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INTELLIGENCE FACE RECOGNITION SYSTEM

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Supervisor

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I hereby declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

Azzam ABDULLAH

Signature

DEDICATION

I am dedicating this thesis to my household and many friends, who have supposed and proceed to imply so a lot to me. Although they are no longer of this world, their recollections continue to modify my life. First and foremost, to father Hameed whose love for me knew no bounds and, who taught me the value of hard work. Thank you soan awful lot “Dad”, I will never neglect your effort. Next, my mom who raised me, cherished me, and taught me all what lifestyles is needed. I additionally prefer to bemindful my sisters whose I should no longer gain what I executed besides their asses! I also dedicating this to my brothers who supported me all alongside the way. Last butnow not least I am dedicating commit this dissertation to my many buddies and veryown circle of spouse and children who've supported me at some point of the process. Iwill constantly admire all they have bought done, specially my doctors for supportingme to amplify my technology skills, for the numerous hours of proofreading, for supporting me to hold close the chief dots.

PREFACE

All reward and thanks are due to Allah. We would additionally like to thank Luxand, who provided us with the required datasets and other tools. We would also like to thank supervisor Asst. Prof. Dr. Ayça Kurnaz Türkben guidance us in the proper direction for the duration of the work of this report.



ABSTRACT

INTELLIGENCE FACE RECOGNITION SYSTEM

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The purpose of this research is to utilize the libraries and models of the luxand platforms for the seek of facial recognitions which pass through four main stages and other many secondary process to achieve the goal of recognition. The system capture the face image and start the process of analyess and face spotting to then for the stage of alignment where is the face features are detected then moving to the extraction stage where are calculation are done , all these calculations and numbers move to the fourth matching process where results are compared with previous stored information for the targeted face , all those processes utilize the locality preserving projections (LPP) .the PCA Linear Discrimination Analysis is used to solely structure the face spaces. The PCA, LDA, and LPP are classified of one of a kind diagrmaed model. The research is going to pass through the Luxaund technique.

Keywords: Image Processing, Deep Learning, Face Recognition System

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ABBREVIATIONS

AI	:	Artificial Intelligence
ML	:	Machine Learning
FAR	:	False Acceptance Rate
FRR	:	False Rejection Rate
PNP	:	Philippine National Police
LBF	:	Location Based Framework
LFW	:	Labelled Face Wiled
PCA	:	Principal Component Analysis
WBCCNN	:	Weight Binarization Cascade Convolution Neural Network

1. INTRODUCTION

1.1 OVER VIEW

Due to the topic's practical importance and cognitive scientists the oretical interest, face re cognit ion has existed f or as long as computer vision. Face recognition has always been a primary subject of rese arch due to it s non-invasive nature and the fact that it is people 's fundamental method of personal identity, despite the fact that other means of identification (such as fingerprints or iris scans) ca n be more accurate. Face consciousness science is progre sively becoming a general biometric solution since it demands far less effort from the individual than other biometric solutions do. The major applications of biometric facialre cognition are in the following three categories: visitor management systems attendance and worker management systems, and eventually.

1.2 BACK GROUND

The Human race have been tring to achive the glory of new technologies which will thrive the world to the prosper and thrive, one of these technologies is face recognition which was started sixties with a group of scientist who started working in sample human face features like eyes and ears and nose and then then reached to calculate the distances between the features. later on the seventies Harmon and Goldstein created a machine that can mark the hair and the hair color and even the thickness, which was the way to all face recognition glory.

1.3 PROBLEM STATEMENT

Attendance of students. This is a prolonged manner that need a big quantity of time and energy, especially when the lecture with a enormous vary of students. When exams are being held, it additionally causes a lot of disruption and interruption. Additionally, when the attendance sheet is shared between many college students and instructional.

1.4 RESEARCH SIGNIFICANCE

Strong authentication was one of the most difficult aspects humen being faces, therefore when face recognition appears it solved a huge hassles and a significant problem .human face biometric verification is now playing and important part in the wold and has worked to fulfill so many fields

like videos , real systems , computer intecation and many other fildes .this paper add for the body of knowledge one more files which is students attendance recognition system . the system will file the student's system in the class room environment and then send the results to the admission department which containe all students information.

1.5 RESEARCH OBJECTIVES

- A. The objective in the again of this research is to absolutely discover out about the area of pattern consciousness (more in particular facial recognition) which is very necessary and is used in a number of functions like identification and detection.
- B. The main porpose is to provide and automated system for student's attendance which will eliminate the traditional file way.

1.6 TERMS DEFINITIONS

Due to the usage of some phrases in distinctive domains, false impression or confusion may occur; thus, this part provides the definition of phrases used along with this project, these definitions were taken from the literature evaluation distinctive in chapter 2.

- i. Image Processing: Digital image processing is the use of a digital laptop to technique digital photographs through an algorithm
 - ii. Luxand: Non-public hi-tech enterprise shaped in 2005. Luxand lookup things to do commenced with Artificial Intelligence and biometric identification technologies, allowing the organization to develop a whole set of equipment and libraries to function completely automatic attention of human faces and facial features.
 - iii. Fc Face Crop: Function, you need to name it when the usage of the luxand library.
 - iv. Artificial neural network: Is computing structures prompted with the useful resource of the natural neural networks that characterize animal brains. An ANN is mainly primarily based on a series of connected devices or nodes
- regarded as synthetic neurons, which loosely model the neurons in a organic brain.

- v. Morphological: Is a collection of non-linear operations related to the structure and the geometrical buildings of an photograph
- vi. Toolbox: A set of software tools.
- vii. Conventional Process: Manner based totally on or in accordance with what is normally finished or believed
- viii. Flaws: A mark, fault, or different imperfection that mars a substance or object.
- ix. FSDK_Detect Face : Refer to this feature in .NET, substitute the FSDK _ prefix with FSDK. Namespace.
- x. Labelled Faces in the Wild (LFPW): A Database for Studying Face Recognition in Unconstrained Environments.
- xi. False Rejection Rate (FRR): Is the occasion of a protection computer failing to verify or grow to be conscious of an licensed person. Also referred to as a type I error, a false rejection does now no longer always thing out a flaw in the biometric system.
- xii. The False Acceptance Ratio (FAR): Is a measure unite that used to measure the false rate
- xiii. Allocation-Based Service (LBS): Is an application that depent in mobilization for providing location information

2. LITERATURE REVIEW

2.1 GENERAL INFORMATION

This chapter highlights ancient works which relate to our study Facial matching consciousness system. These're search introduced and illustrated some challenges and options that have been taken in to consideration in our study.

2.2 RELATED WORDS

Recent advances withinside the face detection and awareness generation can also additionally deliver an impact that the hassle of face matching is in truth solved, thru deep learning fashions the use of lots of samples in step with a face for coaching and validation at the available benchmark facts sets. Human visiondevice appears to deal with face localization and matching hassle in a extraordinary way from the modern face cognizance systems seeing that human beings come throughout faces right away even in maximum cluttered environments, and regularly require a single view of a face to reliably distinguish it from all others. from perception the previous studies that unfamiliar face matching (figuring out whether or not at the sametime as supplied to pictures show the identical) can also be very error-prone. A small quantity of lookup in laboratory settings has proven that the use of extra than one photo or a face average, alternatively of a singlepicture, can beautify face matching [6].

In October 2019, Zhen-Tao Liu, Si-Han Li, Min Wu, Wei-Hua Cao, Man Hao, Lin-Bo Xian, solve the Eyeplace hassle by using Neural Network (WBCCNN). This paper is called "Eye localization based totally on weight binarization neural network". This algorithm depends on 4 range of weight and their jobs is to define the eyes positions from four sides,, however in addition speeds up the operation. Experiment of the eyes localization achieved the Labeled Faces withinside the Wild (LFW), BioID, and Labeled Face Parts withinside the Wild (LFPW) Databases, in whic contribute to reach the result for the fault for right eye and left eye is 0.66% and 0.71% on LFW, respectively. The operation pace of a binary network is about two examples that of a non-binary [7].

In March 2018, Gima Batinggal Jasmin D. Niguidula, tried to velocity up the face recognition, define the false acceptance price (FAR) and false rejection rate (FRR), and notification with the aid of SMS capability.

This paper known as “Classification of Coffee Bean Species Using Image Processing, artificial neural network, and K nearest neighbors”. Confront Acknowledgment Framework (FRS) can be utilized to coordinate snap shots for a precise motive like coordinating opinions of observed person visà-vis with misplaced people. In the Philippines, in spite of the giant variety of misplaced men and women every year. Hence, police from exclusive regions may additionally additionally not be aware almost critiques of misplaced character from one place besides educated by using the vicinity holding the case. For these reasons, this ponders trusts to create a Confront Acknowledgment Framework with Location- Based Framework (LBS) making use of Luxand FaceSDK for rapid recognizable proof and discovering whereabouts of misplaced individual. The reflect on consideration on will take a seem at the unfaithful acknowledgment charge (FAR) and untrue dismissal fee (FRR) of the framework at altering distances withaltering points, confront acknowledgment speed, precision of the framework in recognizing the area of the lost individual, and be conscious thru SMS performance of the framework [9].

3. METHODOLOGY

3.1 INTRODUCTION

The proposed lookup is to sketch an interactive System with synthetic intelligence and data processing Facial matching using Visual Basic. In the proposed system, the ability of the gadget to apprehend faces and supply the device provide small print related to the same character face recognized. Give one hundred percent match faces.

3.2 DATASET PREPARATION

The coaching data set is researchers self-made. It consists of a plenty of faces information element, which includes researcher's docs and classmates The “iPhone X” digital camera was set in PRO mode with 12- megapixel (f/1.8, 1.22-micron) + 12megapixel (f/2.4, 1.0-micron). Those settings had been chosen and tested by the usage of some student’s samples, and evaluating them to real life photographs using eye measurement. Those settings created photographs which were approximately close to real life

3.3 FRAME WORK

The sketch of this lookup is extended to the aspect of synthetic Genius and data processing there forest a tistics is greater concerns

3.4 DATASET CALCULATION

3.4.1 Eyes Calculation

The spinoff of (3.1) The calculation of this part depends on three main factors first the transvers radius of the eye , the altitude and the tangent of the perspective all those factors contrpute for the result of eyes calculations.

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2 \|p_1 - p_4\|} \quad (3.1)$$

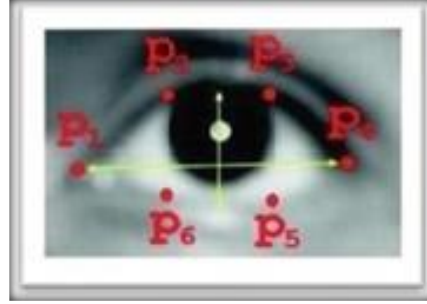


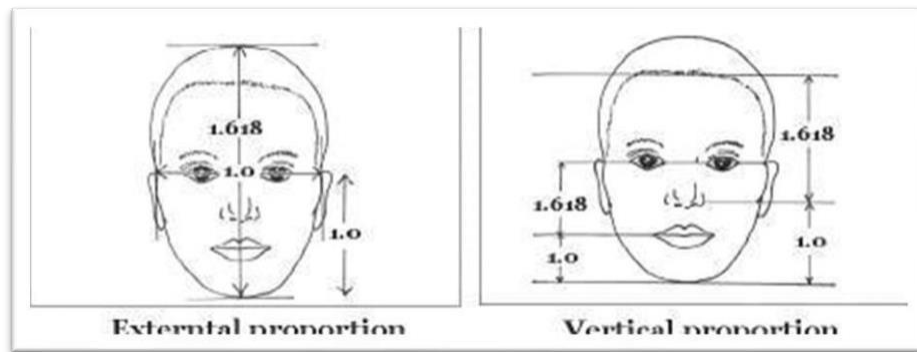
Figure 3.1: Eyes calculation

3.4.2 Yaw Calculation

This equation exhibit the geometric equation of the face of the human in digital pics primarily based on translation, scale, and rotation then, it will provide us with the area and dimension of a face.

Figure 3.2 exhibit a System view of Yaw Calculation.

$$d2(t, pi) = \sum j w_{ij} 2(t_j - p_{ii})^2 \quad (3.2)$$



(a)

(b)

Figure 3.2: (a , b)Yaw calculation

3.4.3 Face Width Calculation

These equations discover the roll, pitch, and yew, then, it will provide us with the width of a face.

Figure 3.3 show a System view of a width calculation

$$dx = camera\ Y - pointY$$

$$df = camera\ f - pointf$$

$$d = camera - point$$

$$pitch = -\arctan 2(dy, \sqrt{dY * dY + d * d})$$

$$yaw = \arctan 2(d, dY) - 90^\circ$$

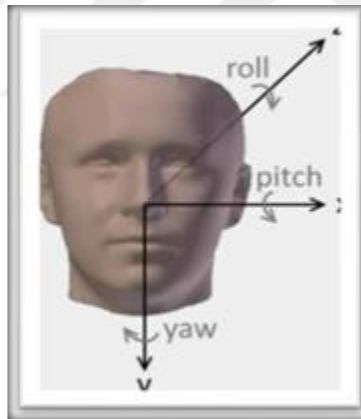


Figure 3.3: Width calculation

3.4.4 Data Processing

Luxand FaceSDK offers the API to extract face templates and fit them. A template extracted from a face can be stored in a database and can then be used to suit faces the usage of the Match Faces function. The features allow single frames to be retrieved from a digicam one-by-one; they are saved in HImage descriptors. The utility typically grabs frames in a loop, showing each body in its window and performing manipulations with images the detection face featue works accourding to the set face reconitionparamters.

3.5 FEATURES

3.5.1 Feature Detection

This method separates the facial region from the relaxation of the background. Figures exhibit a Systemview of a face detection format

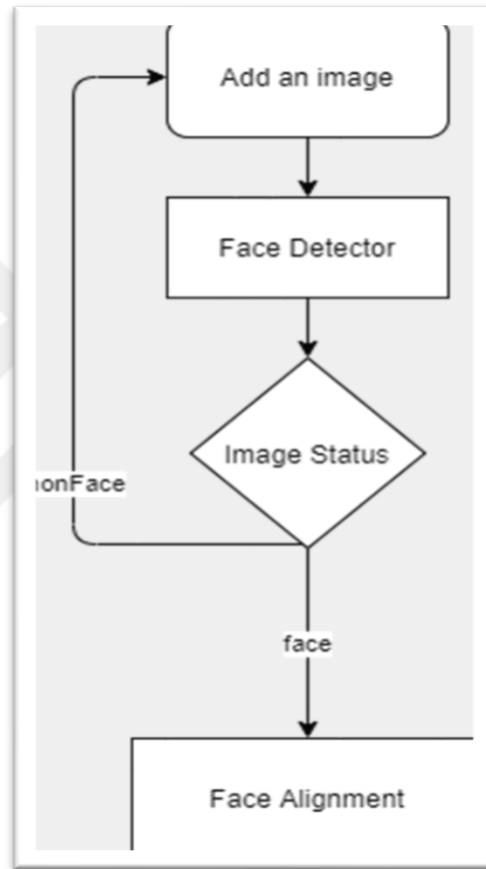


Figure 3.4: Face detection diagram

3.5.2 Feature Alignment

This procedure focuses on finding the high-quality localization and normalization of the face.

Figures 3.5 exhibit a System view of a face alignment design

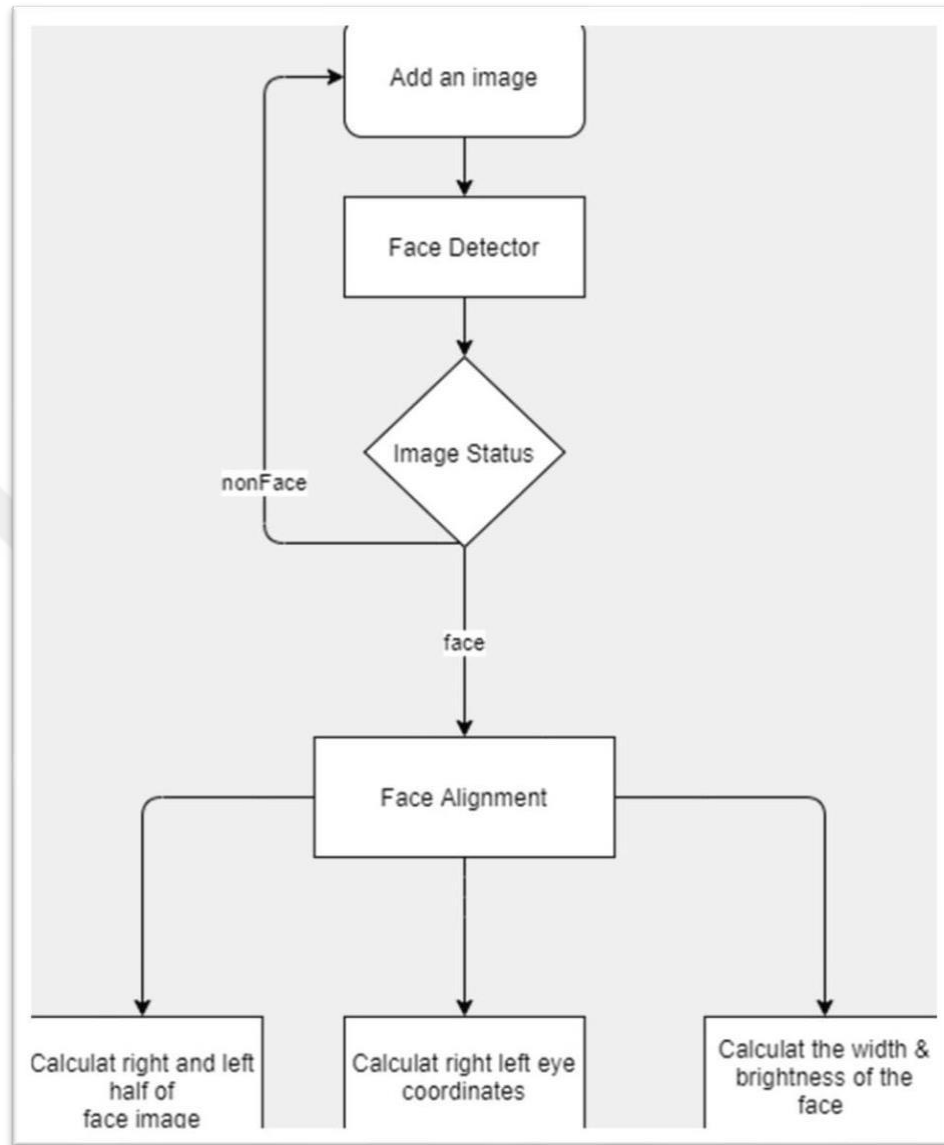


Figure 3.5: Face alignment diagram

3.5.3 Feature Extraction

After the previous two steps, function extraction is performed resulting in superb facts that is beneficialfor distinguishing between faces of special persons. Figures 3.6 exhibit a System view of a face extraction diagram.

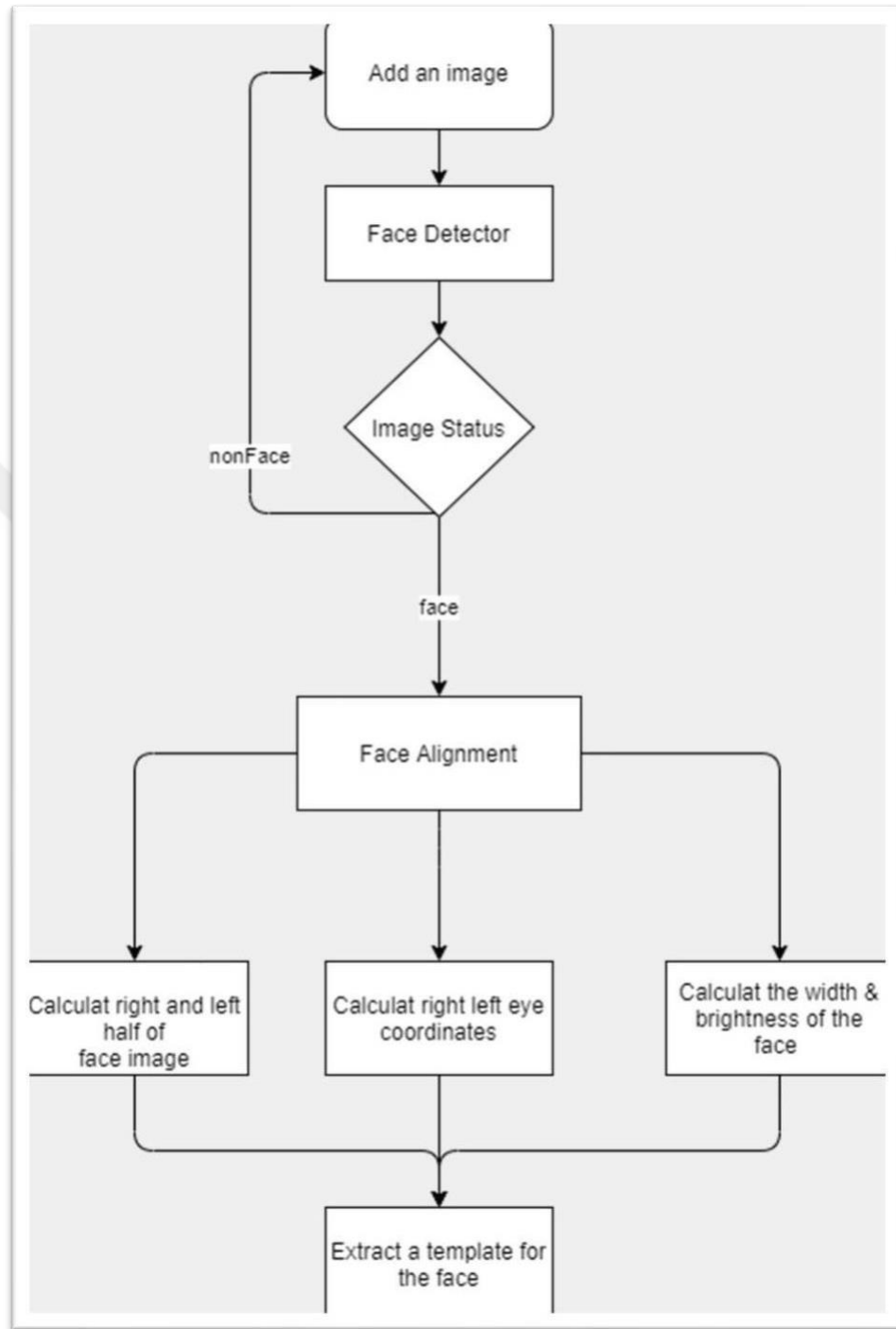


Figure 3.6: Face extraction diagram

3.5.4 Feature Matching

The extracted features are compared to these saved in the database, and choices are made in accordance to the enough confidence in the healthy score. Figures 3.7 show a System view of a face extraction diagram.

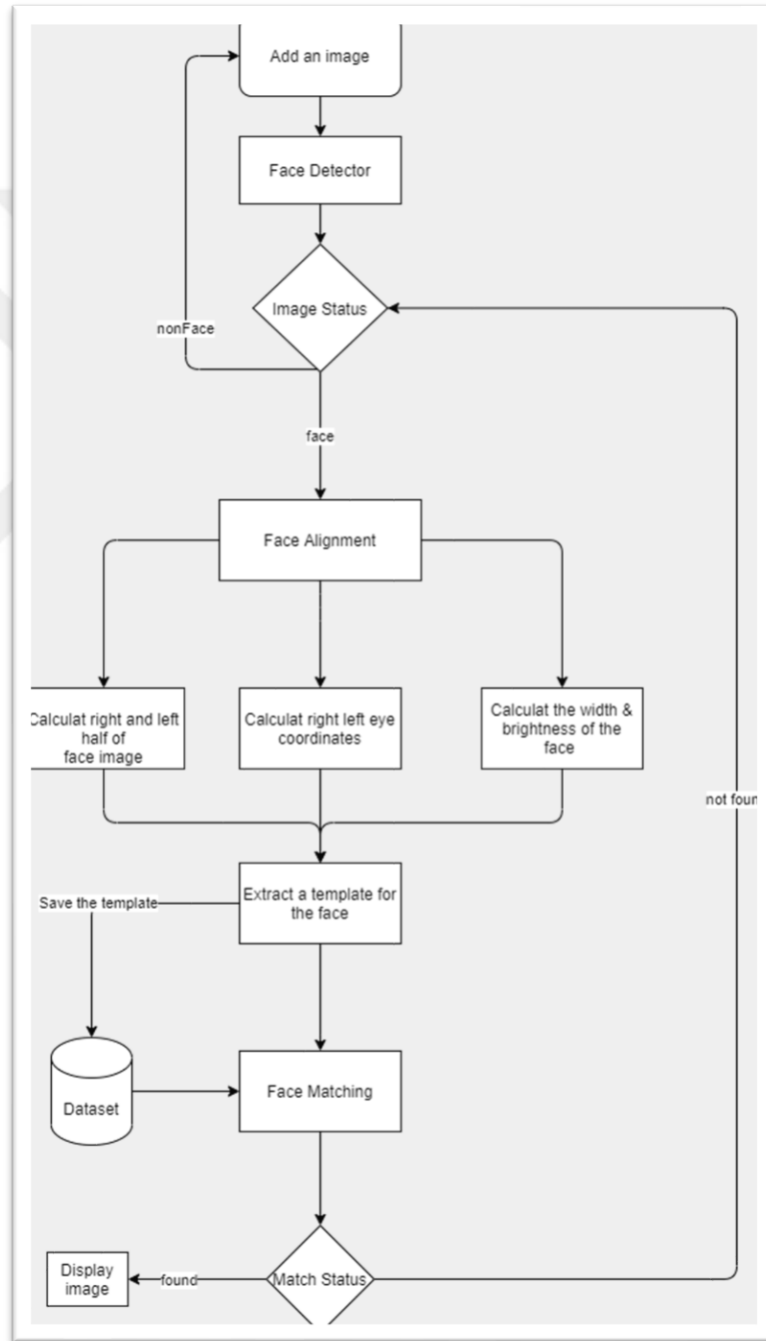


Figure 3.7: Face matching diagram

4. RESULTS

4.1 INTRODUCTION

This chapter contains the implementation lifecycle for this project, where the duties that construct the deliverables are executed. In any project, the step after choosing the components is checking out them in my opinion to make certain that each factor is working perfectly

4.2 HARD/SOFT WARE SPECIFICATIONS

The “iPhone X” digicam was used to take snap shots for our data-set and saved for later processing using Laptop Computer with the following specifications, “Intel Core i7-4600U” up to 2.0GHz, 8GB RAM and 512GB strong kingdom drive capacity, “Microsoft Window 10 PRO” 64bit operating gadget and a trial model of (Visual Studio 2019) platform.

4.3 LUXAND FACE MATCHING PROCESSING MODEL

4.3.1 Face Detection

The major endorse of this future is to identify the faces from non-faces objects or images. The authors faced a hassle in keeping apart the photographs because such pix normally include masses of nonface objects, such as buildings, landscapes, and a variety of physique parts, so the authors used Luxand facial detection algorithms due to the fact it generally starts off evolved by way of finding out human eyes in

which is one of the most easiest ways to detect a face. After figuring out these facial features, and the algorithm concludes that it has extracted a face or non-face.



Figure 4.1: Detect non-face image



Figure 4.2: Face image

4.3.2 Face Alignment

The predominant advocate of this future is to perceive the geometric structure of human faces in digital photographs primarily based on translation, scale, and rotation. The authors used Luxand alignment algorithms to given the place and measurement of a face, it robotically determines the structure of the facefactors such as eyes and nose. So, the algorithm will take the photo then crop it to the face region to calculate the vicinity and size

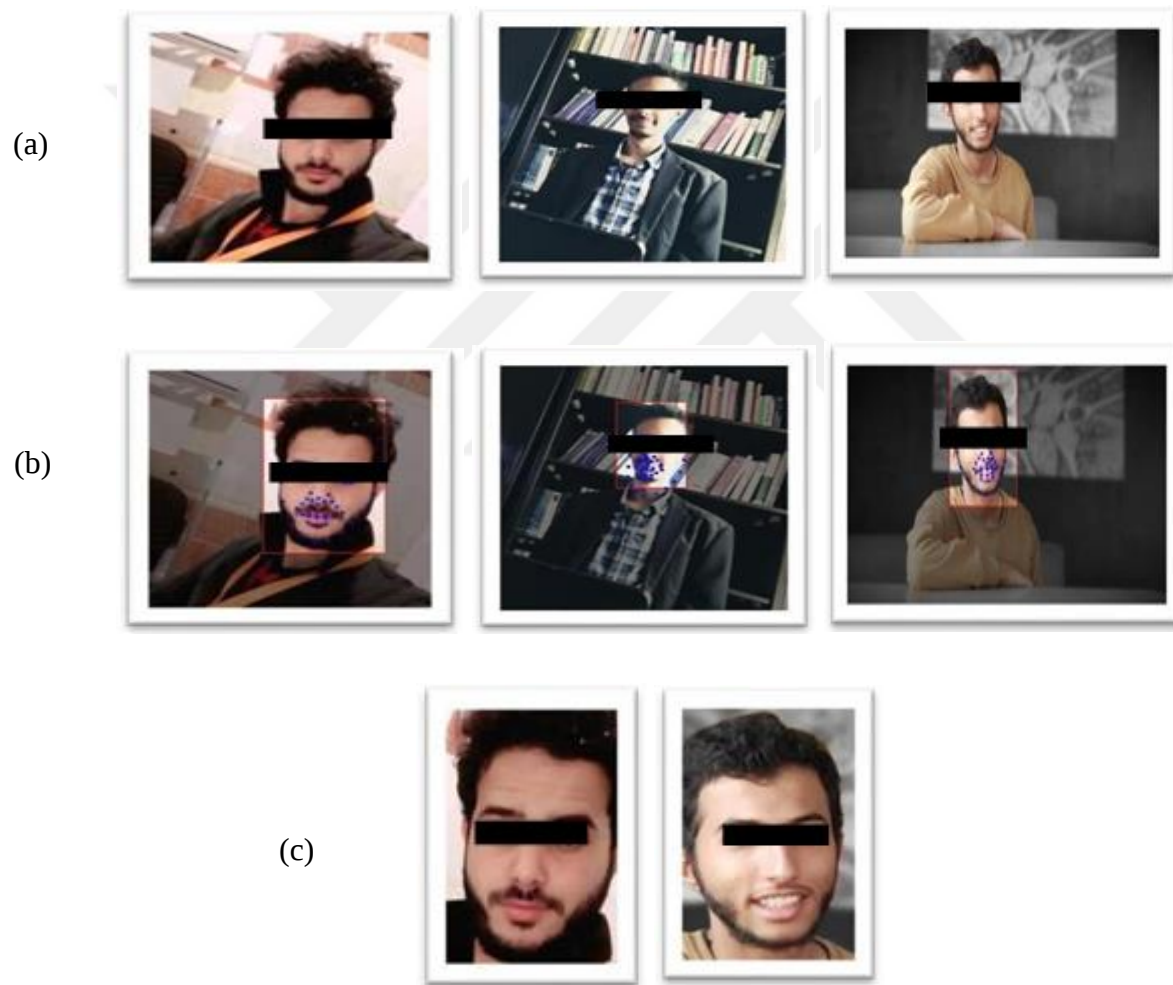


Figure 4.3: (a), (b), (c) Face alignment process

4.3.3 Face Extraction and Matching

The fundamental purpose of this future is to extract the face issue feature then create a template for it. Comparing two faces to measure the matching score between them is performed through

calculating the distance of a saved face templet embedding with the new one generated from an image

Taken by means of the camera. Figures 4.4 show a System calculated data.

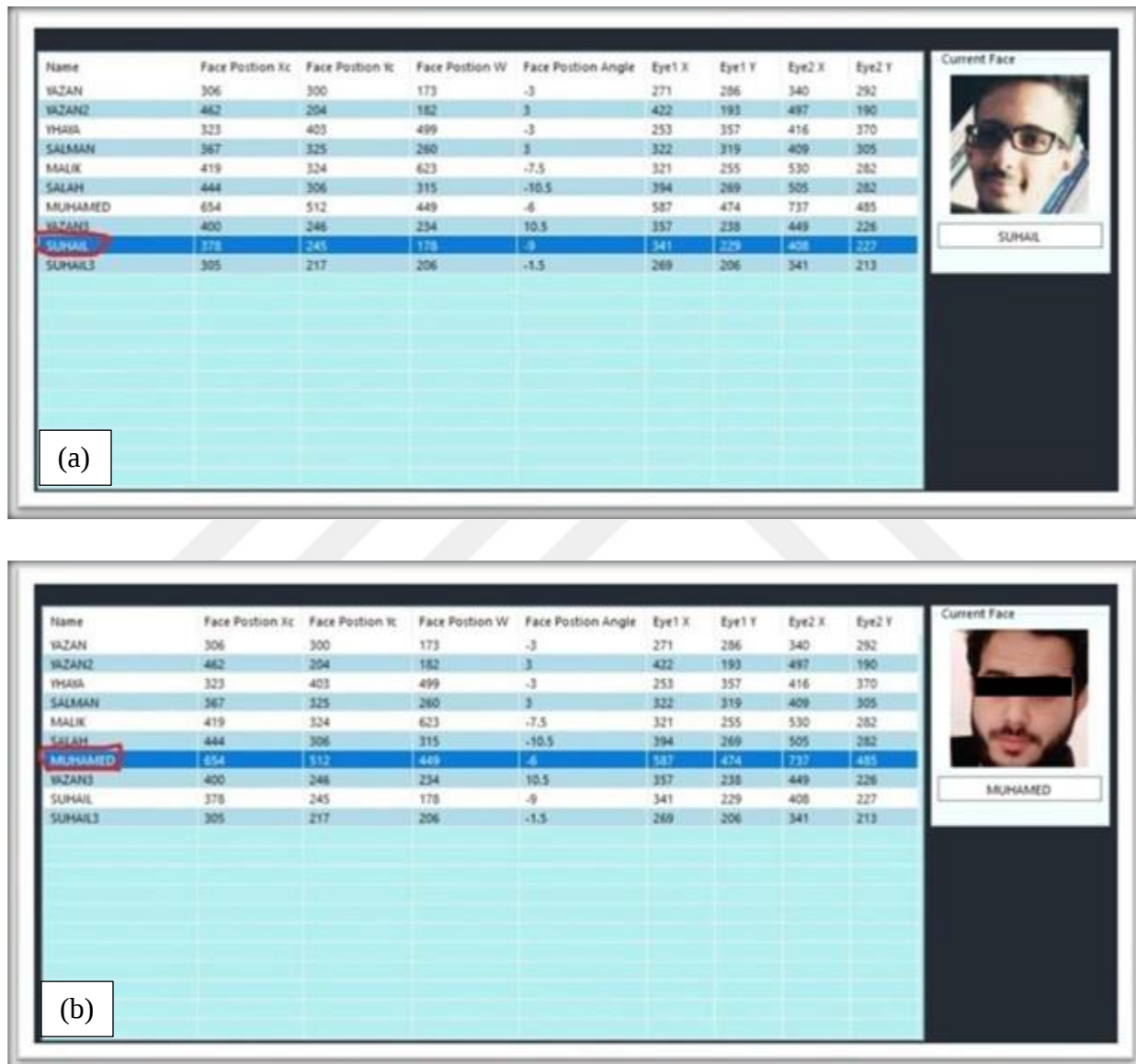


Figure 4.4: Extract face features images

Name	Face Postion Xc	Face Postion Yc	Face Postion W	Face Postion Angle	Eye1 X	Eye1 Y	Eye2 X	Eye2 Y	Current Face
YAZAN	306	300	173	-3	271	206	340	292	 YAZAN2
YAZAN2	462	204	182	3	422	193	497	190	
YHAIS	323	403	499	-3	253	357	416	370	
SALMAN	367	325	260	3	322	319	409	305	
MALIK	419	324	623	-7.5	321	255	530	282	
SALAH	444	306	315	-10.5	394	269	505	282	
MUHAMMED	654	512	449	-6	587	474	737	485	
YAZAN3	400	246	234	10.5	357	238	449	226	
SUHAIL	378	245	178	-9	341	229	408	227	
SUHAIL3	305	217	206	-1.5	269	206	341	213	

Figure 4.4: Extract face features images “Figure Continued”

Matching algorithm used to realize a face in a n image, then to compare that face to every other face (or faces) to determine whether or not there is a healthy or distinguish between two businesses of face matching algorithms. Figures 4.5 show a System view w how the face matching end result

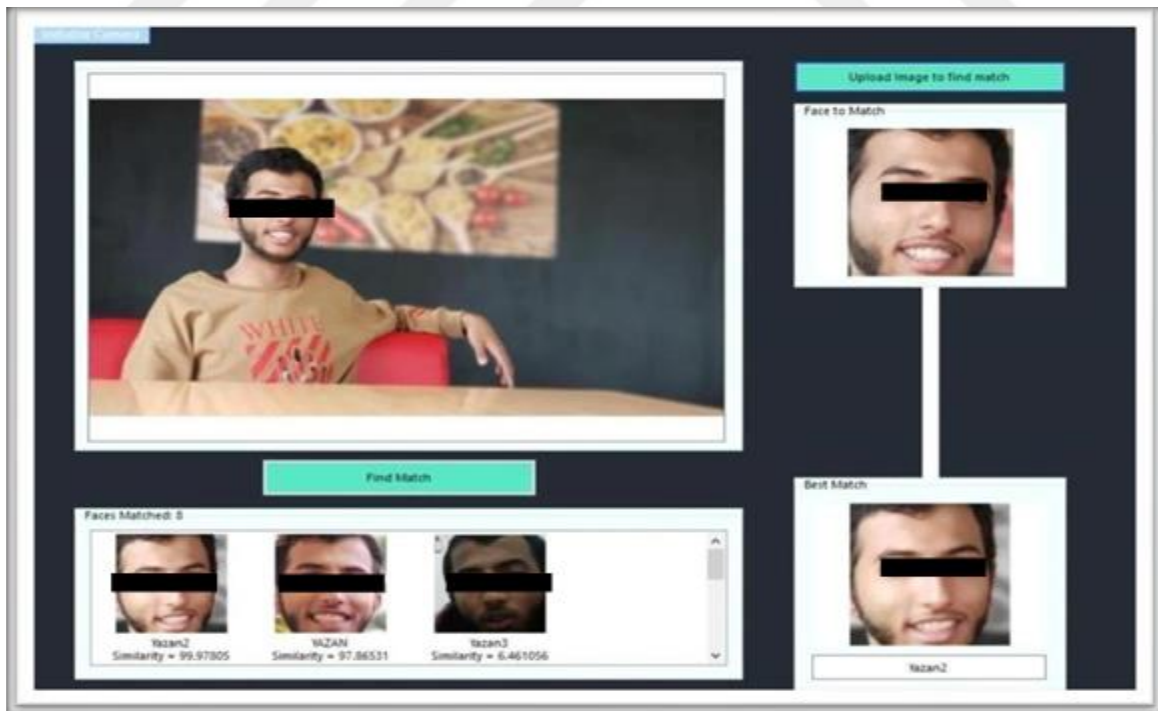


Figure 4.5: Face matching

4.3.4 System Testing

Secured assent structure from 20 people. Utilizing 13 megapixels versatile phone, the ponder captured the confront images of the 20 people. At that factor be a part of these pictures inside the framework. Each character has zero and 300 confront factor shots. I.

Table 1 appears that the normal velocity of the confront acknowledgment is 70 seconds when looking coordinate from 20 enrolled person. Table 4.1 showcase regular pace of the system.

Table 4.1: Speed result

<i>Tests</i>	<i>Speed</i>
<i>Test1</i>	<i>70 sec</i>
<i>Test2</i>	<i>60 sec</i>
<i>Test3</i>	<i>72 sec</i>
<i>Test4</i>	<i>70 sec</i>
<i>Test5</i>	<i>70 sec</i>
<i>Average</i>	<i>70 sec</i>

Table 2 appears that base on the comes about, the framework was able to supply adjust confront areas. Table 4.2 show final result of the system.

Table 4.2: Final result

<i>Names</i>	<i>Result</i>
<i>Yazan</i>	<i>correct</i>
<i>Muhammed</i>	<i>correct</i>
<i>Feris</i>	<i>correct</i>
<i>Salah</i>	<i>correct</i>
<i>Suhail</i>	<i>correct</i>
<i>Precision</i>	<i>Overall (90%)</i>

4.3.5 System Result

consequences exhibit that the gadget can apprehend a face if the angle of the take a seem to beat photo is registered in the database. Therefore, Luxand do no longer make use of face to face matching scheme then again it helps head rotation from 300 to 300 with variant in tilt angle. However, the result suggests that Luxand performs the face consciousness in an frequent tempoof 19 seconds when searching out a inform from dataset registered man or girl affords one hundred percent right results. Moreover, the end end result exhibit that the False Recognize

Rate will expand as the distance from the digicam increases. Matching relies upon on the excellent of the camera, the greater the megapixel of the camera, the limit False Recognize Rate preformed.

5. DISCUSSION AND CONCLUSIONS

5.1 PROJECT CONCLUSION

Face recognition still an important technology which play a very crucial position in the filed of biometric authntcation . in this paper , researchers tried to coved some of the highlighted parts of the biometric authontcation using a new framework and new model library to contribute to the out come results that have been discussed previously . in addition this paper tried to inhance the performance of the model and the efiicincy of the model, researchers hope they provide readers with the required information that is needed in this filed.

5.2 PROJECT DISCUSSION

This challenge introduces the environment friendly and accurate technique of discovering matching in the rale stay environment so we can change the ancient guide methods. No want for specialized for putting in the machine in any place. It can be developed the usage of a digicam and computer. We tried our best to fill the gaps as fit as possible so, the outcome of the project gives time accuracy and excessive effectivity.

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