farmer by sending SMS in case of intrusion of wild animal. The smart farm protection system gives reliable security and safety to crops. This system guarantees the wellbeing of creatures while warding them off. It likewise diminishes the exertion made by man in securing the field.

2. METHODOLOGY

The image that is sent by the camera is received by the PC for classification of animal. Database is created and the set of sample images are stored in it. The program consists of functions 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 Image is used with the retrieve Image function to search for images. The captured image is given as 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 within image Index that are visually similar to the query image. The image IDs 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 found between that of 0-1, then the query image falls under the category of the stored image i.e., the contents in the query image are 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 elephant otherwise it is a leopard. If the score is in the range of 0.1 to 0.9, then the image is matched with that of the stored image. Once the wild animal is identified then the resulting repellent system is applied. If the animal found is an elephant then the Bright light is emitted. If it is found to be a Leopard, then the irritating loud noise is used. Consequently, a SMS is sent to the forest officials and also to the field owner as alert information. If the detected object is not a threat then no SMS is sent. By this way false alarm can be prevent.

2.1 Algorithm

- When the animal enters into the farm.
- The camera will capture the image of the animal that enters the farm.
- After that the captured image will undergo the image processing by using the CNN classification.
- If the animal enters the farm and matches the trained dataset, if it is not found than there will be no action taken.

2.2 Flow Chart

Figure 1 shows the flow chart for the methodology used.

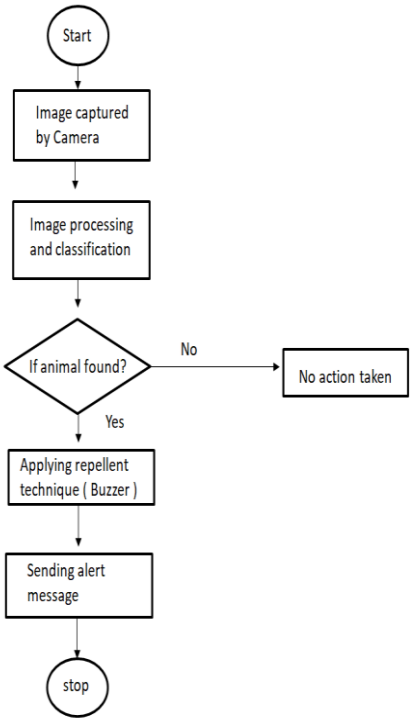

Fig. 1: Flow Chart

2.3 Block Diagram

To obtain (correct) predictions from deep neural networks you first need to preprocess your data. In the context of deep learning and image classification, these preprocessing tasks normally involve:

(a) Mean subtraction.
(b) Scaling by some factor

Open CV's new deep neural network (Dnn) module contains two functions that can be used for preprocessing images and preparing them for classification via pre-trained deep learning models.

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

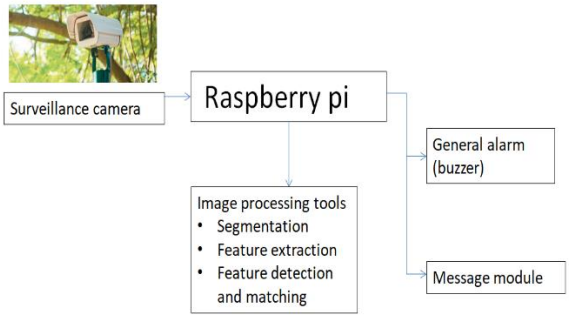

Fig. 2: Block diagram

Comparing 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 or bright.
- Down sampling to increase speed.
- Morphological operations for binary images.
- Scaling by some factor.

Hardware Requirements:

(a) Camera
(b) Raspberry Pi
(c) Power supply

Software Requirements:

(a) Python
(b) Windows / Linux OS
(c) OpenCV

2.4 Raspberry pi

The Raspberry Pi 3+ uses a Broadcom BCM2837B0 SoC with a 1.4 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache. Along with the Pi itself, the microSD card, and power supply, you'll need a HDMI cable and a suitable display. As with a traditional computer, you'll also need a USB keyboard and mouse. The Raspberry Pi 3 has built in Wi-Fi and Bluetooth, but if you're using a different model, you'll need compatible USB dongles (you can check compatibility at elinux.org's Raspberry Pi Hub). If you prefer to use Ethernet, however, the Pi is equipped with an Ethernet port. Once you're set up, and have your preferred operating system installed (unless specified, all of these projects require the latest version of Raspbian), you'll find all of the tools you need to run your Raspberry Pi like a desktop computer. installed (unless specified, all of these projects require the latest version of Raspbian), you'll find all of the tools you need to run your Raspberry Pi like a desktop computer.

Raspberry pi is available in four different types, namely A, A+, B, B+ types. The type of the Raspberry pi used in the project is of type B+. It has Wi-Fi and Bluetooth features. Raspberry pi comes under ARM Cortex 11th type. It has two camera ports. It has power supply port. It has one USB port. It has one Ethernet port. In total Raspberry pi B+ has 40 pins. Out of these forty pins 28 pins are GPIO. It supports for both Wi-Fi and Bluetooth model. In the present implementation Broadcom B+ is used. Out of microcontroller, Arduino and ARM cortex, ARM Cortex is the best one. Under ARM Cortex 11 Raspberry pi is found.

2.5 Power supply

There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable DC voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. DC voltages are required to operate various electronic equipment. These voltages are 5V, 9V or 12V which cannot be obtained directly. Thus, the input to the circuit is applied from the regulated power supply. A power supply takes the AC from the wall outlet, converts it to unregulated DC, and reduces the voltage using an input power transformer, typically stepping it down to the voltage required by the load. For safety reasons, the transformer also separates the output power supply from the mains input.

3. PROPOSED SYSTEM

In the proposed project, PIR Sensors and camera act as first round of security where the animal movement is detected using the sensor and the sensor in turn triggers the camera to take the picture of the animal and transmit the image for processing via

Raspberry Pi. The System transmits the image from the camera to the Pi in the command center where the image processing and classification and Counting of animals is done. Once the animal is found to be a threat Raspberry Pi send the signal to the repellent to take appropriate action, Such lot of time and energy. The system works in real time detect the animals in the field, in addition the farmers can access the view of their fields remotely. Type of animal and also the count can be given. The system causes no harm to the animals or humans, it has a very low power requirement and can also run on a battery thus reducing the hazards of electric shock.

Fig. 3: Proposed System

Here, we are using Raspberry Pi model 3B+ and we are connecting the spy camera and power supply, mouse and keyboard. And connected Buzzer for the output the camera is used to capture the animals which enters the farm field and after capturing the image It undergoes the CNN algorithm and classify the animal. After classification of the animal and it sends the notification to the farm owner and makes the sound by using the buzzer to just distract the animal.

4. CONCLUSION

The problem of damaging crops by wild animals has become a major social problem in the current time. It requires urgent attention and an effective solution. Thus this project carries a great social relevance as it aims to address this problem. The proposed system based on Raspberry pi is found to be more compact, user friendly and less complex, which can readily be used in order to perform several tedious and repetitive tasks. In this project the process does not cause any hurt to animal during repellent.

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