

AN INTELLIGENT SYSTEM THAT DECIPHERS A SPECIES OF ANIMAL USING IMAGE PROCESSING

NIKITHA T¹, VIJAY SAKRE², UJWAL KIRAN T³

^{1,2,3}8th Semester, Department of Electronics & Communication Engineering,
Global Academy of Technology, Bengaluru
vijaysakre2000@gmail.com, ujwalkiran9600@gmail.com, nikithatambraparni@gmail.com

Abstract

Image processing is an essential discipline in computer vision and real-time data analysis, which has been a popular area of research in recent years. Certain classes of animals are known to wreak havoc on fresh fruits, vegetables, and various agricultural yields throughout the year in gardens, estates, and agricultural fields. The property damage is enormous, and it has an impact on the day-to-day life of millions of farmers. Farmers resort to time-consuming and inconvenient manual techniques of chasing the monkeys away with sticks. As digitalization spreads across all fields, the duty of protection may be computerized. The central concept of this project is to automate the process of protecting the crops, fruits, and vegetables by creating an intelligent device that safeguards the produce while causing no harm to the monkeys.

Keywords- Haar Cascade Classifiers, Raspberry pi, pi camera

INTRODUCTION

The project is based on advanced image processing principles, sensors, a Raspberry Pi camera, and the installation of numerous actuators such as speakers, pumps, and sprayers on a Raspberry pi board. Computer vision is a constantly developing field that investigates how computers see digital images and movies. A computer does not see an image as it is, instead an image will be perceived differently on the computer's end. Computer vision is the perception of a visual input from the computer's end, the collection of complex information from images and movies, and the processing of that information to extract desired details. When the R-Pi camera linked to the R-Pi board detects the desired animal, a signal is directly sent to activate the actuator which is a speaker, which in our case is a speaker which will generate the uploaded sounds (firecrackers, sirens, aircraft noise), scattering the monkeys away. The Haar cascade classifier is utilised for image processing. It benefits the end user since the crops they raise can be preserved from monkey damage. Another main reason for implementing this project is that protecting crops from monkeys takes valuable time and is a tough procedure, which becomes tedious. To avoid people from patrolling agricultural fields, the procedure of providing protection from monkeys may be mechanized.

PROPOSED METHOD

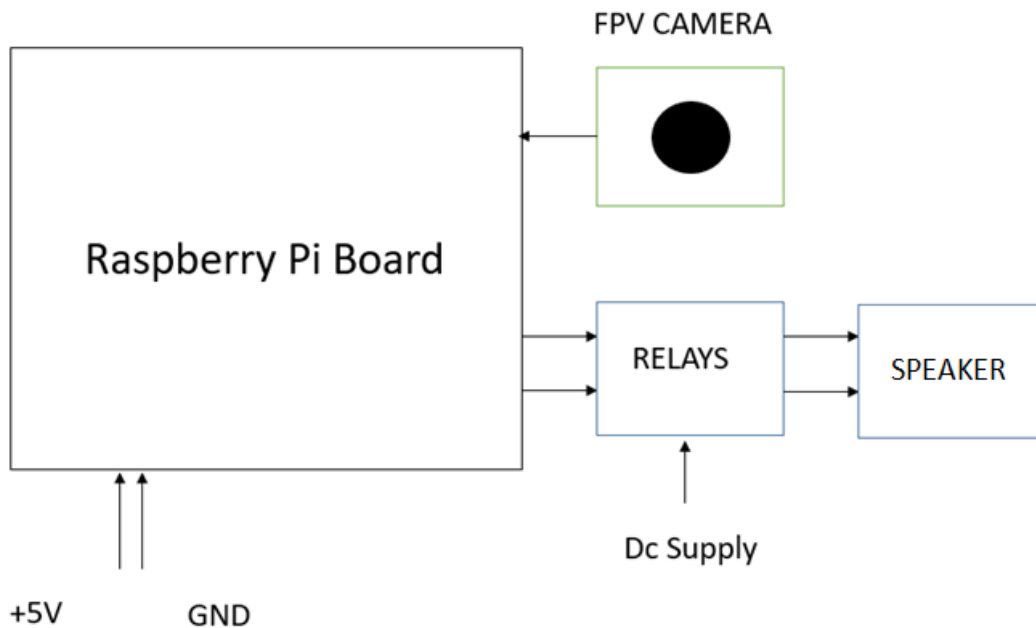


Fig 1: General Block diagram of the proposed system

The Raspberry Pi 3B+ board, which is a microprocessor, is used in the project. The board has 40 GPIO pins and a camera built into it. The camera has a resolution of 5MP.

The project is based on the image processing principle. The pi camera first detects the picture of the monkey. The video is a succession of photos, and when a monkey is detected at any frame, the Haar cascade classifier is used to recognise the monkey.

The Haar classifier is a machine learning algorithm that detects objects using the cascade function. A large number of positive and negative pictures should be uploaded, the system should be trained and it should be learned and translated to an xml file (Extensible markup language). In comparison, it is a quick algorithm.

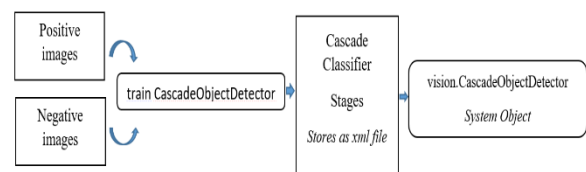


Fig 2: Flowchart of cascade classifier.

In this case, the monkey is used as an object, and both positive and negative pictures are trained using a cascade function, where positive images (monkey photos) and negative images are used (images without monkey). To extract features from an image, Haar cascade features are utilised. Each feature has a single value that is calculated from the difference between black and white pixels.

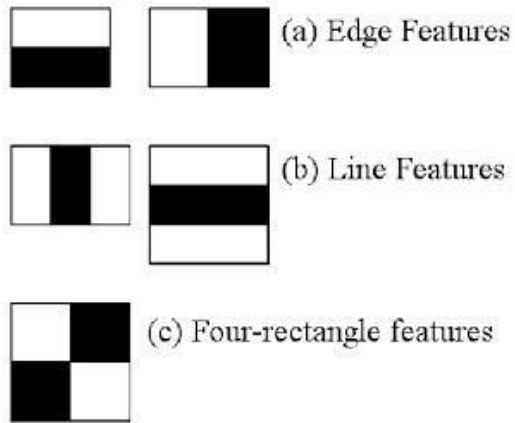


Fig 3: Haar cascade Features

0	0	1	1
0	0	1	1
0	0	1	1
0	0	1	1

Fig 4: Ideal Haar feature pixel intensities

0: White

1: Black

0.1	0.2	0.6	0.8
0.2	0.3	0.8	0.6
0.2	0.1	0.6	0.8
0.2	0.1	0.8	0.9

Fig 5: Real values detected on the image



Fig 6: Colour image



Fig 7: Grayscale image

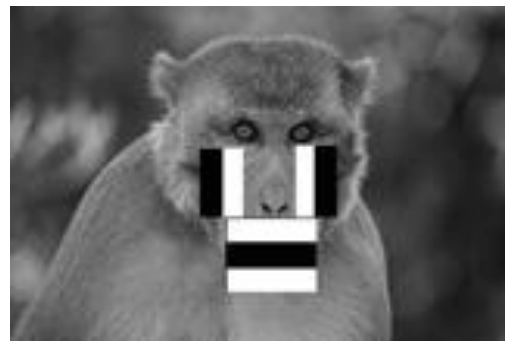


Fig 8: Traversing Haar cascade

Feature through the image

$$\Delta = \text{dark} - \text{white} = \frac{1}{n} \sum_{\text{dark}}^n I(x) - \frac{1}{n} \sum_{\text{white}}^n I(x)$$

This algorithm checks and compares how close the present scenario is to the ideal case scenario.

Δ for ideal feature is: 1

Δ for the real image: $0.74 - 0.18 = 0.56$

The closer the value is to one, the more accurate the detection and the Haar cascade characteristic is discovered.

At each frame, a picture is captured for the process and converted to grayscale in order to determine the image's intensities. The Haar cascade features traverse the picture and compare the image intensities to the ideal value. If the value is closer, the item is recognised and a match is discovered. At each frame of the movie, these Haar cascade characteristics cross the picture.

Thus, whenever the monkey appears in front of the camera, the Raspberry pi processor analyses the monkey by Haar cascade classifier and the sprayer connected to the GPIO pins of the pi circuit gets activated and sprays water on monkeys.

RESULT

As a result of using the Haar cascade classifier approach, we will be able to identify the monkeys and scare them away by playing the uploaded effective sound, reducing the destruction caused by monkeys.

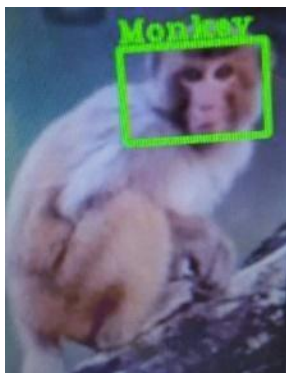


Fig 9: Detected monkey

CONCLUSION:

Protecting crops from monkeys is a tough and time-consuming chore that must be completed for the livelihood of millions of farmers. Manual techniques of human labour can be substituted by this cost-effective detection gadget in the quest to protect agricultural fields and estates. Picture processing is an excellent method for detecting an image of a certain item. The Raspberry Pi board is utilized to carry out this project. When compared to traditional procedures, the destruction inflicted by the monkeys is mitigated to a larger extent (human monitoring). If a monkey arrives within the frame of the camera, the gadget activates and plays the uploaded effective sound, preventing the monkeys from entering the property lands.

The suggested approach provides an effective way of securely getting rid of monkeys while protecting agricultural goods and inflicting no real harm to monkeys. As a result, our suggested technique, named "AN INTELLIGENT SYSTEM THAT DECIPHERS A SPECIES OF ANIMAL USING IMAGE PROCESSING," is a one-of-a-kind way to ensure yield.

The given approach depicts an automated system that continually analyses the surroundings and, upon detection of an item (in this case, a monkey) within its frame, it activates the associated speaker, which plays the relevant uploaded sound. The picture is initially processed on the Raspberry-pi 3B+ board using input from the interfaced Raspberry Pi-camera. This is an efficient way of getting rid of monkeys safely as humanly as possible without causing any real harm to monkeys and safeguarding agricultural commodities. It benefits the end-user, as the crops they grow can be saved from the devastation caused by monkeys.

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