International Journal of Innovative Technologies
WWW.IJITECH.ORG
ISSN 2321-8665
Volume.08, Issue.01,
June, 2020,
Pages:92-95

Design and Implementation of TerrorBot for Detect Terrorists and Soldiers

G. GANESH REDDY[1], K. ASHOK REDDY[2]

[1]Assistant Professor, Dept of ECE, Vignan's Institute of Management and Technology for Women, Hyderabad, TS, India.
[2]Assistant Professor, Dept of ECE, Vignan's Institute of Management and Technology for Women, Hyderabad, TS, India.

Abstract: Most of the defense organization now takes the assistance of robots to hold out many risky jobs that can't be done by soldiers. These robots utilized in defense or usually employed with integrated systems, including video screens, sensors, laser guns, metal detectors, and cameras. The defense robots also have different shapes according to various purposes. Here the new system is proposed with the help of camera through we can trace out the intruders and the robot will be employed with integrated system, including video camera, sensors, gripper and weapon. The intruders face detection by Haar Cascade Classifier and face recognition by LBPH (Local Binary Pattern Histogram). This is specially designed robotic system to protect the country from enemies and to save soldiers life. The proposed algorithm is implemented using Open source Computer Vision (OpenCV) and image processing with python.

Keywords: Raspberry Pi3, OpenCV, Face Recognition, LCD, L293D.

I. INTRODUCTION

Recognition of face is the process of distinguishing people in images or videos by analyzing and comparing patterns. Face recognition algorithms typically extract facial features and compare them to a database and find the similarity. The face recognition can be attributed to the increase of commercial interest and the development of feasible technologies to support the development of face recognition. Biometric, law enforcement, and surveillance, human-computer interaction, multimedia management, smart cards, passport check, a criminal investigation, access control are major areas of Commercial Interest. However, face detection is more provocation because of some unstable characteristics, for example, glasses and beard will impact the detecting effectiveness. Moreover, different types and angles of illumination will make detecting face generate unequal brightness on the face, which will have an influence on the detection process. To overcome these problems, the system used the haar cascade classifier for face detection and LBPH (local binary pattern histogram) algorithm for face recognition implemented using the face recognizer function of OpenCV.

II. RELATED WORK

This section gives an overview of the major human face recognition techniques that apply mostly the frontal faces. The methods considered are Eigenfaces (eigenfeatures) and Fisherface. The approaches are analyzed in terms of the facial representation they used.

Eigenface: The Eigenface method is one of the most used algorithms for face recognition. Eigenfaces are the principal components that divide the face into the feature vectors. The feature vectors' information can be obtained from the convincing matrix. These Eigenvectors are used to quantify the variation between many faces. The faces are characterized by the linear combination of the highest Eigenvalues. Each face can be examined as a linear combination of the eigenfaces. The face can be approximated by using the eigenvectors having the largest eigenvalues. Eigenface is a practical approach to face recognition. Because of the simplicity of its algorithm, the implementation of an Eigenface recognition system becomes easy. It is efficient in processing time and storage. There is a high mutual relation between the training data and the recognition data. The accuracy of eigenface depends on many things. As it takes the pixel value as a comparison for the projection. The accuracy would decrease with varying luminous intensity. Pre-processing of the image is required to achieve a satisfactory result. An advantage of this algorithm is that the eigenfaces were invented exactly for these purposes what makes the system efficient. A drawback is that it is sensitive to lightening conditions and the position of the head. Disadvantages- Finding the eigenvectors and eigenvalues are time-consuming.

Fisherface: Fisherface is one of the most successfully widely used methods for face recognition. It is based on the appearance method. It shows the truthful result in the face recognition process. All used LDA to find a set of basis images that maximize the ratio of between-class scatter to within-class scatter. The disadvantages of LDA is that within the class the scatter matrix is always single since the number of pixels in images is larger than the number of images so it can increase detection of error rate if there is a disparity in pose and lighting condition within same images. So to overcome this problem many algorithms have been proposed. Because the Fisherface technique uses the variation within the class, so the problem with variations in the same images such as lighting variations can be overcome. The fisher face method for face recognition uses both PCA and LDA

(Linear discriminant analysis) which produce a subspace projection matrix, similar as used in the eigenface method.. however, the fisher face method is in a position to require advantage of within-class information, minimizing variation within each class, yet still maximizing class separation. Like the eigenface construction process, the first step of the Fisherface technique is to take each image array and reshape it into a vector. Fisherface is identical to Eigenface but with an enhancement of better classification of different classes image. Fisherface discards the primary three principal components which are liable for candlepower changes; it's more invariant to candlepower. The disadvantages of Fisherface are that it is more composite than Eigenface to finding the projection of face space. Calculation a ratio of between-class scatter to within-class scatter requires a lot of processing time. Besides, thanks to the necessity for better classification, the dimension of projection in face space isn't as dense as eigenface, leads to larger storage of the face and more processing time in recognition.

III. METHODOLOGY

Raspberry Pi is the heart of the system, located at the central of the blocks diagram and controls all the operations of the system as shown in Figure 1.

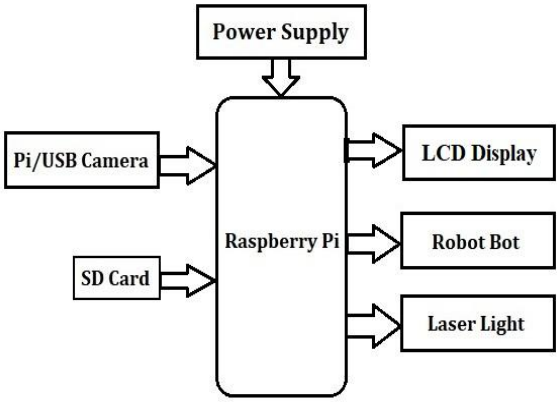

Fig1. Block Diagram.

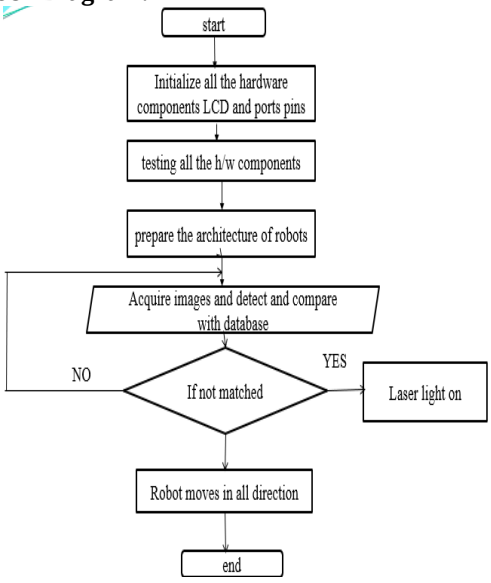

Fig2. Flow Chat.

An LCD is used to display all the operations going under the microcontroller. The work system include microcontroller for collecting data from various places and accordingly movement of robot. The controller is programmed to turn ON a LASER device (as Gun) to target and hit the unknown persons. Web camera is used for detecting the face of the intruders. The work flow of the TerrorBot is shown in the Figure 2.

A. Haar cascade classifier

Viola-Jones Face Detection Method Initially the algorithm needs lot of positive and negative images to train the classifier, then we need to extract features from it. For this Haar features shown in Figure 3 are used they are just like our Convolutional Kernel. Each feature is a single value obtained by subtracting sum of pixels below white rectangle from sum of pixels below black rectangle.

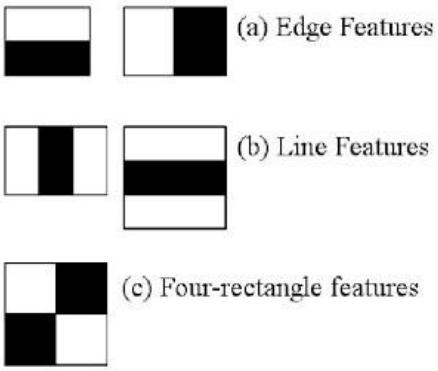

Fig3. Haar Features.

For each feature calculation, we need to find sum of pixels below white and black rectangles. To solve this, they introduced the integral images. It simplifies calculation of sum of pixels, how large may be the number of pixels, to an operation including just four pixels. Observe Figure 4, top row shows two good features. The first feature selected appears to focus on the property that the region of the eyes is often darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose. But the same windows applying on cheeks or any other place is unrelated.

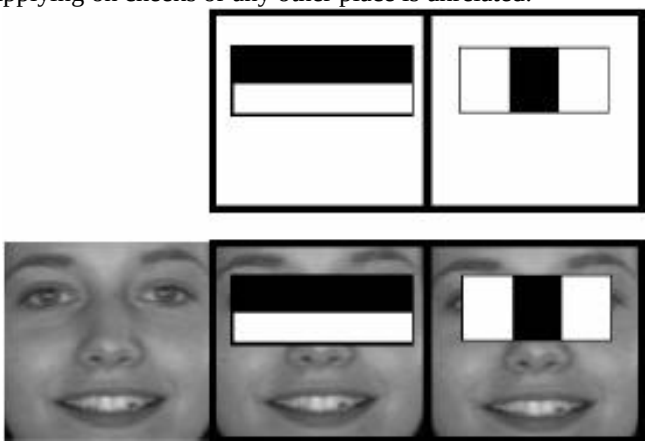

Fig4. Face Image.

B. Viola-Jones Algorithm using haar features for face detection

Local binary pattern histogram for face recognition several methods for extracting the most useful features from face images to perform face recognition. One of these feature extraction methods is local binary pattern (LBP) method. This is done by dividing an image into several small areas from which the features are extracted. These features consist of binary patterns that describe the surroundings of the pixels in the regions. The obtained features from the region are concatenated into a single feature's histogram, which forms a representation of the image. Images then be compared by measuring the similarity(distances) between their histograms. According to the several studies face recognition using the LBP method provides very good results, both in terms of speed and discrimination performances. Because of the way texture and shape of images is described, the method seems to be quite robust against face images with different facial expressions, different lightening conditions, image rotation and aging of persons.

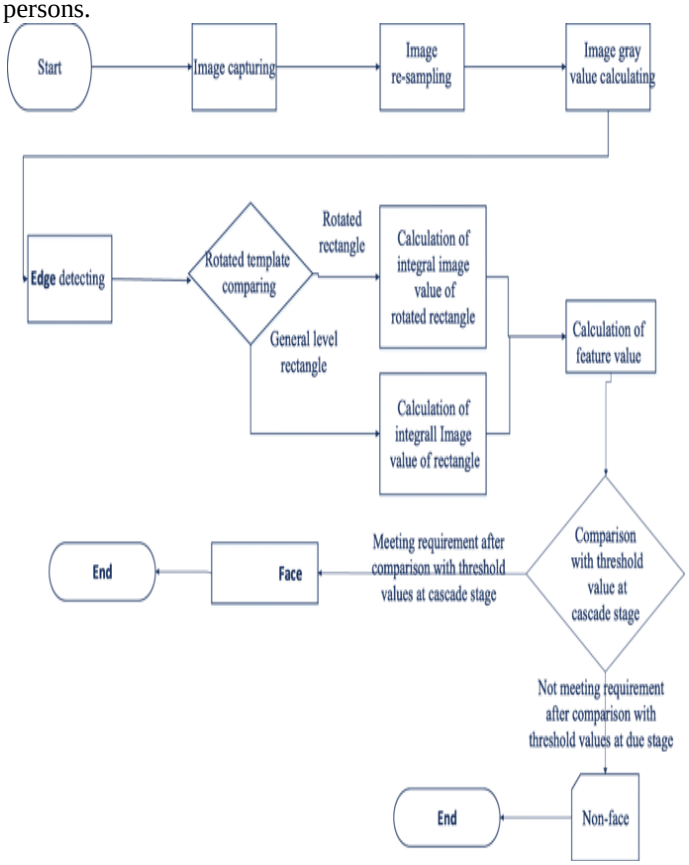

Fig5. Face Detection Algorithm.

C. Principle of LBP

The original LBP operator was invented by ojala et al. this operation works with the eight neighbors of a pixel, using the value of this center pixel as a threshold if a neighbor pixel has a higher gray value then the center pixel (or the same gray value) the a one is assigned to that pixel, else its gets a zero. The LBP code for the center pixel is then produced by concatenating the eight ones are zeros to a binary code as shown in Figure 5.

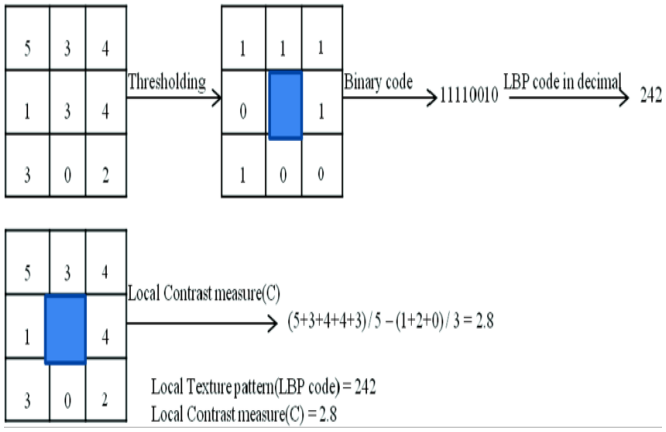

Fig 6: LBP Binary operator.

D. Face Recognition Algorithm

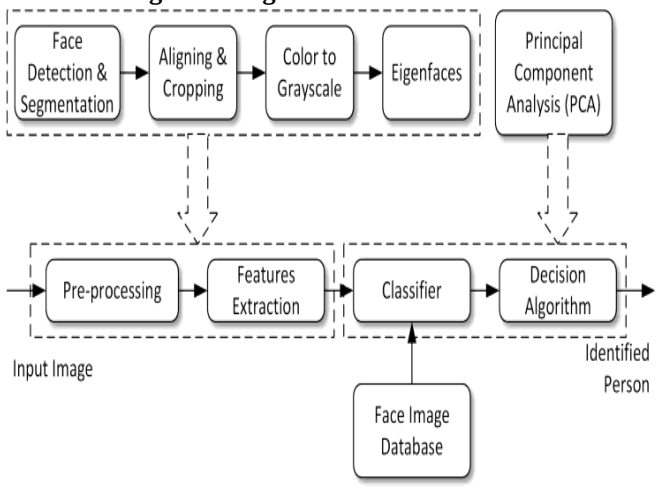

Fig7. Face recognition algorithm.

IV. SYSTEM DESIGN

A. Raspberry Pi 3

The Raspberry Pi just got juicer! Now with a Quad-Core 64bit CPU, WiFi & Bluetooth! The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

B. Raspberry Pi 3 - Model B Technical Specification

- Broadcom BCM2387 chipset.
- 1.2GHz Quad-Core ARM Cortex-A53.
- 802.11 bgn Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE)
- 1GB RAM
- 64 Bit CPU
- 4 x USB ports
- 4 pole Stereo output and Composite video port

- Full size HDMI
- 10/100 BaseT Ethernet socketbr
- CSI camera port for connecting the Raspberry Pi camera**.**
- DSI display port for connecting the Raspberry Pi touch screen display**.**
- Micro SD port for loading your operating system and storing data**.**
- Micro USB power source

C. 16x2 LCD Display

A **16x2 LCD display** is very basic module and is very commonly used in various devices and circuits. A **16x2 LCD** means it can **display** 16 characters per line and there are 2 such lines. In this **LCD** each character is displayed in 5x7 pixel matrix. Command register stores various commands given to the **display**.

D. L293D Motor Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

E. Web Camera

A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware. Webcams can be used during a video chat session involving two or more people, with conversations that include live audio and video.

V. CONCLUSION

Today, defense ground robots & unmanned vehicles are used worldwide. However, the significant growth of the current defense robots comes as the nature of combat changes in every region while the globally integrated enterprise replaces nationalistic dominance. This proposer system gives an exposure to design a simple robot that can be used to do multifunction in defense. Manual control is additionally employed to regulate the robot from the room which is found distant from the border area.

VI. REFERENCE

[1]https://www.researchgate.net/publication/335219198_FACE_DETECTION_AND_RECOGNITION_USING_RASPBERRY_PI
[2]https://www.researchgate.net/publication/322009772_Development_of_face_recognition_on_raspberry_pi_for_security_enhancement_of_smart_home_system
[3]http://ijarcet.org/wp-content/uploads/IJARCET-VOL-6-ISSUE-11-1720-1723.pdf
[4]https://www.pyimagesearch.com/2018/06/25/raspberry-pi-face-recognition/
[5]http://academia.edu/35567333/Internet_of_Things_Approach_for_Face_Detection_and_Face_Recognition_using_Raspberry_Pi
[6]https://www.raspberrypi.org/
[7]https://pysource.com/2018/10/31/raspberry-pi-3-and-opencv-3-installation-tutorial/

Author's Profile:

G. Ganesh Reddy, Currently working as an Assistant Professor, Dept. of ECE, Vignan's Institute Of Management and Technology for Women. Kondapur (V), Ghatkesar (M), Medchal Dist-501301, TS, India.

K. Ashok Reddy, Currently working as an Assistant Professor, Dept. of ECE, Vignan's Institute Of Management and Technology for Women. Kondapur (V), Ghatkesar (M), Medchal Dist-501301, TS, India.