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Home Automation and Security

Prabhakar Kota
Department of Electronics & Telecommunication
MES's College of Engineering Pune, India

Nikita Chauhan
Department of Electronics & Telecommunication MES's College of Engineering Pune, India

Suket Netragaonkar
Department of Electronics & Telecommunication MES's College of Engineering Pune, India

Renuka Gajbhar
Department of Electronics & Telecommunication
MES's College of Engineering Pune, India

Abstract
The real-time Camera module face detection has been made possible by using the method of Viola Jones, blob Analysis work. The software first taking Camera video/image of all the authorized persons and stores the information into database. Proposed work deals with automated system to detect and classify the Faces using CNN (Convolutional Neural Network) algorithm. The real-time Camera module body detection has been made possible by using the method of Viola jones work. The software first taking Camera module of all the authorized persons and stores the information into database. Proposed work deals with automated system to detect face and recognized the person.
Display that person name; classify the body using CNN algorithm. The methodology comprised of three phases, first take video and convert it into frames. Next apply blob analysis for the purpose of Body Detection from Camera module, third apply CNN for the purpose of classification. Also verify fingerprint using fingerprint sensor. Using android app, we control home appliances like fan and lite.

I. Introduction

The Face is commonly used biometric to recognize people. Face recognition has received substantial attention from security guard due to human activities found in various applications of security like forensic, airport, face tracking, criminal detection, etc. Compared to other biometric traits like palm print, finger print, palm print etc. They can be taken even without visitor knowledge and further can be used for security-based applications like criminal detection, face tracking, airport security, and forensic etc.**1]** Face recognition involves capturing face image from a from a web cam- era. They are capture image of visitor and compared image with the stored database. Classify them with known classes and then they are stored in the database. Face biometrics is a challenging field for researchers with various limitations imposed for machine face recognition like variations in change in illumination, head poses, facial expression, occlusion, aging etc. Various approaches were suggested by researchers in overcoming the stated.**2]** Automatic face recognition involves feature extraction and face recognition, face detection. Face recognition algorithms are classified into two classes as geometric feature based and image template based.**3]** The template-based methods compute correlation between one or more model templates and face to find the face identity. Principal component analysis, kernel methods, linear discriminate analysis etc. are used to create face templates.**4]** The geometric feature-based methods are used to analyze explicit local features and their geometric relations. Multi resolution tools such as ridge lets were found to be useful for analyzing information content of images and found its application in pattern recognition, and computer vision, image processing.

II. System Design

System Architecture

Here it is and as we would expect the boards look very similar the Raspberry Pi 3 model B+. This after all an incremental upgrade of the previous Raspberry Pi 3 looks a slightly less busy on the top. but the main thing we probably notice straight away is that the system on a chip on the Raspberry Pi 3 model B+ has got a

mental heat spreader on the top. This is for better thermal performance and in the whole board is designed for better thermal performance than the previous Raspberry Pi 3.

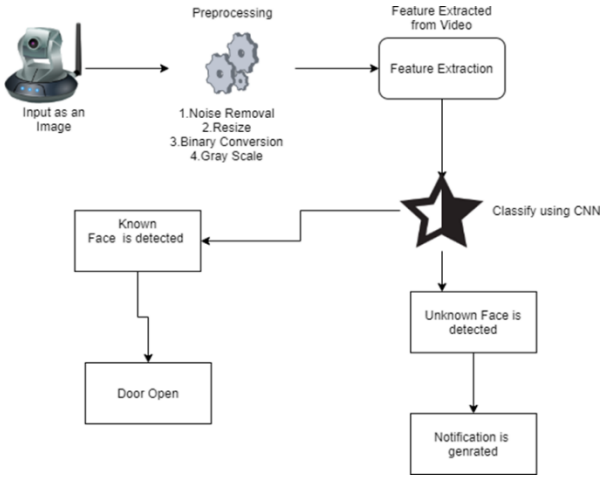

Figure.1: system Architecture

- **Raspberry Pi: -**

Here we compare the Raspberry Pi 3 Model B+ to the previous Raspberry Pi 3

Figure.2: Raspberry Pi 3

Figure.3: Raspberry Pi 3 Model B+

So, the idea is the heat doesn't focus in the system on a chip he does on the previous model. The heat is dissipated across the whole board for this better thermal for phones.

The Raspberry Pi 3 model B+ does use according to the Raspberry Pi foundation substantially more power than the previous Raspberry Pi 3.

Specification: -

We recognize no Raspberry Pi we have still got a display (DSI) connect twist over that camera character. we have still got 1GB of RAM memory. The system on the chip is also effectively the same. It's an update version. it's a BCM2837 B0 SOC and there still contains as on the previous raspberry Pi 3.

A 64-bit quad core ARM cortex A53 CPU.

But the change here is it now clotted up to 1.4ghz – 1.2ghz maximum clock on the previous Raspberry Pi 3.

Although to be technically correct we say this is plotted up to 1.4ghz below 70 degree Celsius and then above 70 degree Celsius it drops back to 1.2ghz and when it's throttles to 80 degree Celsius. we have also got the same HDMI connector on one side of the board with 1080p HDMI video the same audio and composite jack and the same 5V micro-USB power connector. On the other side of the board, we still got standard Pi 40 pin GPIO connect. Next to it there now also a 4-pin power over ethernet or POE connector which in the future. We will be able to connect a new POE hat in this context it's good to report.

But the Raspberry Pi 3 model B+ has better support or improved for PXE Ethernet Booting. As we may have noticed next to the system on a chip was a little mental box with embossed Pi logo. But it's not no his is a shield for covering the on-board wireless networking components and specifically here on the Raspberry Pi 2 model B+. we have got dual band 80211 AC wi-fi and Bluetooth 4.2. Next is connectivity on the end of the board we still have 4 USB 2 ports and an ethernet socket. But the last has been upgraded to GB ethernet. Although it's still connected internally over USB 2. So, in practice we get about a three times speed improvement in wide networking up from about a 100mbs – 300mbs. But we still don't have true GB ethernet on a Raspberry Pi. We are still on micro-SD card slot and the micro-SD card slot is just begging to be fed with an operating system isn't it on the micro-SD card

But we are using Raspberry Pi 3 Model B+.

Scheme of Implementation

- **Pre-processing: -**

1. **Histogram Equalization: -** In this preprocessing technique the idea of equalizing a histogram is to stretch and redistribute the original histogram using the entire range od discrete levels of the image, in a way that an enhancement of the image contrast is achieved.
2. **LOG Technique: -** LOG is another frequently used technique of gray scale transform. It simulates the logarithmic sensitivity of the human eye to the light intensity. Although LOG is one of the best methods in dealing with the variations in lighting on the three databases; it decreases the recognition rates on the other subsets of the CAS-PEAL database greatly. One possible reason is that difference between the mean brightness values of the transformed images belonging to the same person is too large.
3. **GIC: -** The Gamma Intensity Correction (GIC) corrects the overall brightness of a face image to a pre-defined canonical face image. Thus, the effect of varying lighting is weakened.

But We are using gray scale model for the face recognition

- **Segmentation: -**

Image segmentation is one of the most essential part in digital image processing. In image segmentation, images are divided into multiple set of pixels, generally required to detect the region of interest (ROI) from an image based on some homogeneity criteria such as color, intensity or texture, which helps to locate and identify objects or boundaries in an image. There are currently different kind of algorithm, for doing the segmentation process. Each of them are separate from each other. Currently image segmentation approach, based on two properties of an image, is divided into two categories:

1. **Discontinuities based: -**In this category, subdivision of images are done by the basis of suddenly changes of the intensity of grey levels of an image. Our task is primarily based on identification of isolated points, lines and edges. This includes image segmentation like edge detection.
2. **Similarities based: -**In this category, subdivision of images are done by the basis of similarities in intensity or grey levels of an images. Our task here is on determine of similar points, lines and edges. It is also includes image segmentation algorithms like thresholding, region growing, region splitting and merging. There are different kind of method for Image segmentation and one of them is edge detection based. There are many different ways to perform edge detection, however, two most prominent used algorithm is Gradient Based Method and Gray Histogram Technique.

But we are using viola Jones and CNN algorithm method

- **Feature Extraction: -**

Facial feature extraction is the process of extracting face component features like eyes, nose, mouth, etc. from human face image. Facial feature extraction is very much important for the initialization of processing techniques like face tracking, facial expression recognition or face recognition.

- **Classification: -**

There are two major alternatives to CNN (Convolutional Neural Network) namely:

I. Graph Neural Networks.

II. Capsule Neural Network.

The reason why Convolutional Neural Networks (CNNs) do so much better than classic neural networks on images and videos is that the convolutional layers take advantage of inherent properties of images.

1. Convolutions: -

A. Simple feedforward neural networks don't see any order in their inputs. If you shuffled all your images in the same way, the neural network would have the very same performance it has when trained on not shuffled images.

B. CNN, in opposition, take advantage of local spatial coherence of images. This means that they are able to reduce dramatically the number of operations needed to process an image by using convolution on patches of adjacent pixels, because adjacent pixels together are meaningful. We also call that local connectivity. Each map is then filled with the result of the convolution of a small patch of pixels, slid with a window over the whole image.

2. Pooling layers: -

There are also the pooling layers, which downscale the image. This is possible because we retain throughout the network, features that are organized spatially like an image, and thus downscaling them makes sense as reducing the size of the image. On classic inputs you cannot downscale a vector, as there is no coherence between an input and the one next to it.

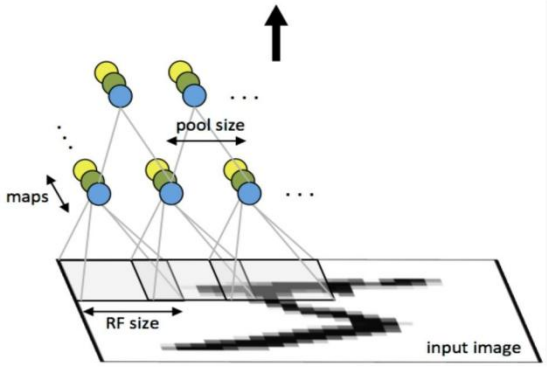

Figure.4: CNN

Why CNN is better than graph neural networks & capsule neural networks?

Because convolution in neural networks is operation of finding patterns. It has kernel that with which it basically scans an image and place where kernel have 100% match is a place where pattern matched. And thus, image and videos processing are based on patterns we got total match on this method.

Data Flow Diagram

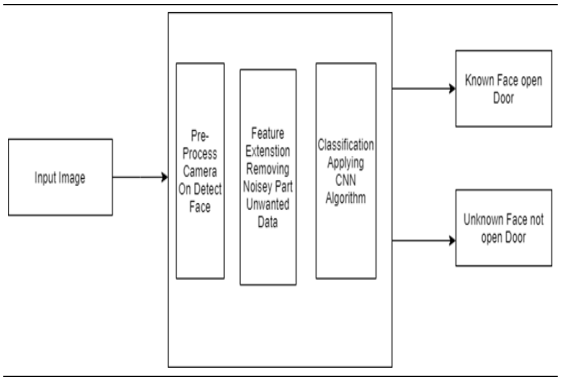

Figure.5: Data Flow diagram

UML DIAGRAMS

Unified Modeling Language is a standard language for writing software blueprints. The UML may be used to visualize, specify, construct and document the artifacts of a soft- ware intensive system. UML is process independent, although optimally it should be used in process that is use case driven, architecture-centric, iterative, and incremental. The Number of UML Diagram is available.

- Use case Diagram.
- Component Diagram.

- Activity Diagram.
- Sequence Diagram.

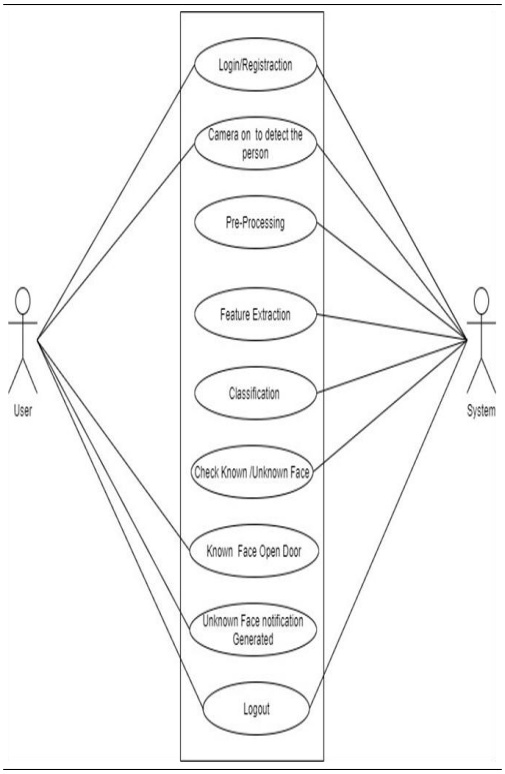

Figure.6: Use case Diagram

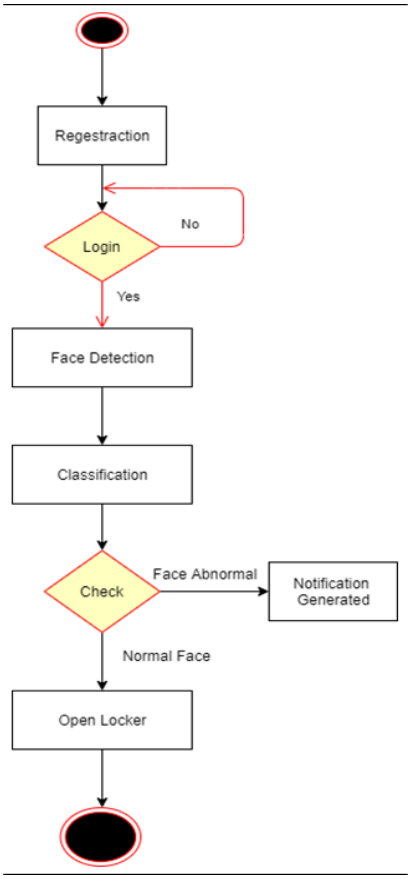

Figure.7: Activity Diagram

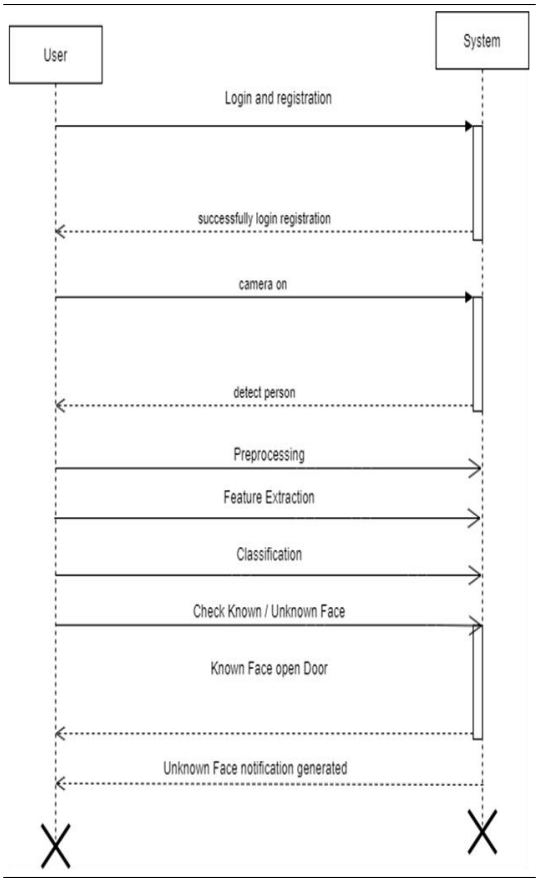

Figure.8: Sequence Diagram

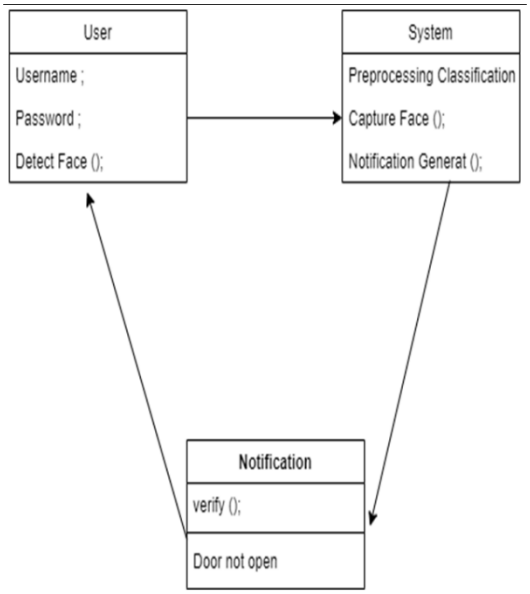

Figure.9: Class Diagram

III. Conclusion

This project focuses on developing an automated system for home. It saves time and effort, especially if it has huge number of people. It can be extended to video surveillance to detect person at crowded areas such as bus stands, theatres, railway stations where in by face recognition techniques, the identity of the culprits can be found. Face recognition is a challenging problem in the field of computer vision, which has received a great deal of attention over the past years because of its several applications in various domains.

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