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Dangerous Insects Identification and Alarm System Employing CNN Based Image Processing System

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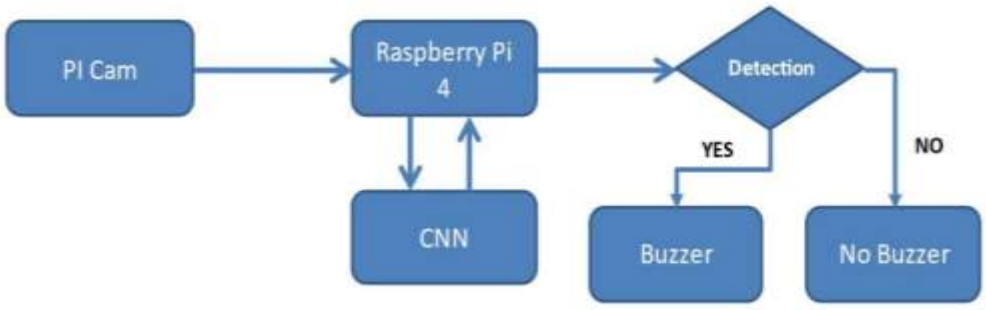
ABSTRACT

In households, especially old ones, a lot of objects would have not been moved for a long time. This may have allowed insects, some dangerous, to accumulate under those objects. Placing a camera module integrated with an embedded and alarm system in those spots with a minimal lighting will alert the inmates of the building of the presence of such insects. The embedded system is loaded with CNN image processing module trained by a dataset of images of dangerous insects in that light setting. The collected images and video footages can be employed for future data analytics.

INTRODUCTION

Insect pests are one of the preeminent reasons for crop damages all over the world. It is well known that different species of insects might have similar phenotypes, and insects often take on complicated phenotypes due to different environments, growth periods and damages. The prevention of those damages could avoid the loss of an outsized portion of the harvest and permit a better efficiency of the agriculture. Not only pests might reduce the harvest, they could also damage the machinery and therefore the equipment. Since people without the knowledge of entomology cannot distinguish insect categories and the growth period of insects, it is necessary to develop more rapid and effective approaches to tackle this problem. Reducing such a drag would cause an economic process of the entire sector and would require a lower amount of natural resources to supply an equivalent amount of food. The first step to stop crop damages thanks to insect pests is the ability to acknowledge and classify insects, so as to discriminate between the safe ones and therefore the dangerous ones. Since this task requires endless and expensive monitoring, there has been a growing interest in automatic pest's classification in recent years. In this paper we propose a replacement method to classify insect pests supported convolutional neural networks (CNNs).In this way we augmented the image data and that we used the new samples to coach multiple networks to create an ensemble. Placing a camera module integrated with an embedded and alarm system in those spots with a minimal lighting will alert the inmates of the building of the presence of such insects.

PROPOSED SYSTEM:



The proposed system consists of a Raspberry pi 4, a Pi camera and a buzzer. The process goes as follows. The Pi camera acquires the image data and it is then sent to the Raspberry pi. The Raspberry pi processes the image and feeds it into the model and activates the buzzer if an image is detected as one among the dangerous insects class. The training is done with 460 images consisting of 4 classes of species namely the Indian honeybee, red scorpion, monarch butterfly and red ant. The training was done in the Google COLAB Environment and after training, the weights file and the weights are deployed in the raspberry pi. During deployment, the raspberry pi obtains the image data from the pi camera and then processes it using the weights. When the model detects an image to be one among the dangerous insects class, it raises an alarm as an alert using the piezoelectric buzzer attached.

RESULTS AND DISCUSSION:

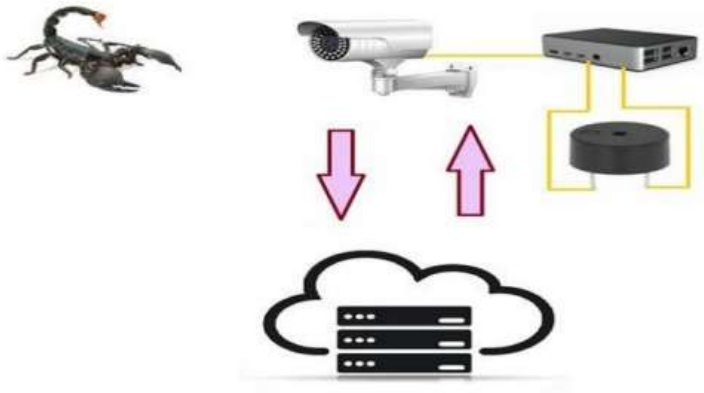


Fig 1: Schematic Diagram

Presented above (Fig1) is a schematic diagram of the system presented in this project. The camera placed in strategic positions in a building captures the image of the insect and transmits the image data to a server via the Internet. The server is loaded with a trained CNN module that can identify different varieties of insects. and sent to the locally placed microcontroller unit at the building to initiate the alarm.

Fig 2: Poisonous insects

Presented above are two images (Fig 2) of a poisonous variety of centipede and a venomous spider.

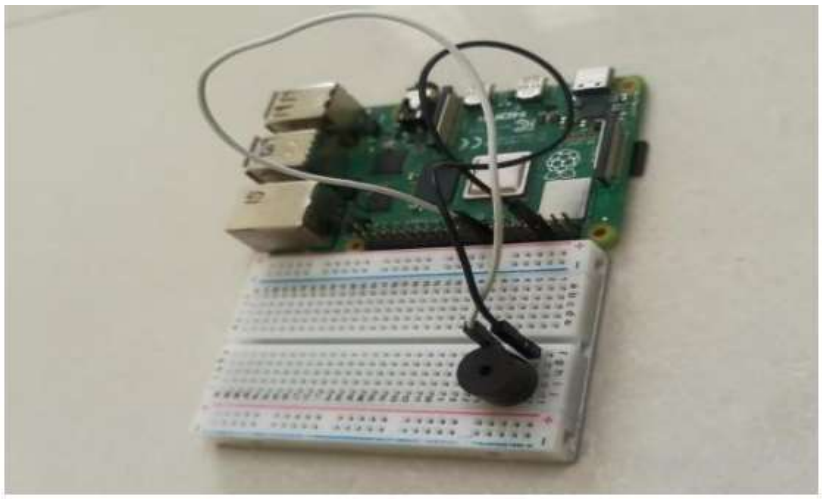


Fig 3: Raspberry Pi Setup

Fig 4: Detected class sample image 1

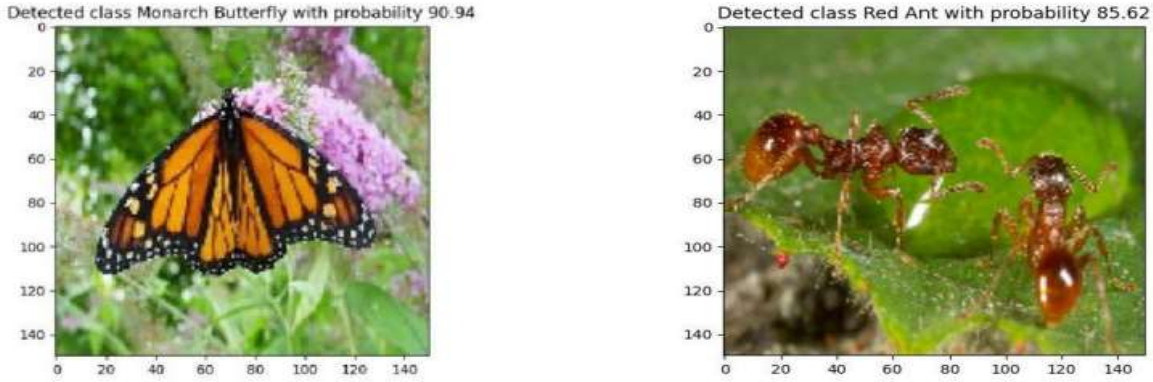


Fig 5: Detected class sample image 2

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Detected class Indian Honeybee with probability 91.92
Detected class Indian Red Scorpion with probability 89.47
Detected class Monarch Butterfly with probability 90.94
Detected class Red Ant with probability 85.62

Process finished with exit code 0
```

Fig 6: Status Output

Inference As shown in the Figure 6, the circuit of the system consists of a Raspberry Pi, a Pi cam and the corresponding actuator, which in this case is a buzzer. This is an ideation level prototype of the product presented in this paper. The industrial grade prototype of this product will have a very similar setup as above. The difference will be that more industrial grade components will be used. This circuitry along with the image processing CNN algorithm was tested and the performance was satisfactory in terms of validating the proposed method. The dangerous insect, when identified, triggers the buzzer. Images obtained in this project are continuously sent to a centralized server in the industrial grade unit.

CONCLUSION:

Camera traps are one of the primary methods of identifying the presence of a particular species of animal, be it in the wild or human occupied region. Camera traps are the most effective identification of a species of animal or insect. Disadvantages are the complexity of the system, the unpredictable external lighting and effective computation of the obtained image either locally or by transmission and reception. In most cases, automated identification of cases is done only with artificial intelligence and machine learning based automata. Direct top-down methods to identify a species from images is close to impossible owing to the infinite possibilities of image angles in which they can be captured. Apart from that the background is also very unpredictable. Automated bioacoustics monitoring device is one cheap and effective alternative to image processing-based identification of animals and insects.

Automated bioacoustics monitoring devices rely on the specific and unique sounds produced by these animals and insects. One effective way to conserve both power and periodic computation of image processing-based systems is to integrate the automated bioacoustics monitoring devices with the image processing device and automatically switch on the later when the sound input has been recorded in the former. In the system presented in this paper, any unidentifiable species of insects has to be maintained as a separate class and the newly captured data must be sent to a centralized server for identification and updating the database.

References

[1]. Saeed Azfar, Adnan Nadeem, Ahmad Alkhodre and Kamran Ahsan, "Monitoring, Detection and Control Techniques of Agriculture Pests and Diseases using Wireless Sensor Network: A Review", December 2018International Journal of Advanced Computer Science and Applications 9(12):424 – 434

[2]. https://medium.com/machine-learning-researcher/convlutional-neuralnetwork-cnn-2fc4faa7bb63

[3]. https://www.theengineeringprojects.com/2021/03/what-is-raspberry-pi-4- pinout-specs-projects-datasheet.html

[4]. Google COLAB - https://in.docworkspace.com/d/sIOC_mbhG4PychwY

[5]. https://en.wikipedia.org/wiki/Raspberry_Pi

[6]. https://static.raspberrypi.org/files/product-briefs/Raspberry- Pi-4-ProductBrief.pdf

[7]. https://keras.io/api/applications/#vgg16