IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 4, April 2017

# Face Detection and Face Recognition Using Raspberry Pi

**Shrutika V. Deshmukh[1], Prof Dr. U. A. Kshirsagar[2]**

P.G Student, Electronics and Telecommunication Department, HVPM's College of Engineering and Technology Amravati, India[1]

Professor and HOD, Electronics and Telecommunication Dept, HVPM's College of Engineering and Technology, Amravati, India [2]

**Abstract**: Nowadays the number of thefts and identity fraud has become a serious issue. In order to avoid these thefts and identity fraud, a face recognition system must be established. The scope of this project is to develop a security access control application based on face recognition. The haar-like features is used for face detection and HOG +SVM algorithm is used for face recognition. In order to achieve a higher accuracy and effectiveness we use OpenCV libraries and python computer language. Training and identification is done in embedded device known as Raspberry Pi.

**Keywords**: Face detection, Face recognition, raspberry pi, security.

## I. INTRODUCTION

In this current time a lot of incident occurs like robbery, stealing unwanted entrance happens abruptly. So the security does matters in this daily life. People always remain busy in their day to day work also wants to ensure their safety of their beloved things. Sometimes they forget to look after their necessary things like keys, wallet, credit cards etc. Without these, they are unable to access their home or any place they want.Traditional security system require the user a key, a security password, an RFID card, or ID card to have access to the system. However, these security systems have deficiencies; for example, they can be forgotten or stolen from unauthorized people. As a result, there is a need to develop software that guarantees a higher security level is a template. One of the unique features of our brain is that it can think only in images not in words. Once you may forget to keep your Car's key but you will never forget to bring a face with you.God has given everyone a unique face. Face is the most important part of our body, so that it can reflect many emotions of a person. From a long year ago, we are using non-living thing (smart cards, plastic cards, PINS, tokens, keys) for authentication and to get grant access in restricted areas like ISRO, NASA, and DRDO etc. There are two types of biometric as physiological characteristics (face, fingerprint, finger geometry, hand geometry, palm, iris, ear and voice) and behavioural characteristics (gait, signature and keystroke dynamics). Sometimes your behavioural traits may changes because of illness, fear, hunger etc. Face detection and recognition system is more cheap, simple, accurate and non-intrusive process as compare to other biometrics. The system will fall into two categories as face detection (1:1) and face recognition(1:N).In the face detection we have to classify between face versus non face region while in recognition process we have to compare that single face image with multiple images from the input image. In This work uses BCM2835 processor, popularly known as Raspberry pi Board. The core of the board is the above processor. It is a RISC processor based on ARM11. The board has special features like camera interface and touch screen that make it suitable for real time image processing Open cv consists of huge number of inbuilt functions for image processing. It is under BSD license and hence libraries are free of proprietary cost. The full-fledged library functions simplify the complex mathematical operations.

## II. RASPBERRY PI

To implement such a project, the main and most important step was finding the hardware to use for the device. We have chosen a Raspberry Pi model B3 to use in our device. We have done a lot of research, and compared elements in different microcontrollers, like, cost, processing, and user friendliness. The main reasons why we have chosen this specific element are the high processing capacity, relatively low price, and its ability to adapt in different programming modes.The device uses Linux as an operating system, which has access to a large number of libraries and applications compatible with it. Raspberry Pi has an Ethernet port allowing us a network connection, as long as we are in the same subnet with the device we want to access and manage, 4 USB ports used to connect devices like a keyboard, mouse, camera, and other devices that connect through a USB port, and an HDMI port giving us access to the interface of the operating system installed, and can also be used the first time while installing the devices.It has 40 pins that allow us to

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 4, April 2017

receive and send signals. They are divided in half into two groups: the 3V, and the 5V group. Therefore, one side of the microcontroller gives a voltage of 3V, and the other 5V. Besides the 40 voltagepins, it has pinsthat are used to receive signals, which in our case was used to connect the button, that will send the signal for the face identification. Raspberry Pi does not have an operating system previously installed, but that can be downloaded from the Raspberry website, and transferred to an SD card, Figure 1 shows the Raspberry pi model B 3 along with its components

The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl. The system is programmed using Python programming language. We have developed algorithms, for face detection and recognition for security.

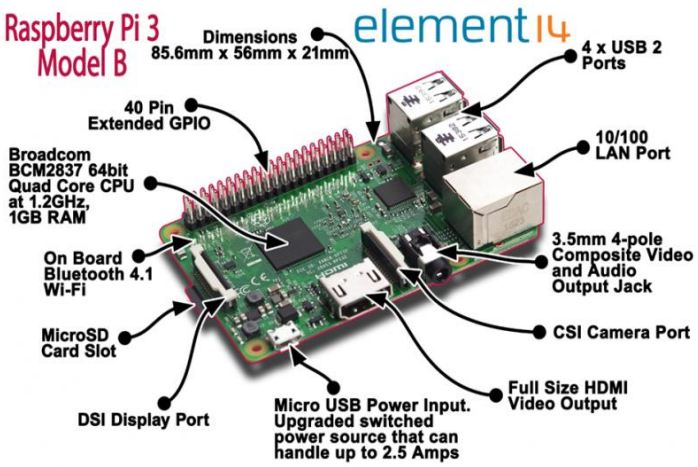


Fig. 1 Raspberry pi model B 3

## III.FACE DETECTION

All Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene. HAAR Cascade Haar-like features are digital image features used in object recognition. They owe their name to their intuitive similarity with Haar wavelets and were used in the first real-time face detector.

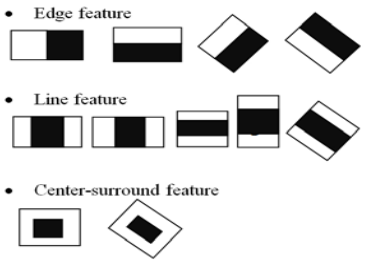


Fig. 2.Haar feature

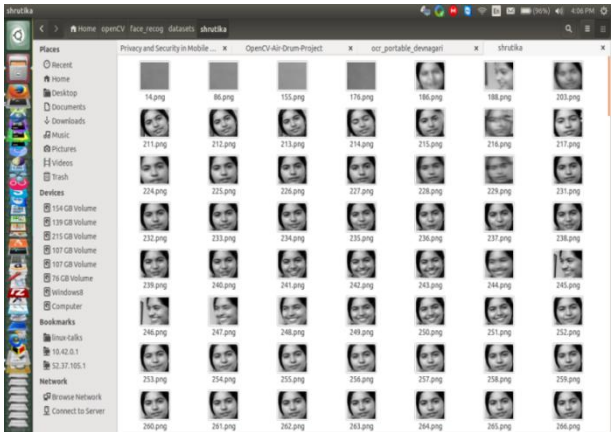

Fig.3 Created database


DOI10.17148/IJARCCE.2017.6414

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 4, April 2017

Here we will work with face detection. Initially, the the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, haar features shown in below image are used. They are just like our convolutionalkernel. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle. Now all possible sizes and locations of each kernel is used to calculate plenty of features. For each feature calculation, we need to find sum of pixels under 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 involving just four pixels

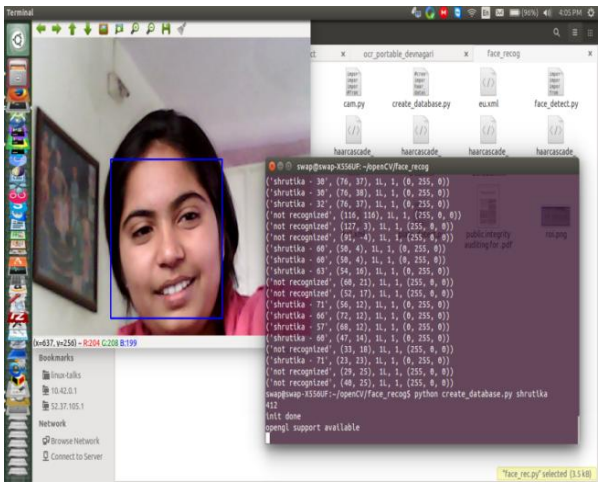

Fig.4.Captured image

## IV.FACE RECOGNIZATION

The histogram of oriented gradients (HOG) is a feature descriptor usedin computer and image processing for the purpose of recognition The technique counts occurrences of gradient orientation in localized portions of an image. This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spacedcells and uses overlapping local contrast normalization forimproved accuracy.The essential thought behind the histogram of oriented gradients descriptor is that local object appearance and shape within an image can be described by the distribution of intensity gradients or edge directions. The image is divided into small connected regions called cells, and for the pixels within each cell, a histogram of gradient directions is compiled. The descriptor is the concatenation of these histograms. For improved accuracy, the local histograms can be contrast-normalized by calculating a measure of the intensity across a larger region of the image, called a block, and then using this value to normalize all cells within the block. This normalization results in better invariance to changes in illumination and shadowing. The final step in object recognition using histogram of oriented gradient descriptors is to feed the descriptors into some recognition system based on supervised.

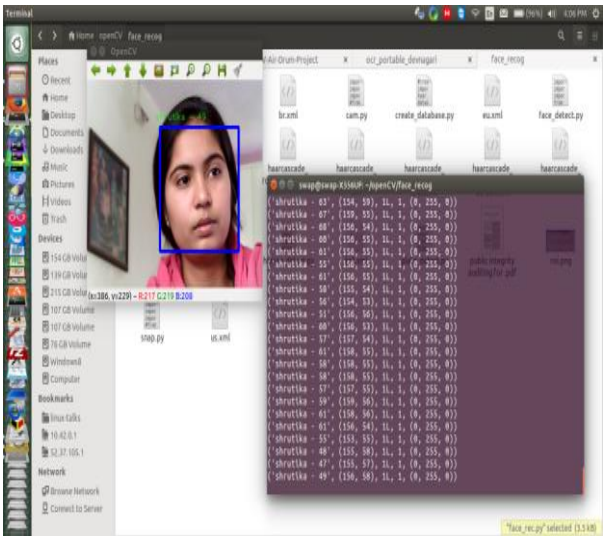

Fig.5.Authorized persons Captured image

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 4, April 2017

The support vector machine (SVM) classifier is a binary classifier which looks for an optimal hyper plane as a decision function. Once trained on images containing some particular object, the SVM classifier can make decisions regarding the presence of an object, such as a human, in additional test images. More formally, a support vector machine constructs a hyper plane or set of hyper planes in a high- or infinite-dimensional space, which can be used for classification, regression, or other tasks. Intuitively, a good separation is achieved by the hyper plane that has the largest distance to the nearest training-data point of any class (so-called functional margin), since in general the larger the margin the lower the generalization error of the classifier

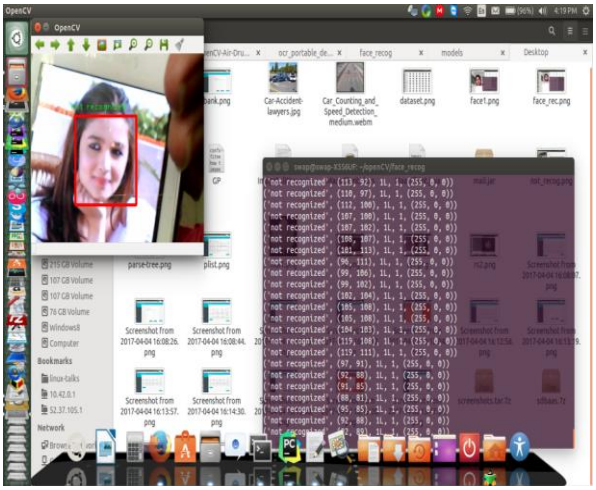

Fig.6. Unknown persons Captured image

## V.CONCLUSION

The system can be used in several places like banks, hospitals, labs and other sophisticated automated systems, which dramatically reduce the hazard of unauthorized entry. Evidence can be given to the security department if any robbery issue occurs.The design of the face recognition system using Raspberry pi can make the smaller, lighter and with lower power consumption, so it is more convenient than the PC-based face recognition system.Because of the open source code, it is freer to do software development on Linux.. The system was programmed using Python programming language. Both Real time face detection and face detection from specific images, i.e. object recognition, was carried out. The efficiency of the system was analyzed in terms of face detection rate. Theanalysis revealed that the present system shows excellent performance efficiency and can be used for face detection even from poor quality images.

## ACKNOWLEDGMENT

Thank to Prof Dr. U. A. Kshirsagar, HOD, Electronics and Telecommunication Department, HVPM's College of Engineering and Technology, Amravati, India.

## REFERENCES

[1] S. Prabhakar, S. Pankanti, and A. K. Jain, "Biometric recognition: Security and privacy concerns," IEEE Security Privacy, vol. 1, no. 2, pp. 33–42, Mar./Apr. 2003.
[2] A. K. Jain, K. Nandakumar, and A. Nagar, "Biometric template security," EURASIP J. Adv. Signal Process., vol. 2008, pp. 113–129, Jan. 2008.
[3] SanjanaPrasad, P.Mahalakshmi, A.John Clement Sunder R.Swathi"Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor" International Journal of Computer Science and Information Technologies(IJCSIT)ISSN 0975-9646 Vol.5 (6),2014, 7107-7109
[4] Anoop Mishra "Embedded Image Capturing & Digital Converting Process using Raspberry pi System interfacing and Comparison of Generation 2 verses Generation 1 models in Raspberry pi" et al, /(IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (2), 2015, 1798-1801
[5] "Face Recognition based on Elastic Template," Beijing University of Technology, China, M H Yang, D J Kriegman, and N Ahuja. Detecting facesin images: a survey. IEEE Trans. on PAMI, 2002
[6] Dalal N. and Triggs B. 2005. Histograms of Oriented Gradients for Human Detection. In Proceedings of IEEE International Conference on Computer Vision and Pattern Recognition
[7] ] Liu Y., Yao J., Xie R., and Zhu S. 2013. Pedestrian Detection from Still Images Based on Multi-Feature Covariances. In Proceeding of the IEEE International Conference on Information and Automation
[8] Hussain S. and Triggs B. 2010. Feature sets and dimensionality reduction for visual object detection. In British Machine Vision Conference
[9] ] Jun B., Choi I., and Kim D, "Local Transform Features and Hybridization for Accurate Face and Human Detection", IEEE Transactions on Pattern Analysisand Machine Intelligence, 2013.
[10] R. Chellappa, C.L. Wilson, and S. Sirohey, "Human and machine recognition of faces: Asurvey," Proc. IEEE, vol. 83, pp. 705–740, 1995.