SMART DOOR LOCK WITH FACE RECOGNITION IN RASPBERRY PI

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CERTIFICATE

This is to certify that the project entitled "**SMART DOOR LOCK WITH FACE RECOGNITION**" submitted by **SHAIVAL RAJAN SHAH (15BCE110), KAUSHAL THAKKAR (15BCE125)**, towards the partial fulfillment of the requirements for the degree of Bachelor of Technology in Computer Engineering of Nirma University is the record of work carried out by him/her under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination.

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ABSTRACT

Our project is based on smart security module for monitoring. In today's world technology is becoming faster. So, it should be used in our daily life. Now a days IOT is booming all around and people are expecting automation in everything. Now, most of our house have traditional door locks and can be opened or closed manually. So, if someone is in last room of the house and someone comes to his/her house he/she must open the door manually. But we are making a system that opens the door automatically when some authenticated person comes. And tell his/her name to the house owner.

CONTENTS

LIST OF FIGURES

Chapter 1: Introduction

1.1 Introduction to the project

We are making a system that detects the person who comes in front of the door and if that person is authenticated person then opens the door automatically and say his/her name in the house. And if that is not an authorised person then just say that unknown person has can and ask the admin to add that person or not. This project is based on home automation and IOT.

1.2 Literature Survey

[1] "Smart Surveillance System using Raspberry Pi and Face Detection" Vol. 6, Issue 4, April 2017 by Chinmaya Kaundanya, Omkar Pathak, Akash Nelawade, Sanket Parode.

[2] "Face Description with Local Binary Patterns: Application to Face Recognition" by Timo Ahonem, Abdeonour Hadid, Matti Pietik¨ainen.

[3] "Face Detection and Recognition" by Eyal Arubas.

1.3 Scope of this work

This project can be used in many fields like home automation, Surveillance Systems, automatic Attendance System etc.

Chapter 2: Proposed Methodology

2.1 Introduction

We have made a smart door lock using Raspberry Pi and Webcam. First, if Raspberry Pi camera detects any face then it will capture the photos and store into a file and then it checks that the person in the photo is present in the database or not. If the person is authenticated, then it opens the door automatically and say the name of the person in the house. And if the person's data is not present in the database then System will say that unknown person has arrived so please open the door manually. Then System asks the owner to add that person's data in the database. The system flow chart for that is given bellow.
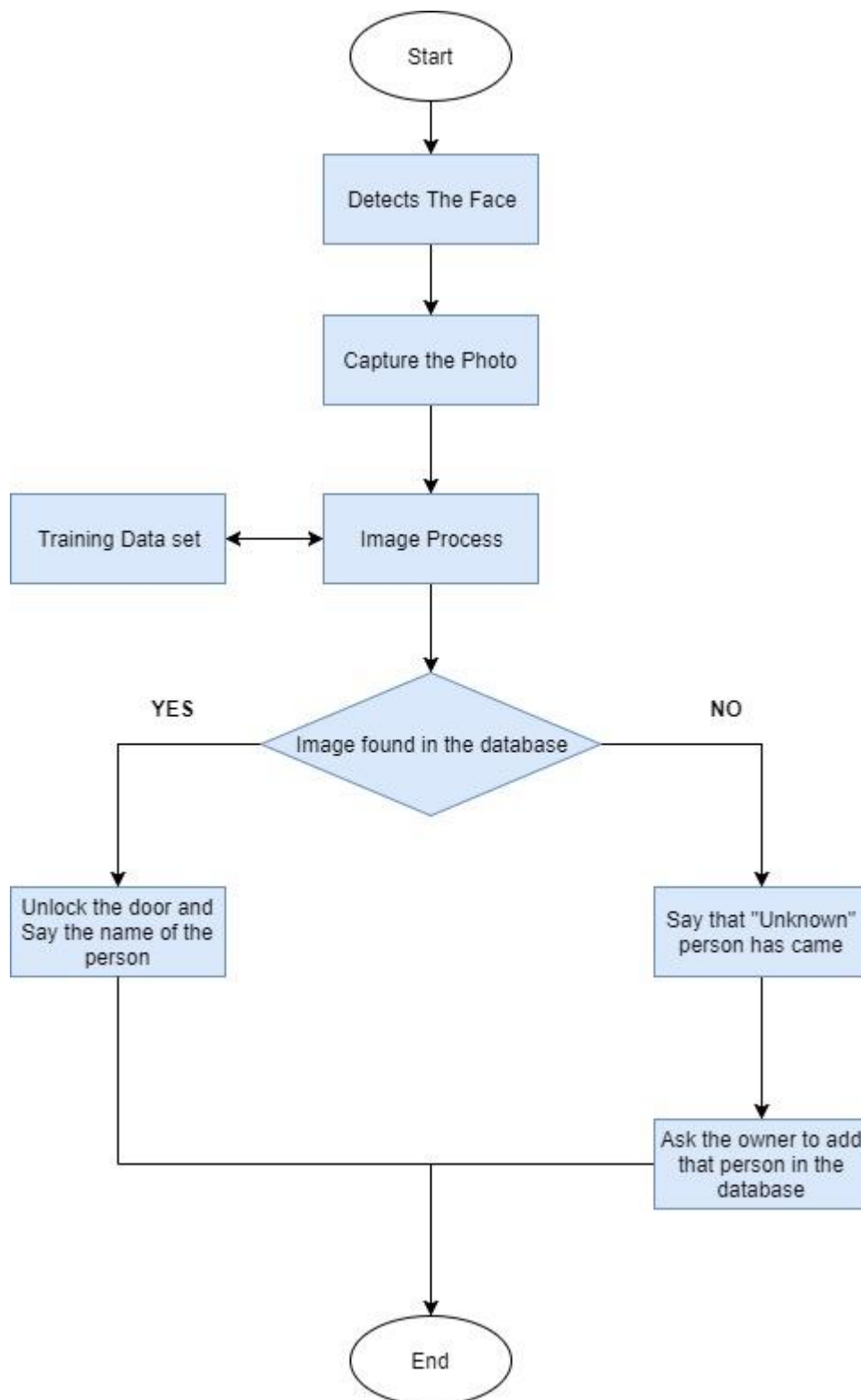
Figure 2.1 System Flowchart

2.2 **Software implementation**

This project is based on Python programming for detecting the face. Various Python libraries are used to process the image. Face detection is done by Haar-cascade in OpenCV. And the face recognition is done by Local Binary Pattern(LBP) algorithm. These both algorithm we will see in this report.

2.2.1 **Haar-cascade in OpenCV for detection of the face**

Haar-cascade is proposed by Paul Viola and Michael Johns. It is very simple and efficient face detection method and it is also used to detect object in opencv.
"Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001 was a research written by above mentioned authors .it is based on machine learning. Training is done between large number of face and non-face object like machine is learning between these two. We need to extract features from the images. Features from the images is extracted then. For this haar features is explained in below images.
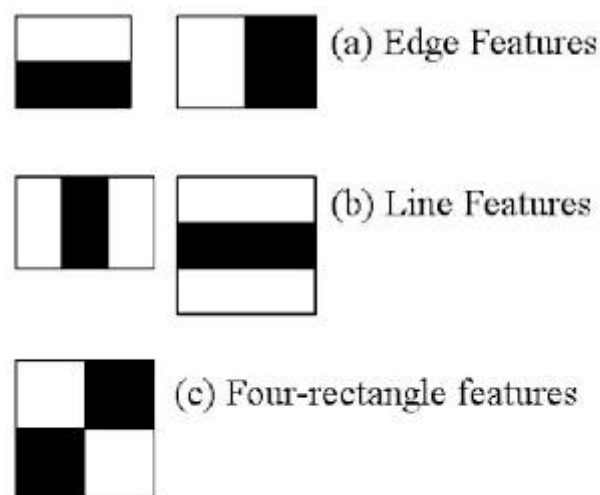

Figure 2.2.1 Haar-Cascade Features

In this black region is considered as '1' and white region is considered as '-1'. Each feature obtained which is singled valued is sum of pixels under white rectangles and sum is formed of pixels under black rectangles.
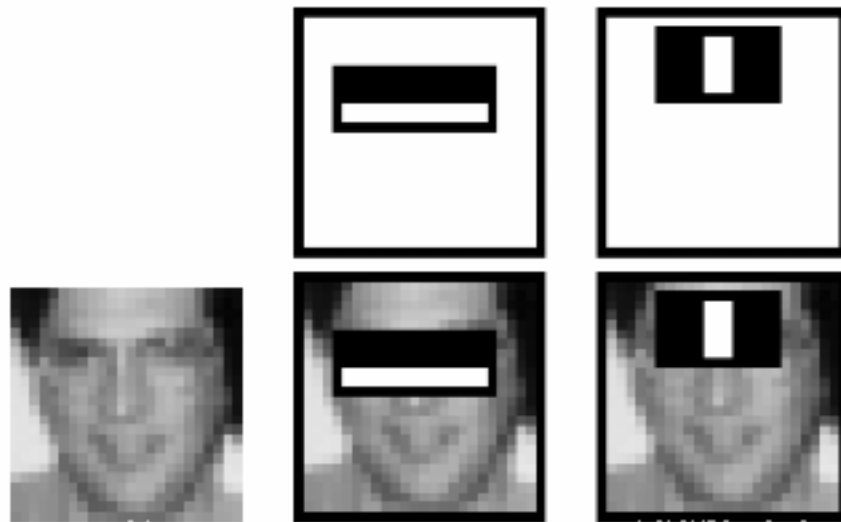
Figure 2.2.2 Haar-Cascade for Face Detection

In image mentioned above first feature is matches. With the eyes because in normal image eye is black and region under that is white so it will be match at the eye position. A large number of features for detecting various regions are used for detecting

2.2.2 Local binary Pattern Histogram for Recognizing the faces

Local Binary Pattern Histogram (LBPH) is used in computer vision for classification. This is done by dividing image in to small parts from which features are extracted. It follows a simple procedure yet effective. First image is divided into small parts and then features are extracted. Each feature has binary pattern surrounding the pixels in the region. Binary pattern is generated by a method. Gray scales image is used and when gray scale value of surrounding pixel is larger then that pixel is given 1 value and if it is less then it is given 0 value. Result obtained is concatenated in single histogram. Now this histogram is compared with the samples in the database.

The face image is divided into blocks   LBP histogram from each block   Concatenated feature histogram
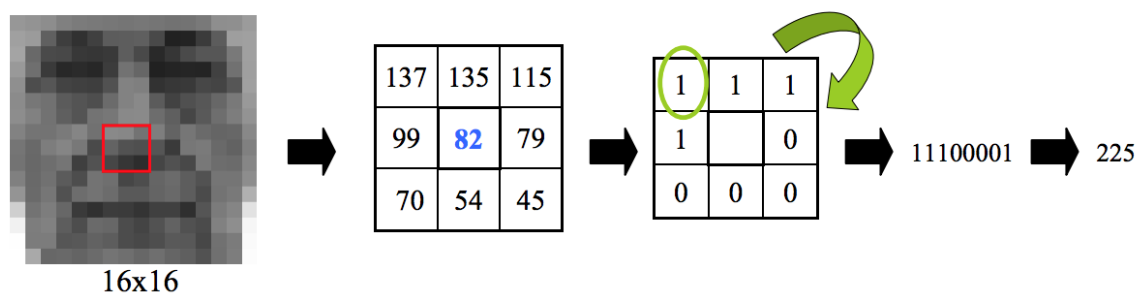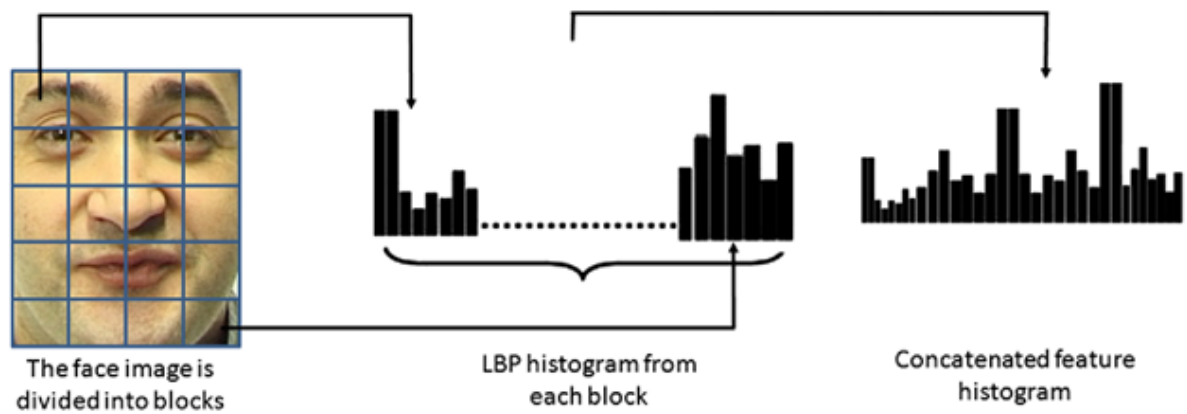
Figure 2.2. Histogram of a Local Binary Pattern

Our project uses local binary pattern to recognize face.

It is giving prediction index of the face recognized. Lower the prediction index more accurate the result. Local binary pattern has some flaws. It used gray scale image so if lighting conditions are not there it accuracy decreases. Also, if someone with specs arrives also sometimes it is not able to detect well. Also, quality of camera plays a major role. Full HD camera gives better accuracy.

Chapter 3: Database

Sqlite database is used in this project. It is compatible in python and sqlite module is available in python. Here database is used for storing person's data and to fetch if a person is blocklisted or not. Also dataset of sample images are stored in source folder and person name is fetched by comparing these dataset. "insertOrUpdateData()" method is used in our program in which it inserts name of a person in the database and enter detail if person is in block list.

If the administrator is not there then other temporary dataset is used to store images of person and when administrator comes he can see which person came to door and add them to blocklist or not.

Chapter 4: Dataset

3 different datasets are used in our project.

Following are:

- Main dataset
- Temporary dataset
- Recorded dataset

Main dataset is used to store all the persons photos which had come to door.

Temporary dataset is used to store temporary photos of person which is currently at the door.

Recorded dataset is used to store photos of persons which had come to door when administrator is out.

All the person's details are stored in one database names people.

Chapter 5: Text to Speech

We have incorporated text to speech in our project. Basically, is speaks the sentence written. When person is recognized it speaks persons name. It is guiding administrator to particular task.

Pyttsx module is used to implement text to speech.

It speaks any sentence written in python script.

Pyttsx:

Pyttsx is a cross-platform speech library. Metadata of voice such as gender, age, language, and name can be set in this library. It also contains large number of voices for the user.

Chapter 6: Summary and Conclusion

3.1 Summary

In this project we have implemented face detection and then face recognition algorithm. For that we learnt haar-cascade for face detection and Local binary pattern Histogram for face recognition. We also added text to speech feature for speaking the person's name when he/she will come at front of the camera.And we used SQLLite database for storing the person's details. We also added block list for adding the persons details who are blocked.

Accuracy is the factor in which face recognition has to be improved. Conventional Neural Network (CNN) is used for recognizing face which uses machine learning techniques and learn to recognize more accurately. Also true depth camera is used which extract every dents and bulges to recognize face.

3.2 Conclusion

Safety in the house is very important. Smart door lock with face recognition technique provides more efficient way to monitoring and automation. It provides more simplicity to the human being. Though face recognition technique used in this project is not so accurate to recognize faces but this can be also done using some great Neural Network and Deep Learning Face Recognition algorithms very accurately

Appendix A – list of useful websites

- http://eyalarubas.com/face-detection-and-recognition.html
- http://docs.opencv.org/2.4/modules/contrib/doc/facerec/facerec_tutorial.html
- http://www.ijstr.org/final-print/june2015/Automatic-Door-Access-System-Using-Face-Recognition.pdf