

**IMAGE PROCESSING BASED HUMAN FACE RECOGNITION USING HAAR
CASCADE CLASSIFIER**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree
of Bachelor of Science in Computer Science and Engineering.

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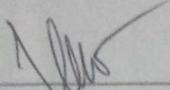
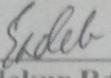
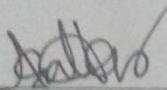
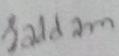
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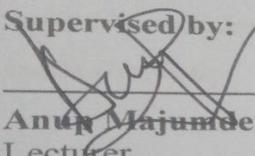
This Project title is “**Image Processing Based Human Face Recognition Using Haar Cascade Classifier**”, submitted by Arup Sarkar ID: 161-15-6721, Probal Roy Antu ID: 161-15-7171 and Saykot Kumar Barmon ID: 161-15-6956 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 6th December 2019.

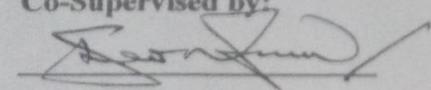
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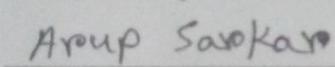
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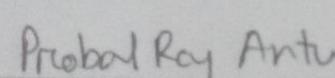
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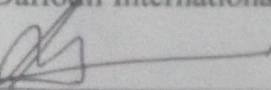
We therefore declare that, this project has been finished by us under the supervision of **Anup Majumder, Lecturer, Department of CSE**, Daffodil International University. We also announce that neither this project nor any piece of this task has been submitted somewhere else for award of any degree or diploma.

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ABSTRACT

As of late PC based face recognition is a progressed and solid methodology which is in effect surely misused for some, get to control situations. It is perhaps the most straightforward approaches to isolate the personality of one another in the face. Human facial recognition characterizes an individual distinguishing proof or validation system that checks personality. Essentially the procedure depends on two phases, one is face detection and another is face recognition. Facial recognition alludes a PC system that has a few applications to recognize human faces in images. Facial recognition is typically worked by utilizing 'perfect' information of full-frontal facial pictures. Despite the fact that, as a general rule, there are sufficient circumstances where full frontal countenances may not be accessible, the blemished faces originate from the CCTV cameras present valid example. Subsequently, by utilizing fractional facial information as tests is still to a great extent an unexplored region of research of the issue of PC based face recognition. In this report we inquire about the inquiry that covers face recognition by utilizing incomplete facial data. We build up our system by applying critical analyses to test the presentation of AI utilizing of Haar Cascade Classifier. We have investigated this classifier calculation by partitioned into four stages. In this report, we apply Haar feature selection, creating integral picture, Adaboost preparing, Cascading Classifiers for complete the detection step. We have utilized Local Binary Patterns Histograms (LBPH) calculation to finish facial recognition system for human security of this venture with face detection. A few parameters are utilized in LBPH and we get a dataset by applying algorithm. We get total our computational part by applying LBPH activity and removing the histograms. For creating "Image Processing Based Human Face Recognition Using Haar Cascade Classifier" we utilize an open source stage to be specific OpenCV and Python language.

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CHAPTER 1

INTRODUCTION

1.1 Introduction:

In AI approach characterizes a neural system has effectively been applied to investigating visual fanciful. It has a few applications in facial recognition and video investigation, recommend frameworks and normal language preparing. Here we exhibit face identification and recognition for people on foot by image processing. Face recognition is growing a multidisciplinary inquire about region and it has open applications in the ground of security, distinguishing proof and check of an individual in picture. Face detection and recognition characterize biometric programming application which is capable for unique distinguishing proof and confirmation an individual by looking at and breaking down examples rely upon individual's facial setup. Facial recognition contrasts the data and a database of realized appearances to discover the match. We have concentrated on people who want to enter university to recognize and confirm them from a source that gives computerized pictures.

1.2 Motivation:

Facial recognition innovation is being utilized in numerous areas like as payment, improve security, criminal distinguishing proof, promoting, human healthcare and so on. We need to utilize facial detection and recognition for entering university. Now and again unapproved people enter varsity grounds that can be unsafe for university grounds and students. Immediately enlist removed students in university watch list on the off chance that they endeavor to return it won't sheltered. On the off chance that we need to ensure occasions, auditorium and computer labs by quickly distinguishing rusticated students, risky lawbreakers and other open dangers we can recognize them and not entering them. It will secure grounds, offices, gym, library, cafeteria, lounge, athletic preparing places and all the more utilizing our savvy access control stage. Keenly control access to grounds research centers, emergency clinics and other touchy areas utilizing face recognition. It will likewise coordinate with existing security systems.

1.3 Objectives:

Our fundamental worry about is to identify unauthorized students do not enter into university campus. We are endeavoring to develop a quick and proficient face recognition system that identifies appearances of people in entrance. We need to limit the impacts of undesirable ongoing condition by utilizing Haar Cascade classifier.

At one time the face detection is done; our following goal is to train our system with pictures. By utilizing Local Binary Patterns for each picture, a feature vector is to be figured. With this feature vector we want to name the objective pictures utilizing Support Vector Machine (SVM) classification.

Through our proposed methodology we need to decrease unauthorized entrance of students.

By embracing this proposition, we can raise open mindfulness about regular students can enter into the university.

By the foundation of our task we need to take suspicious people under discipline.

In addition, our principle concern is to accomplish a secure university campus that no one can entering the campus who is unauthorized.

1.4 Expected Outcomes:

Facial recognition is immediately embraced far and wide. These days for different security purposes facial recognition is utilized broadly. Its fame originates from the tremendous territories of potential applications. A few viewpoints originate from our tasks are given beneath.

The system can be applied at university, school, office, railway station, bus counter and home entrance for recognizing people faces, when our system distinguish any suspicious faces it would be make an inward caution or sign.

The system ensures the security of any campus where it would be implemented. To secure university campus our proposition would work proficiently.

It completely reduces unauthorized entering which are generated by unauthorized people as well as it helps to secure the area.

1.5 Report Layout:

Chapter 1: Introduction

We clarify about introduction, motivation, objectives, expected outcomes and also report layout of our project in this chapter.

Chapter 2: Background Study

Background part of our proposed technique is talked about in chapter 2. We likewise clarify literature review, related works, argumentation of the issues and claims about our task in this segment.

Chapter 3: Methodology

In this section we incorporate generally methodology that we have used to fabricate this proposed system. Techniques are clarified here bit by bit.

Chapter 4: Design Specification

In this area we have talked about the graphical interface and show to the users.

Chapter 5: Implementation and Testing

Our experimental outcomes are appeared alongside the presentation investigation that is accomplished by the proposed system. We have likewise shrouded outcomes outline in this part.

Chapter 6: Conclusions and Future plans

In this piece of the report we have examined about conclusion and future points of our proposed system.

CHAPTER 2

BACKGROUND STUDY

2.1 Introduction:

“Image Processing Based Human Face Recognition Using Haar Cascade Classifier” is a system that detects authorized and unauthorized people where we have built up the system by utilizing OpenCV and python language. It empowers to distinguish and detect persons face who wants to enter into a secure area for recognizing and confirming them and furthermore it is utilized for a wide range of issues.

Some human facial highlights like mouth, nose, ear and eyes in a frontal picture are known as the face recognition system. For building up our system OpenCV is utilized for face detection. An open source computer vision library specifically OpenCV is an open source stage that everybody can uninhibitedly utilize the library. OpenCV is worked by utilizing of C++ and its essential interface is in C++ yet there are catching Python, Java and MATLAB. OpenCV, for the most part, may give three strategies to confront recognition like as Eigen faces, Local binary pattern histograms histograms (LBPH), Fisher faces.

Face recognition procedure is sorted into two stages which are face detection and face recognition. Its fundamental concern is to bring issues to light of the device of what a face resembles. Face detection by and large holds a few principles like situation of nose, space between eyes, mouth and others. We gather and note data about the face position and size from a picture or video stream. Some specific issues are looked by the procedure of face recognition. During imaging for incommodious circumstance make an issue to separate frontal area from the foundation. We utilize a bigger and better preparing tests for the goals of this issue. This proposed technique dependent on the utilization of RGB camera without complex data and can't recognize a genuine face from a face imprinted on paper. In this reason, in this procedure, a customary camera can't affirm a genuine face. Face recognition procedure should be possible by following the face recognition steps. Face recognition is exceptionally advantageous and easy to perform than iris or unique finger impression recognition.

This paper manages the identification of face by utilizing Haar classifier and depicts the exactness picked up by Local binary Patterns Histograms face recognition algorithm. The cascade classifier is found out with pictures of faces and pictures without faces. In the event that Haar-like features are found in the wake of examining a picture with the classifier then the picture is said to be found a strategy for face recognition is utilizing Local Binary Patterns Histograms which spotlights on the statement of the surface features and reflects the subtleties of the qualities displayed by the face.

In our proposed technique when a people enter into a secure area will come before our utilized camera then it detects his/her face and compares it and picture database which is prepared by our system. At the point when any match can be discovered then it send the facial subtleties of people into database.

2.2 Literature Review:

Ilias Maglogiannis et al. [1] created detection and recognition of regular human feeling utilizing Markov arbitrary fields to build a coordinated system for feeling recognition. Three modules were comprised for the strategy and they utilized color pictures. For picture division and skin detection they utilized Markov arbitrary fields that actualized the skin recognition. They were viewed as shaded pictures of human faces as the training set. They utilized HLV shading space of the predefined eye and mouth locale for the recognition and extraction of eye and mouth. They utilized edge identification and estimated the angle of eyes and mouths areas. Their proposed technique comprises of two principle parts. Face localization for discovering face competitors recognize skin locales that perhaps hold a human face. Their proposed strategy had a division procedure that changed pictures from RGB to YCbCr shading space. Their skin recognition calculation was developed on measurable picture handling model using Bayesian estimation. A Markov irregular field and MRF picture division was utilized by them. While a MRF is a non-easygoing model, they utilized MRF for skin identification. Skin location rate 96.24%, Face detection (eyes and mouth) was 84.97% and feeling detection and recognition was 96.68% they picked up by testing their proposed technique.

Tomas Markciniak et al. [2] executed the impact of low resolution of pictures on dependability of face detection and recognition to test credibility of the continuous system, face identification and recognition from low resolution pictures. They utilized numerous projects for face

identification and the face comment interface. Fundamentally they got face recognition by three phases as the decrease of effect of meddling and clamor decrease, wisdom of fields with magnificent possibility where a face can be set, at that point affirmation of the earlier chosen regions is performed lastly the face is distinguished and stamped. For face detection a few normal methodologies were utilized. Face area developed on the shade of human skin was considered as the main methodology. They utilized scientific morphology activity in the chose area of intrigue where further highlights could be confined, which showed that the nearness of a face in the picture. By utilizing geometric models at this progression, they discovered face area established on looking at the area of the chosen example of the test face with prepared picture. At that point they utilized Haar-like highlights for face detection. It was fabricated rely upon the objective finder which is proposed by Paul Viola and Michael J. Jones and afterward updated by Rainer Lienhart and Jochen Maydut. They distinguished the two eyes and independently left and right eye by utilizing four classifiers in their program. They clarified the reason for goals on both the face location stage and distinguishing proof. They accomplished outcomes by utilizing in CCTV picture examination.

H. Zhi, S. Lui et al. [3] had proposed face recognition dependent on genetic algorithm to raise data security. They concentrated on character distinguishing proof to guarantee the security in the zones of money, national security and equity, etc. They extricated the primary parts of genetic algorithms like coding system, wellness function, genetic administrators and control parameters. The potential arrangements of the issues would have coded into singular chromosomes when they applied genetic algorithm. They picked up the fitness function of people from an underlying determination gathering, the people fulfilling the end conditions could be output.

Shonal Chaudhry et al. [4] Chandra proposed a face identification and recognition strategy in an unconstrained domain for portable visual assistive system. They had seen that the fundamental material is the intelligent systems module. They built up their proposition by utilizing CNNs or cascade classifiers dependent on the performance. They utilized with cloud based supportive system for figuring the highlights in times of learning the chose smart system. So as to guarantee security and dependability, by utilizing explicit information move conventions were changed into the cell phone. They found the visual assistive framework which executed for low end cell phones that component input camera. In sunshine condition, the best picked up by the discovery module by utilizing CNNs was 94.64% however lower

execution in other lighting condition. Also, they acquired greatest execution of 80% by the recognition module when they utilized CNNs which face pictures had poor lighting.

Alireza Tofighi et al. [5] had proposed a strategy to improve the presentation of face identification and recognition system. Essentially their proposed technique comprises of two fundamental parts. Right off the bat, they identified faces and afterward perceive the distinguished appearances. They utilized Gaussian skin color model joined with AdaBoost calculation for skin color division in recognition step. AdaBoost calculation is quick and furthermore increasingly exact. To improve the face recognition execution, they utilized a progression of morphological administrators. They isolated their undertakings into four stages to finish face recognition part. They utilized Gabor features extraction, measurement decrease utilizing PCA, include determination utilizing LDA, and SVM based arrangement. They utilized both PCA and LDA together for improving the ability of LDA. They utilized a face database for a couple of test pictures and furthermore they analyzed the system with face databases. In various lighting condition they tried the system and they picked up results that show the framework is vigorous enough to recognize faces.

2.3 Comparative Studies:

Facial pictures are worried for face recognition. Various calculations have been set up to purpose the face recognizable proof issue. We can recognize one of the most punctual work was that Savvides et al. In their proposed technique they investigated a few facial territories to assemble quantifiers with discriminating ability. For feature extraction rely upon gray scale pictures the technique for piece relationship channels was used to diminish picture degree. On account of the partition between various facial features they utilized Support Vector Machines (SVM). In their trial, they tried just three essential fields of face are eyes, nose and mouth. They increased test result and proposed that the eye side has a radiant verification degree by contrasting with the mouth and different zones.

In a similar to way He et al. [6] found a technique named the Dynamic feature Matching (DFM) for halfway face recognition. They proposed a technique developed on Fully Convolutional Networks (FCN) with inadequate portrayals. They utilized FCN to substance highlights among numerous photos which can show increasingly discriminating highlights. They proposed VGG face model for moving highlights to FCN. Their proposed technique increased classification accuracy.

Additionally, different strong face recognition strategies had been proposed due to relegate the goes for face recognition because of face detainment in various situations. In [7], Long et al. created subclass pooling for grouping (SCP) to take care of the twofold detainment issue. They utilized limited information in a preparation set. In their proposed system they utilized a fluffy max-pooling technique and they likewise utilized the normal pooling plans. They increased a superior outcome that shows a striking edge of execution of their system.

These days, Lahasan et al. [8] proposed a system called as the Optimized Symmetric Partial Face diagram (OSPE) for facial distinguishing proof inside different circumstances. In their proposed strategy they utilized a few prompts that comprises determined face, facial control, and variety of flaring. They presented incomplete facial information by which they picked up consequences of their trial that gives a few advances in face recognition rates.

Furthermore, Daun et al. [9] found a system named Topology Preserving Graph Matching (TPGM), so as to improve the recognition strategy by utilizing deficient pictures of appearances. They built up the procedure established on the Geometric diagrams, to present countenances and display faces. They limited geometric and textural cost of capacity by utilizing TPGM. They utilized four face databases to pick up the normal result of their proposed technique. They accomplished better execution on facial acknowledgment from those databases; it additionally demonstrated that their innovation overlooked other cutting-edge approaches at the time.

In like manner, Cai et al. [10] proposed a facial variety demonstrating system for meager portrayal for face recognition. They built up their proposed technique rely upon a solitary example face. They advised the facial transmission towards various impartial, front of countenances from differing facial point see. They performed face recognition for single picture face recognition issue and demonstrated that fundamental upgrades can be accomplished.

Another volume of face recognition assignment which is in this part was created by Li et al. [11]. They built up their technique to perceive human faces in frontal perspectives with various light, mask and impediment. They built up another innovation to perceive human face which embodiments a powerful subspace from pictures and they picked up the curious regions for each issue. They spoke to a property of discriminating component for those zones. They utilized the K- nearest algorithm (K-NN) [12], in view of giving recognizable proof convention to order face pictures. Both open databases ORL and Extended Yale B were utilized where

they applied their proposed strategy. They likewise utilized incomplete facial laws for recognition human face pictures and results depicted that their recognition rates were better.

At present, Peng et al. [13] proposed a strategy named Locality Constrained Collaborative Representation (LCCR) to improve disposal of delegate pictures. They applied LCCR that have five separation measures with various databases. In their proposed system three essential facial highlights have been utilized, for example, right eye, nose, and mouth with hair by recognizing the primary pictures. Their test results showed that they increased a high recognition rates from the correct eye, mouth and hair by working with LCCR and City Block Distance measures.

By the by, as of late the exhibition of proposed strategies decays strikingly when managing intense impediments in a face. A few past discourses demonstrate that in facial recognition, closeness has all the earmarks of being a key acknowledgment factor. The pace of closeness of picture changes when the objective face picture is incomplete blocked, with demeanors and with the age of the subject.

2.4 Challenges:

Our project "Image Processing Based Human Face Recognition Using Haar Cascade Classifier" is exceptionally challenging work for us. In our system we have to identify strangers and remember them just as show all the spared information about them which is exceptionally challenging for us. To recognized an individual in a legitimate manner we have to train his/her picture consummately which is challenging trying for us.

Requirement

Making a dataset by sparing caught pictures was prepared right off the bat to perceive a match of face. Indicating people appropriate data which is recognized is trying to the point that we had required the correct face highlights for identifying. Server controlling which contains a ton of data was a lot of trying for us.

Time Scheduling

Time scheduling alludes a lot of techniques used to create and offer schedules that says when the entire work will be finished. Our primary concern was about time scheduling to finish this project meanwhile. In the event that the experiment was not set up on time it will be a major

issue for us. We partitioned our working time and undertaking work among us to finish entire activities.

Cost Reducing

Each choice in project advancement influences cost so it was another challenging task to diminish cost and increment our benefits.

Increasing Communication

During the hour of building up our project we had confronted numerous inquiries. For accomplishing arrangement, we spoke with supervisor and co supervisor. For this situation, expanding correspondence, it was small trying for us.

Skills for the Projects

Expected abilities to finish our entire project work were taken appropriately.

CHAPTER 3

METHODOLOGY

3.1 Introduction:

In past chapter we examined about the related works of face detection and recognition system. We have likewise clarified about some distinction kinds of technique that were utilized in previous. In this part we will examine about our strategy that we have used to build up this system. At the point when we learn about related works of our system then we came to think about some distinction calculation which can be utilized for creating face detection and recognition system. After that review we chose to choose a particular algorithm. We have used Haar course classifier for identifying face and Local Binary Patterns histogram (LBPH) calculation for perceiving the face. We will examine quickly about our utilized algorithms in the net piece of this chapter.

3.2 Methodology:

In our system we need to distinguish faces and remember them. So when people on foot come before the camera then it recognizes his/her face's segment and contrasts it and picture database. Whenever distinguished picture and database picture coordinate, at that point his/her subtleties will go into server. For making database we need to prepare those pictures alongside this system. For finishing entire system, we have to cover following advances:

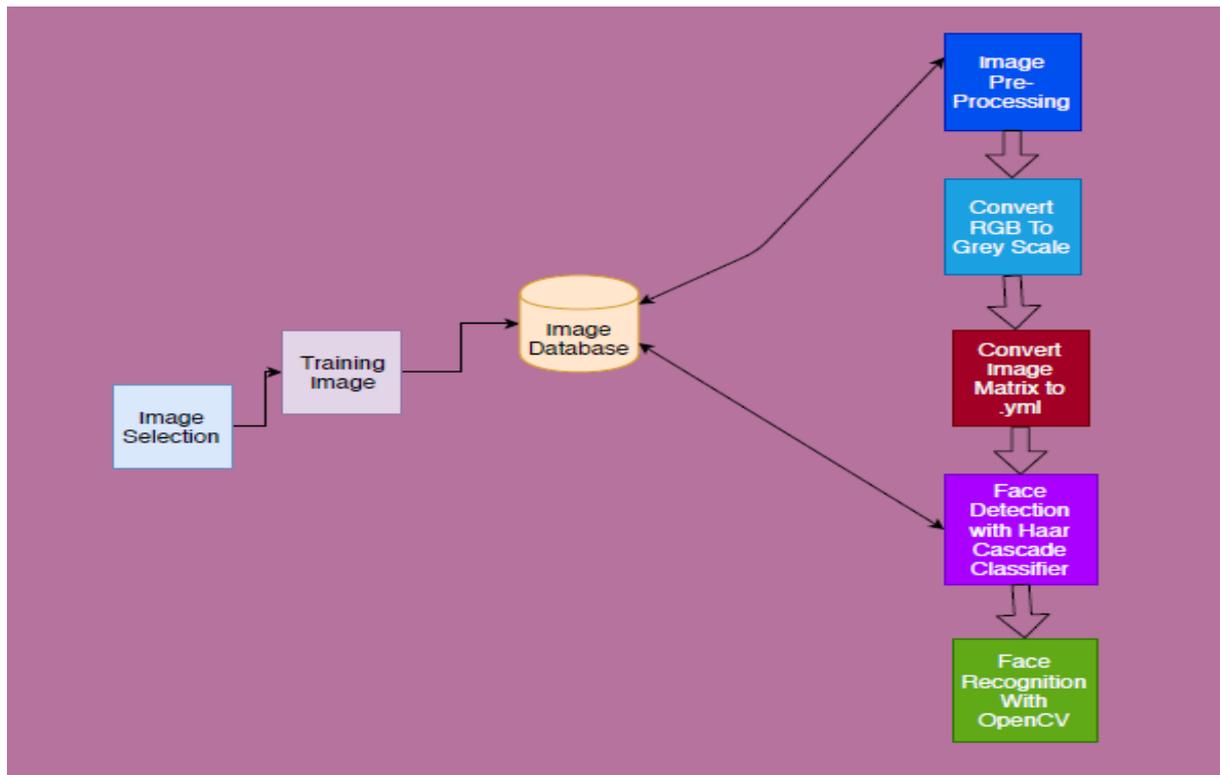


Figure 3.2.1: Structure of Face Detection and Recognition Using Haar-Cascade with OpenCV

Our entire system worked with 3 central Steps which are given underneath:

- A. Face data gathering,
- B. Train the stored face data
- C. Face recognition using Local Binary Patterns Histograms (LBPH) algorithm.

A. Face Detection: The target of face detection means discover the faces from an individual's full picture or from recordings or real time video. The faces are detected by the utilizing of Haar cascade classifier. Haar cascade classifier has 4 stages:

1. Haar features selection
2. Creating integral image
3. Adaboost training
4. Cascading classifiers

Recognizing face this algorithm needs a lot of positives and negative pictures. Positive pictures are which is with face and negative pictures are which is without face. These pictures are expected to train the classifier. Haar feature works with neighboring rectangular locale at a

particular area in windows. It figures the aggregate pixel power of each domain and discover the verities among these totals.

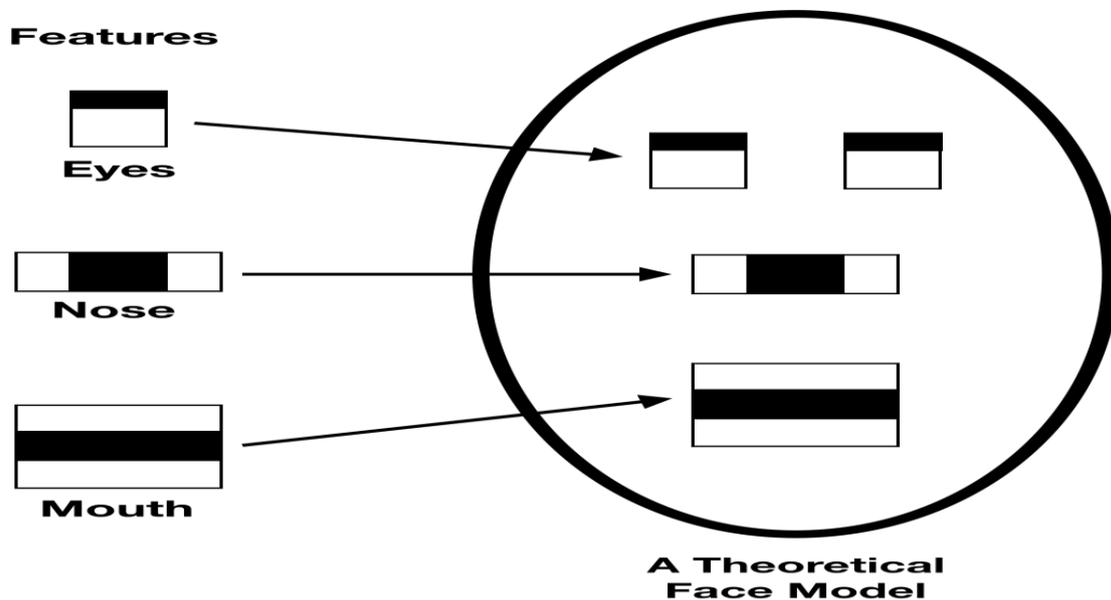


Figure 3.2.2: Haar-Cascade Classifier [14]

For making this system super-quick inward pictures are utilized. There can be a great many features. Consequently, Adaboost is utilized to discover best element and classifier is prepared by Adaboost to utilize them.

The cascade classifier has a gathering of stages and each stage is brimming with frail learners. Feeble learners which is additionally basic classifier and it's called choice stumps. A method called boosting that is utilized to prepare each stage. Boosting takes weighted normal of choice which is made by frail learners. It has capacity to prepare most exact classifier. Each phase of the classifier marks the domain is the present situation of sliding windows. It might positive or negative. In the event that positive, at that point item was found. On the off chance that negative, at that point article was not found. At the point when mark is negative, the grouping of the area is finished. At that point identifier passes windows to the net position. Generally, the classifier passes the region to the net stage. The stages dispose of negative example at the earliest opportunity. A lot of positive and negative pictures are expected to prepare course classifier.

One of the commitments of Viola and Jones was to utilize added summed-area tables, which they called integral images. Integral images can be characterized as two-dimensional query tables as a matrix with a similar size of the first picture. Every component of the integral picture contains the total of all pixels situated on the up-left locale of the first picture. This permits to figure entirety of rectangular zones in the picture, at any position or scale, utilizing just four queries:

$$\text{Sum} = I(C) + I(A) - I(B) - I(D)$$

Here A, B, C, D are parts of the integral image I.

Each Haar-like component may require multiple queries, contingent upon how it was characterized. Viola and Jones' 2-rectangle highlights need six queries, 3- rectangle highlights need eight queries, and 4- rectangle highlights need nine queries.

B: Train Stored Images: This is one of the most significant part. It is basic to make a database of pictures in "yaml" file which are prepared by the machine. Contrasting and the prepared information a face will be recognized.

C: Face Recognize with Using LBPH: Presently observe Local binary patterns histograms calculation steps:

1 Parameter: Local binary patterns histograms algorithm takes four parameter which are:

A. Radius: For building the roundabout local binary patterns the span is utilized. The range around the central pixel is spoken by it. Regularly its value is 0.

B: Neighbor: Test point is fundamental to assemble round neighborhood local binary patterns. Its value is ordinarily 8.

C. Grid X: Some measure of cells horizontal way. In the event that more cells, at that point progressively better grid and the subsequent component is higher dimensional. It value is additionally 8.

D. Grid Y: Some measure of cells vertical way. More cells, progressively better grid and coming about component is higher dimensional. The greater part of the occasions it is set to 8.

2. Training Algorithm: From the outset we have to train the algorithm. We have to utilize dataset which is utilized for recognized. Likewise, there is something else required which ID for each picture. Same individual's pictures must have same ID.

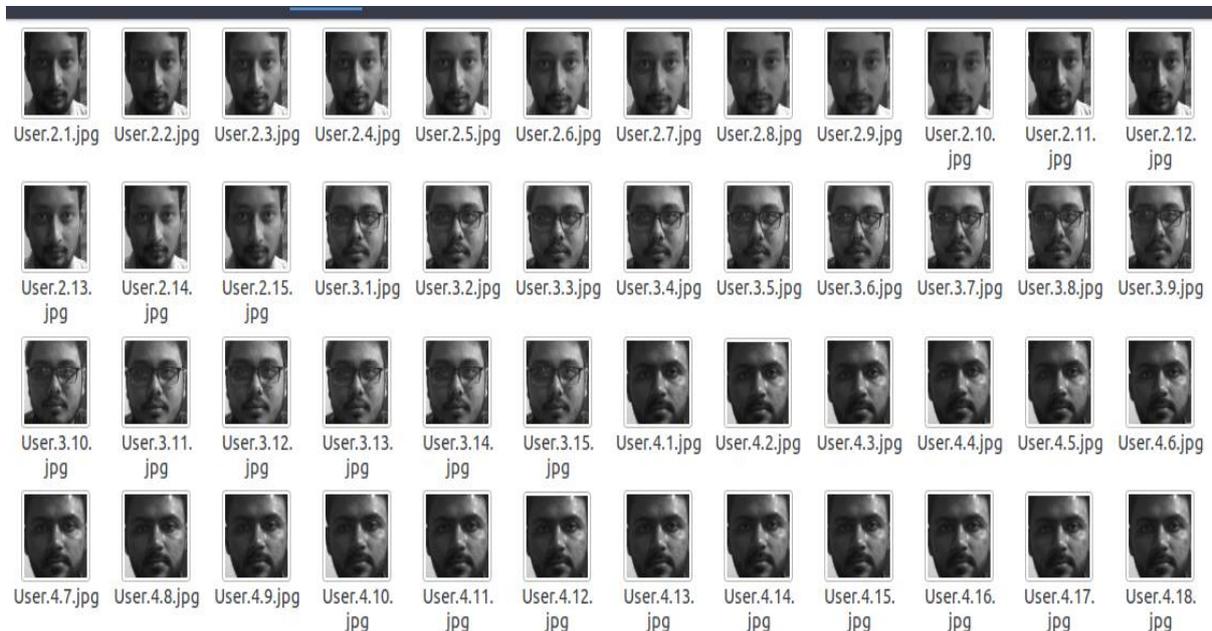


Figure 3.2.3: Training Dataset

3. Applying LBP Operation: This is a computational step. Making intermediate picture is the principal computational step which depicts the first picture in another manner with utilizing facial qualities that is better. This algorithm utilizes sliding windows with utilizing Radius and Neighbor.

In the event that we portray bit by bit, at that point it will progressively justifiable. So how about we break it into certain means:

- This algorithm breaks a picture as some grid and also matrix. Each of this matrix and grid is 3x3 pixels.
- Take center estimation of the matrix and use it as edge.
- For every one of 8 neighbors of edge, set another binary value.
- Put 1 for equivalent or more noteworthy than edge and 0 for littler than edge.
- At present Matrix is full with simply binary number.
- Concatenate estimation of matrix line by line for each position
- Convert binary value into decimal and put it as the middle value of matrix.
- Now get another picture of unique picture with better portrayal of qualities.

4. Extracting the Histograms: By utilizing Grid X and grid Y it breaks into grid. Every histogram has just 256 positions. It represents intensity of every pixel. At that point connect each histogram for making new and huge histogram. The qualities of unique picture are spoken to by conclusive histogram.

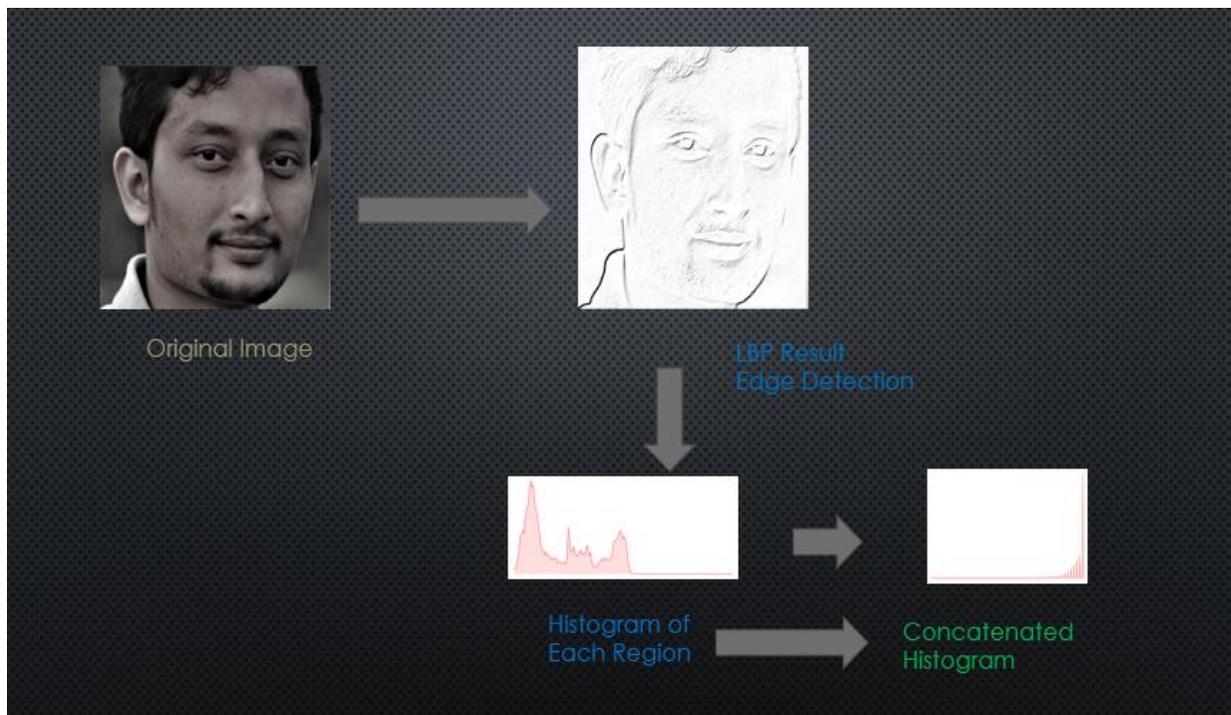


Figure 3.2.4: Extract Histogram from Original Image

5. Performing and Recognition:

In this progression, algorithm has been trained. Each histogram is made for speaking representing to every picture from database. On the off chance that we give new picture again as an information, we play out the means again and make new histogram for representing database picture. So, for finding the coordinating picture we have to analyze two histograms.

At that point it restores a picture with the closest histogram. We may utilize various types of law to discover the contrast between two histograms like as Euclidian separation, chi-square and so on. Here we can utilize Euclidian distance to gauge separation between two histograms. The yield of the calculation is Id from the picture with the closest histogram and return estimated separation. Estimated separation can be utilized as Confidence estimation. Here lower certainty means separates between two histograms are nearer. Along these lines, lower certainty is superior to higher certainty. Presently we can utilize limit esteem. Face acknowledgment will completely fruitful if certainty is lower than limit.

3.3 Data Flow Diagram:

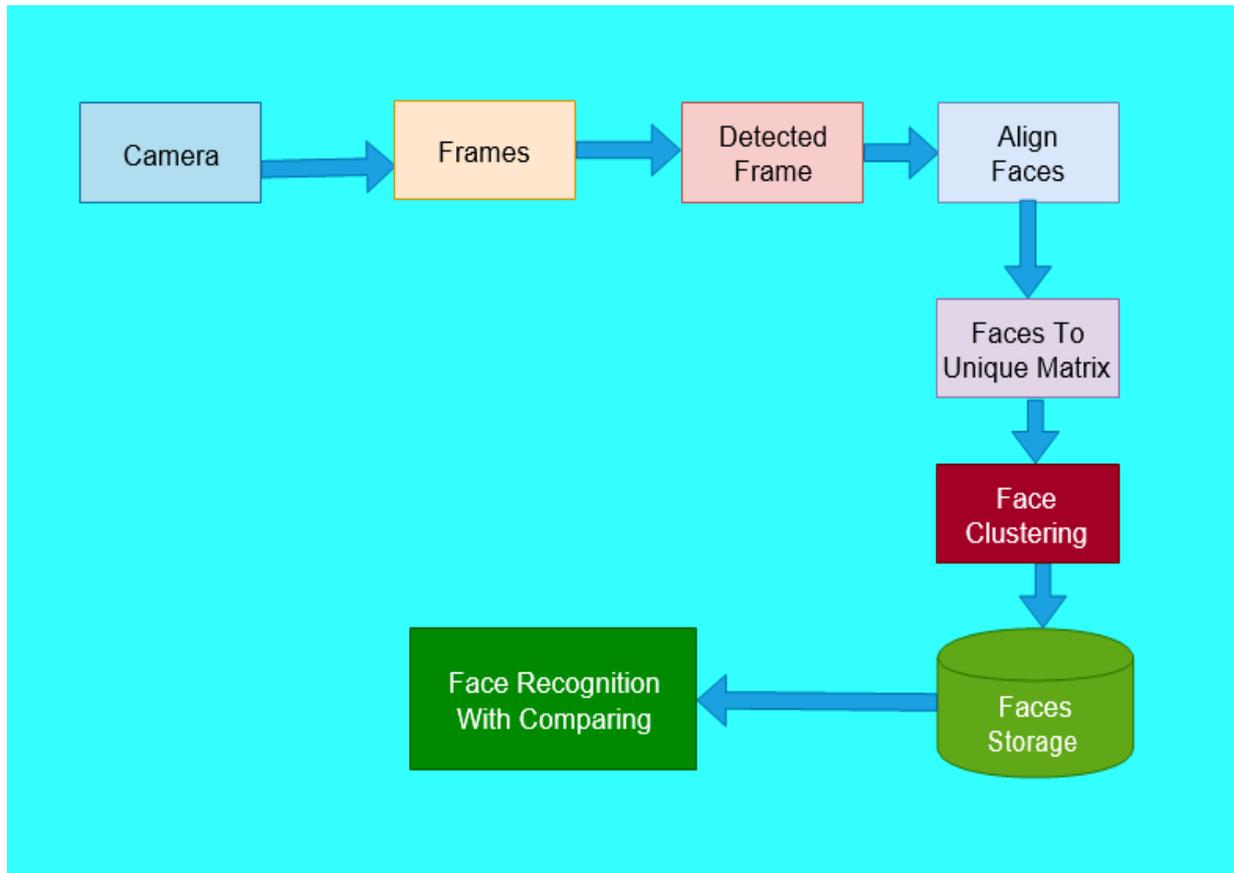


Figure 3.3.1: Data Flow Diagram of Entire System

Description:

In our system, data is passed by figure-3.3.1. Camera recognizes face from video catch and convert face picture into matrix. At that point it faces clustering and store faces on database. At that point it perceives face with contrasting. At the point when match happen, at that point it passes information about the recognized individual on dataset.

CHAPTER 4

DESIGN SPECIFICATION AND RESULT

4.1 Front-end Design:

The Admin will put explicit client id for every client to prepare his/her picture. This client id needs to precise recognizable proof of client. Try not to put same client id for more than one client. Administrator additionally take 200 pictures of one client for preparing and all pictures will be putted under one client id.

4.2 Back-end Design:

Table 4.2.1: Simple Database of Stored Data

User ID	Name
1	Arup Sarkar
2	Saykot Kumer Barman
3	Probal Roy Antu
4	Abdul Ahad Rony
5	Shah Poran Vhuiyan
6	Shafikul Islam Munna

At the point when our system recognizes faces for preparing administrator needs to give one of a kind ID and name to store information about distinguished individual. What's more, in our database it is put away like as table-4.2.1.

4.3: Experimental Result:

The experiment was executed by utilizing 'Visual Studio Code' version 1.39.2 on Ubuntu 18.04.3 LTS working system. 'yaml' file is utilized for data storing. In figure.6 three pictures of faces which are diverse in appearance that are detected effectively.

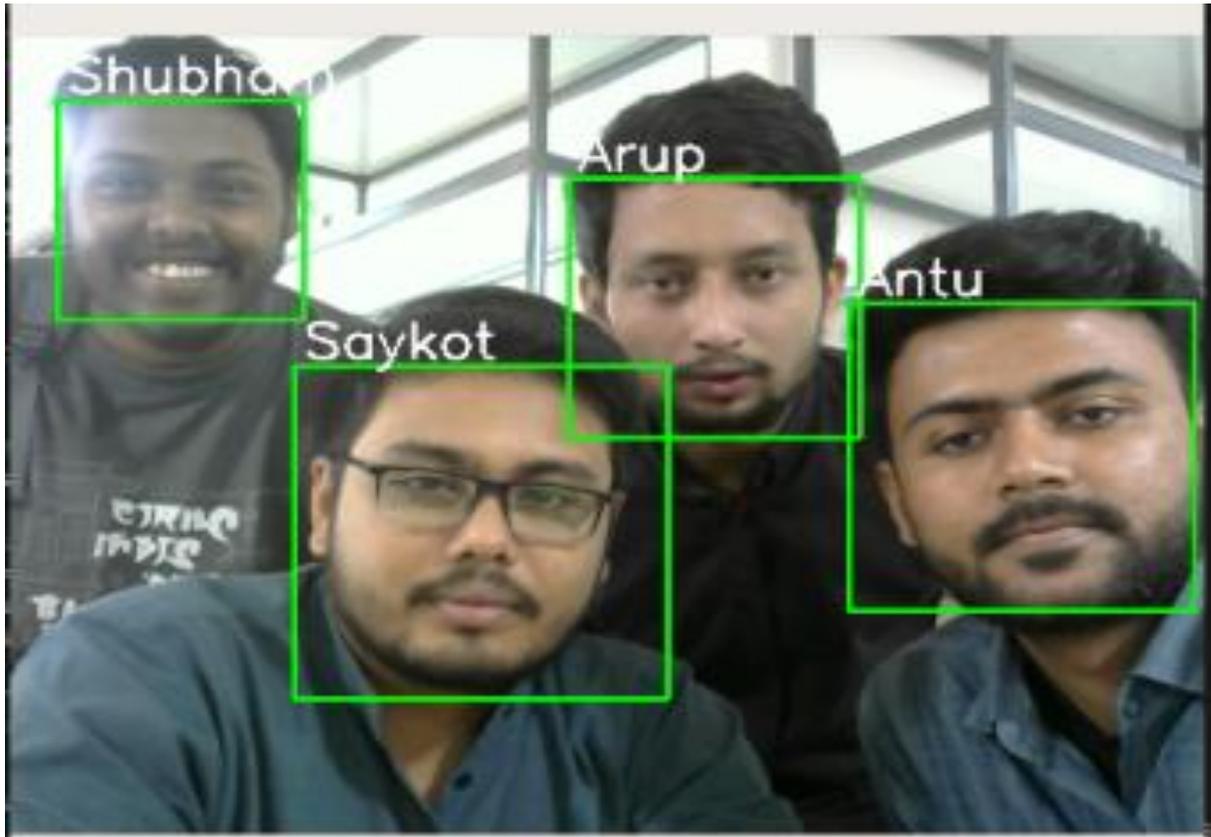


Figure 4.3.1: Detection of Multiple Faces

The procedure of detection is executed by utilizing real time video capture. In the following stage detected area of picture is cropped and stored in database as dataset with a unique userID.

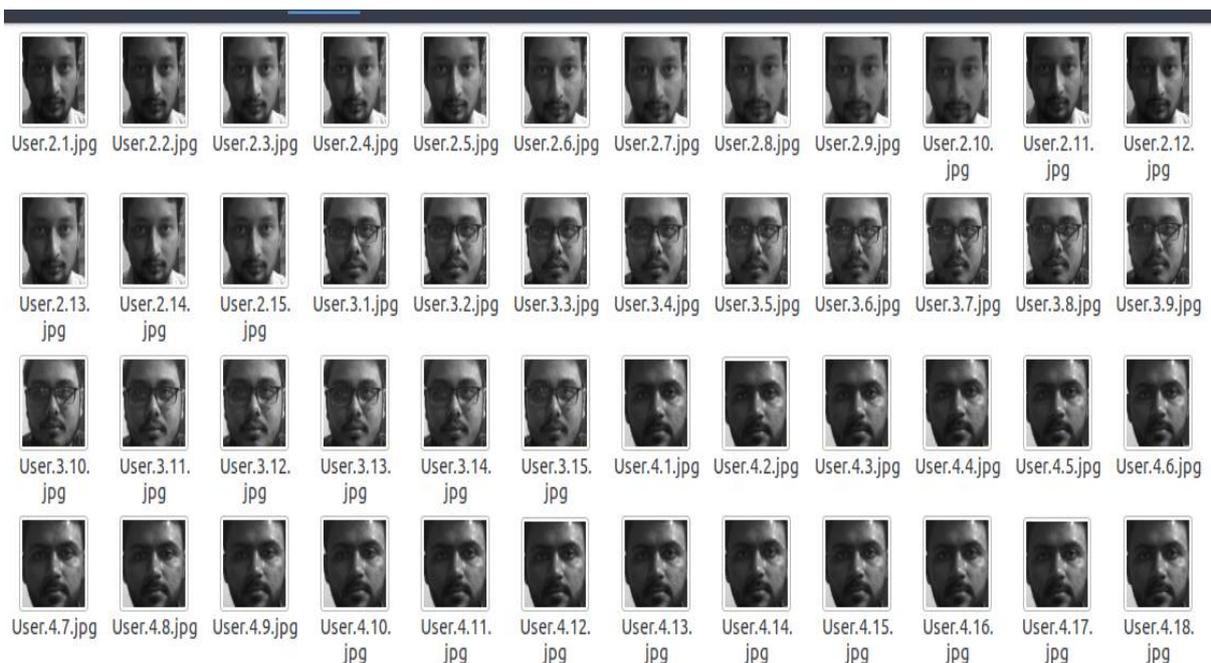


Figure 4.3.2: Image Dataset

The following part is to recognize face. For recognition is analyze two histogram and return nearest histogram with the user ID. At that point system brings the Name from database that is stored in database with unique user ID.

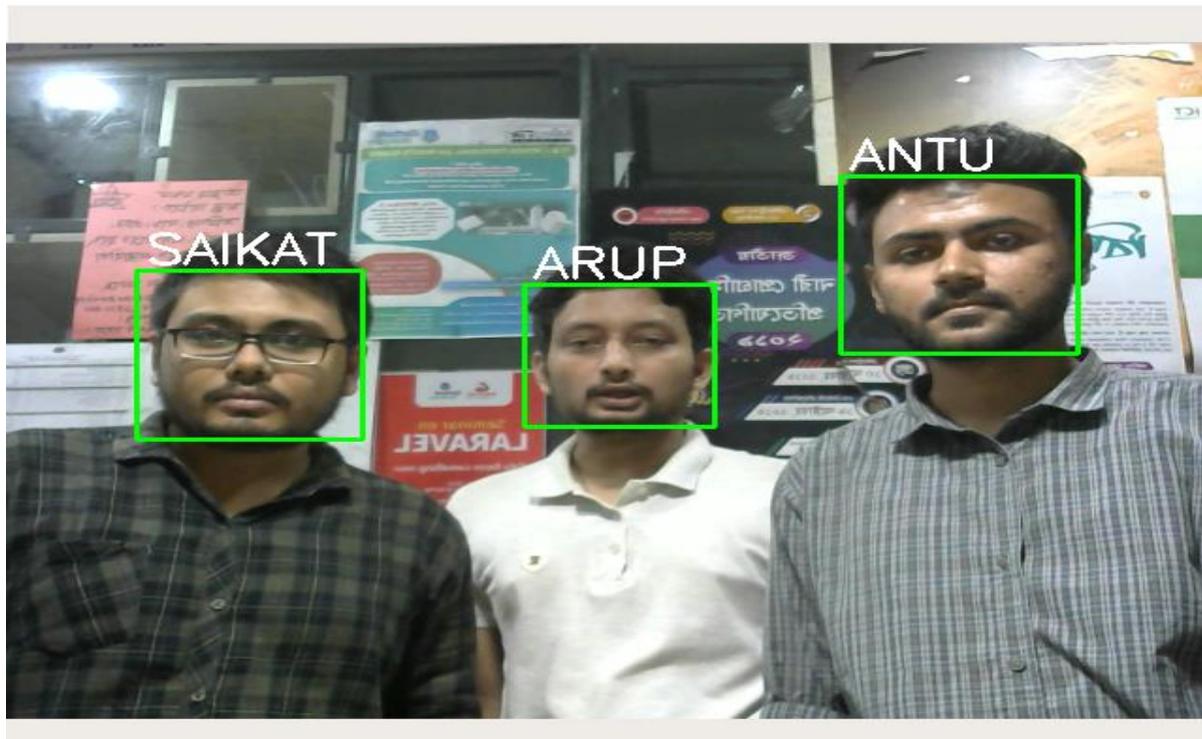


Figure 4.3.3: Recognition of Multiple Faces

4.4 Implementation Requirement:

At the point when we began to execute this task, it was unfamiliar to us. That was difficult to conceal this test. For executing a few cameras requirement for detection and recognition and need a PC to actualize the code. We have to set those cameras under a similar Wi-Fi network. Other than it requires some delicate abilities.

- Python3
- OpenCV-python (3.3.1.11)
- OpenCV-contrib-python (3.3.1.11)
- NumPy (1.17.3)
- Dlib (19.18.0)
- YML

The database taking care of ought to be cautious with the goal that database isn't be substantial for information excess.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 User Registration with Face Detection

For face recognition, from the outset we need to enlist user with recognizing his/her face utilizing camera. By putting unique user ID, a picture is isolated from another picture.

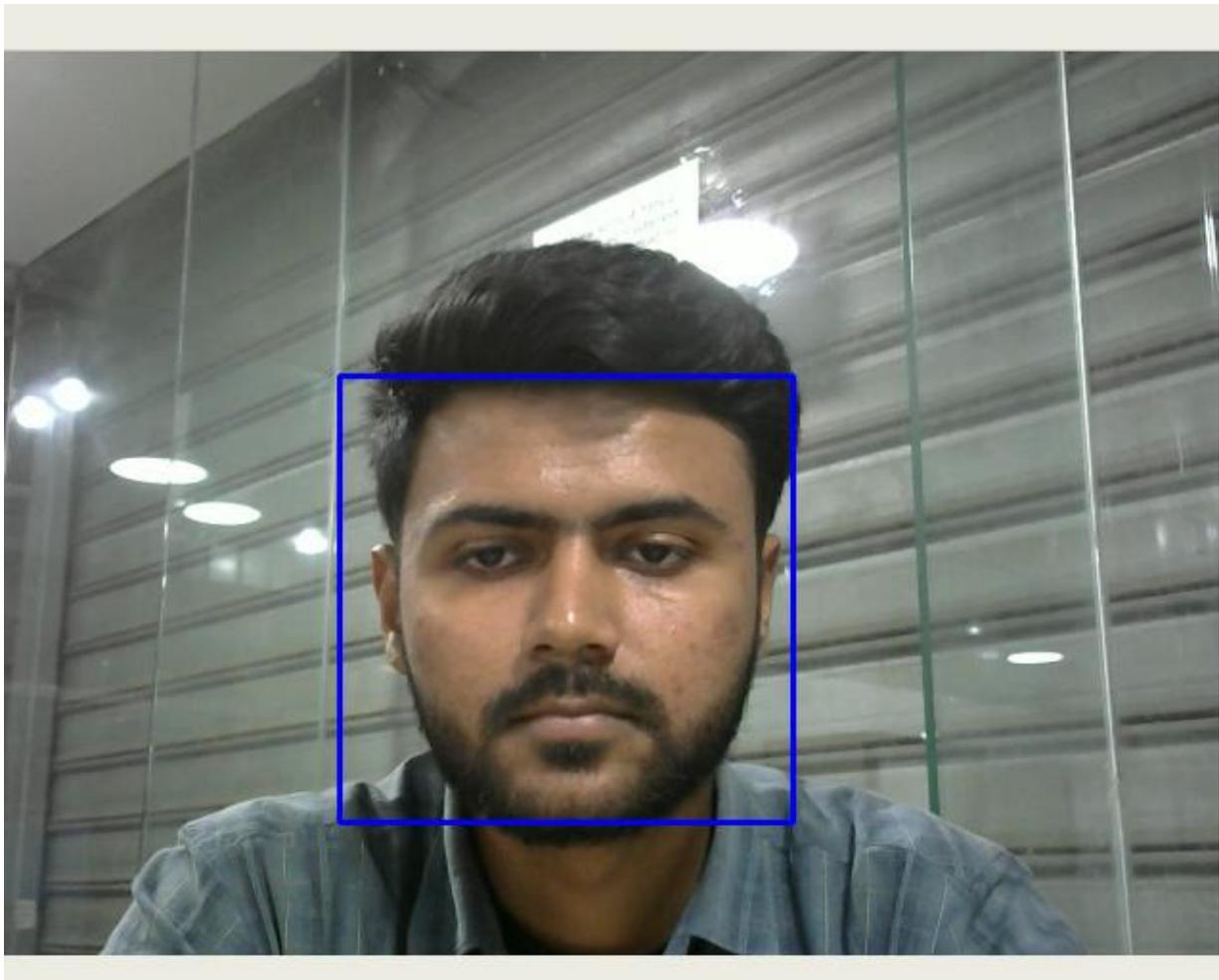


Figure 5.1.1: Registration Using Face Detection

5.2 Implementation of Database

Database contains a lot of pictures and individual name of each picture alongside user id. Database will be dynamic in future.

Table 5.2.1: Design of Database

User ID	Name
1	Arup Sarkar
2	Saykot Kumer Barman
3	Probal Roy Antu
4	Abdul Ahad Rony
5	Shah Poran Vhuiyan
6	Shafikul Islam Munna

5.3 Training Data

Trainer create ‘.yml’ file. This file contains all the matrix of every picture. These matrix are utilized for contrasting pictures.

```

%YAML:1.0
---
threshold: 1.7976931348623157e+308
radius: 1
neighbors: 8
grid_x: 8
grid_y: 8
histograms:
- !opencv-matrix
  rows: 1
  cols: 16384
  dt: f
  data: [ 6.94444450e-03, 2.25694440e-02, 0., 0., 6.94444450e-03,
6.94444450e-03, 0., 1.21527780e-02, 0., 0., 0., 0., 0.,
1.73611112e-03, 0., 5.20833349e-03, 8.68055597e-03,
1.21527780e-02, 3.47222225e-03, 0., 1.73611112e-03, 0., 0.,
5.20833349e-03, 3.47222225e-03, 6.94444450e-03, 0., 0.,
1.38888890e-02, 5.20833349e-03, 1.04166670e-02, 1.04166670e-02,
0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
0., 0., 0., 1.73611112e-03, 0., 0., 0., 0., 3.47222225e-03, 0.,
0., 0., 1.73611112e-03, 0., 1.73611112e-03, 1.38888890e-02,
1.21527780e-02, 0., 0., 0., 0., 1.73611112e-03, 0., 0., 0., 0.,
0., 0., 0., 0., 0., 6.94444450e-03, 0., 0., 0., 0., 0., 0.,
1.73611112e-03, 0., 0., 0., 0., 8.68055597e-03, 0.,
3.47222225e-03, 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
0., 0., 0., 0., 0., 1.38888890e-02, 3.47222225e-03, 0.,
1.73611112e-03, 1.73611112e-03, 1.73611112e-03, 0.,
1.73611112e-03, 3.47222225e-03, 0., 0., 0., 1.90972220e-02,
1.73611112e-03, 8.68055597e-03, 5.20833349e-03, 0.,
8.68055597e-03, 0., 1.04166670e-02, 0., 1.73611112e-03, 0.,
2.95138899e-02, 0., 0., 0., 0., 0., 0., 0., 5.20833349e-03, 0.,

```

Figure 5.3.1: Matrix of Dataset in YML file

5.4 Testing Implementation:

Testing part is so great experience for us. In this part we take 200 picture for every individual with numerous outward appearance for finding the shortcoming of our system. In any case, our system gives us exceptionally splendid outcome. It can detect multiple faces in a single casing and can effectively perceive various faces in a single edge. It can –

- a. Detect faces
- b. Recognize faces
- c. Give detail of an individual who is recognized
- d. Add new user with putting new user ID.

5.4.1 Acceptance Test

This experiment is superior to other related software which can detect and recognize faces.

5.4.2 Test Result and Report

All the tested value was positive. We have to concentrate on graphical interface our system.

5.4.3 System Testing

The beta testing result was strong. End users will comprehend the system effectively and acknowledge will be certain.

CHAPTER 6

CONCLUSION AND FUTURE PLAN

6.1 Discussion and Conclusion

Human face recognition has noteworthy uses in law implementation and equity arrangements by stretching out beyond the consistently propelling offenders on the planet. Facial identification and recognition system incorporates software solution for university campus to provide student safety. Facial recognition system has adequate use for university campus and ensures criminal assault in university campus defense. Legitimate utilization of this system can be found in any campus which have security issue. Facial recognition system can improve the viability of movement and traditions faculty. The budgetary help zones have an incredible worry of security system. Human face identification and recognition system expands the security in budgetary assistance areas.

We create facial recognition dependent on face detection for selected area like university campus. Our primary point is to recognize unauthorized people and throw them out of secure area. We are anxious to build up a quick and productive face recognition system that recognizes countenances of people and not entering them. We can reduce the internal campus crimes by measuring unlawful moving of strangers by utilizing our proposed technique just as our point is to expand open mindfulness, human security and law authorization by embracing our proposition.

6.2 Future Plan

A portion of the work we have completed yet we have a future intend to build up this system is progressively dependable, justifiable and easy to use. To accomplish the objective, we need to do some work that's are-

- Develop an excellent graphical UI
- Create enormous database
- Develop dynamic web application
- Create validation to utilize

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Face

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