AUTOMATED ATTENDANCE SYSTEM BY FACE DETECTION AND EMOTION BASED MUSIC PLAYING AND WALLPAPER CHANGING SYSTEM

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APPROVAL

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon, Assistant Professor,** Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

In our project we implement three congruent systems adopt on face detection and recognition. Our faces contain a huge amount of information, known as expression of face and it plays an important role for finding out of individual‘s behavior. Facial expression is an efficient way of communication with our emotions. Facial expression recognition refers to the classification of facial features such as happiness, sadness, fear, surprise and anger. It’s a potential input for AI based system to detect and recognize a human and his emotional state. Based on face detection and recognition, we implement an effective Automated Attendance Management System, emotion based Music player and changing Wallpaper. Our Attendance Management system takes spontaneously attendance of students by detecting and recognizing of their faces. We use face API for detecting faces. Our music playing and wallpaper changing system can play songs fitting to our mood and changing our desktop wallpaper to happy images if we’re sad. If we’re angry it may change it to calming images.

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TABLE OF CONTENTS

LIST OF FIGURES

FIGURES **PAGE NO**

LIST OF TABLES

TABLES **PAGE NO**

CHAPTER 1

INTRODUCTION

1.1 Introduction

The face is the feature of all emotions and we restlessly read facial expressions to understand what others are feeling. A person is necessarily identified by face and emotion can be detected and recognized by the expression of face. In our project, we detect and recognize faces, using this principle we build model of Automated Student Attendance System. AAMS is the advancement that why we replacing traditional attendance marking activity.

In our country, every school, college and university takes student's attendance as student's observation or for counseling. Student attendance is very significant for improving student's academic performance like if a student has poor attendance his/her academic result or retention will generally become poor. Thus attendance of students are being recorded or maintained by faculty of schools, colleges and universities. But there are some drawbacks by taken traditional attendance. For proper arrangement we build our project which is provided by student's face detection and recognition.

Facial expression analysis is the most effective way to detect human emotion. In this project, we also proposed an approach for playing music and change the wallpaper for personal computer based on recognizing emotions through facial expressions displayed in live video streams. Facial expression recognition refers to the classification of facial features such as happiness, sadness, fear, disgust, surprise and anger. To extract this type of feature we detect faces in front of a webcam we build own dataset according to facial expression and corresponding HAAR classifiers are used. Then we make a playlist based on emotion and user interest and also build a model of the changing wallpaper in such a way that it will play songs fitting to our mood and changing our desktop wallpaper to happy images if we're sad. If we're angry it may change it to calming images.

1.2 Motivation

Image processing plays a unique role in the advent of technological advancements. For this advancement people start to use smart devices like, video surveillance camera, web camera and many other smart devices. And at present for image processing is very easy for available data collection for which we can proper utilize face detection and make new innovative applications.

The main motivation to build our project comes, education system has been upgraded day by day, but some traditional system are not upgrading like attendance system which is taken by roll calling by teachers in a sheet. For this we lose class time, extra manpower to manage attendance system.

Our existing music player system only play user's mixed playlist songs therefore, user's need to skip songs to listen his favorite songs based on his/her mood.

1.3 Objectives

In The primary goal of our project is to design, implement and evaluate a system using different learning techniques. This type of goal will be achieved through the following objectives:

1. We will be using existing techniques in related areas as building blocks to analyze our system.
2. This system consists of many features, each of which is responsible for one task. At first, we need to analysis the related work and decide the overall architecture of our system, i.e. how many modules it has, the responsibility of each of them and how they should interact with each other.
3. Implement and test different techniques for each module and find the best method by comparing accuracy, speed, and robustness.
4. Focus on the classifier which is the core of a recognition system, trying to design new algorithms which hopefully have better performance compared to an existing system.

Some other goal of our system given below:

Prepare a database of students: Preparing a database of all students with their relevant information, such as name, id, face image etc.

Security: The most discussed secondary goal of accuracy is security. While often thought of as its own goal, security is simply a means to accuracy.

Accuracy and precision: We want our system handling to accurately report to the students and users so we try to highly provide this application accuracy and precision.

Reliability: When you create an application it must be reliable for the people if people cannot trust your application people cannot want to use your application. So we will try to develop one application which is reliable for the people.

1.4 Expected Outcomes

This system will play a vital role in human interaction. It will help to create a significant correlation between social intelligence and emotional intelligence. AAM system will provide higher efficiency, less other staffs interaction and consumes teacher affords. Emotion based music player and changing wallpaper system will be a great opportunity for music listeners which reduce the searching time and unnecessary computational time, with better accuracy and efficiency. It will provide best playlist according their mood which will help user to setup their mental situation and create refreshment in their mind and produce their working energy.

1.5 Report Layout

The entire project is composed six chapters. In the report layout section all the chapter is summarized. Discuss the summarized below:

Chapter 1 gives an introduction about our project and its motivation. We also discuss our project objectives and expected outcomes.

Chapter 2 it will provide background about this kind of application and covers extensive literature reviews of related works of the project and discussion of the problem and challenges of the system.

Chapter3 gives an overview of the system architecture and talks about the methodologies of all features of our project. Dataset development and concept of system implementations are also discussed in this chapter. In this chapter we highlight the implementation requirements.

Chapter 4 provides test result of our system. The screen shots of the output of different features are given and cover the presentation of dataset analysis and interpretation of system result.

Chapter 5 discussed about the conclusion and future scope or possible development of our project work.

CHAPTER 2

BACKGROUND

2.1 Introduction

Face is another medium for expressing the feelings of human's mind. Generally, we express our emotions by voice but these emotions mainly bloom on our face. Since 19th century, facial expression analysis has been most active subject for researching and identifying human behavior. Suwaet al [1] in 1978, introduced the first automatic facial expression recognition system to the mankind. Tracking the motion of 20 identified spots on an image sequence for analyzing facial expressions was the first ambition by this system. Since then, various computer systems have been made for understanding and human communication achieved a long road using this natural form of the system where a lot of work has been done in this domain.

Facial Action Coding System was introduced and developed for measuring facial expressions by analysis muscle contraction and changes in the face appearance also in 1978 by Ekman et al [2]. An Action Unit (AU) is noted for contractions of muscles action. For detect facial expression changes the system has 46 AUs and for eye gaze direction and head orientation it is connected with 12 AUS. Ekman theorized that joy, sadness, anger, fear, disgust and surprise these are six basic emotion expressions which are universal. This system motivation was to help psychologists for face behavior analysis.

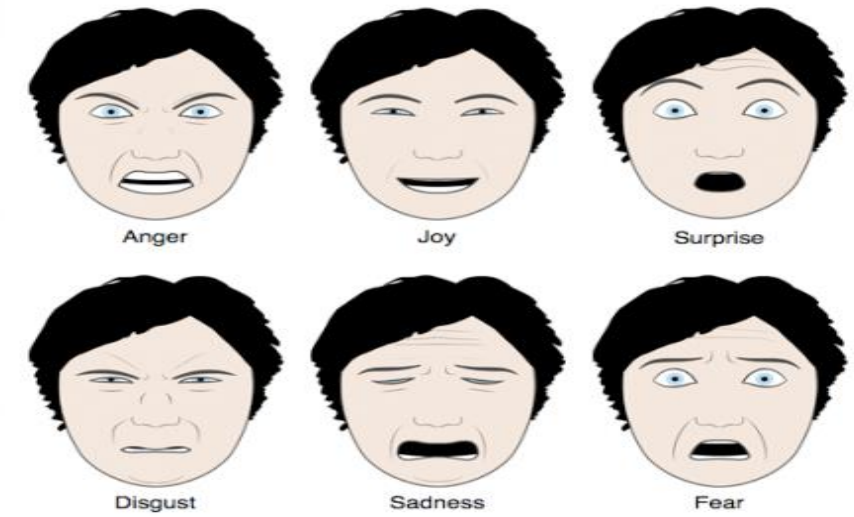


Figure 1.1: Six universal emotions [3]

2.2 Related Works

2.2.1 Facial Expression Recognition

There have been several expression recognition approaches developed and a full survey can be found in [4], [5]. Related work of expression recognition approaches that are given below:

In [6], the authors approach are called Boosted Deep Belief Network (BDBN). This approach has three learning stages that are feature learning, feature selection and classifier construction. The BDBN focus on the six basic expressions that were conducted using two public databases of static images. Cohn-Kanade [7] and JAFFE [8] gained an accuracy of 96.7% and 68.0% respectively. The online recognition is calculated in function of the weak classifiers and time required to train the network about 8 days. There have seven classifiers for each expression. The online recognition time is 0.21s and for each expression it.

In [9], the authors perform a more study using Local Binary Patterns. They try to find compare and combine different machine learning techniques such as Linear Discriminant Analysis, Support Vector Machine, linear programming and template matching to recognize facial expressions. They also study to analyze the impact of image resolution in the accuracy result and geometric features do not handle low resolution images. The accuracy rate in their work is 95.1% using SVM and LBP in the CK database. The training time and the online recognition time don't mentioned by the authors.

2.2.2 Automated Attendance Management System Based on Face Recognition

Fingerprint based attendance system [10] is a portable system that consists of fingerprint device. This device passed among the students during lecture time without the instructor's intervention in the class. Using finger attendance has been taken. This system is error-free and fool-proof for marking the attendance of students in the class. The main problem with the device is that students may be distracted during lecture time for the passing of the device.

RFID based system [11] is one of the automated attendance management systems in which every student has RIFD tag type ID card and this id card has been placed on the card reader to record their attendance. This card reader gets attendance to the students and records it on the database and RS232 devices used for connection purpose. This system is

very risky because using RIFD tag type ID any unauthorized person can access on the Organization.

Face recognition smart attendance system [12] which is faster and more reliable all of the processes. The problem in this approach is this system can detect and recognize frontal of the face and don't recognize in the poor light.

2.2.3 Emotion Based Music Player

There have been several methods of face detection and recognition and audio features from an audio signal. But there have very few methods that can make playlist easily based on facial expression. Some of which try to describe below:

Brain Computer Interface (BCI) [13] is a system that proposed mobile multimedia controller. EEG hardware uses in this system. There mostly need man power to continue the multimedia. This system is very costly and cognitive detection algorithm also used in the system. This algorithm also set in the mobile that's why EEG signal have been monitored by EEG machines and then recognized the user's mind.

In [14], the author uses voice/speech, using that emotion can be recognized. If the system is set up in the open weather then noise will have the effect on the performance of the system. Voice activity detection algorithm has been used in this system which can detect the speech clearly that comes from the user input.

In [15], the author uses Electroencephalography (EEG) signals, using that emotion can be detected. Our brain is the main part of our body. Every activity has been controlled by the brain and this activity can be recorded using EEG. The signal comes from our brain neurons. EEG signal uses for find real facial expression. EEG signal work with seven emotions.

To extract Facial features and audio features from an audio signal numerous approaches have been built but for emotion based music playlist are in less number and this system is very complex and memory requirement high for using the sensor, which gives a lesser accuracy in generation of a playlist.

Our system resolves the drawbacks by avoiding the employment of any additional hardware, design an automated emotion based music player for the generation customized playlist which gives high efficiency.

A very useful 2-dimenesional (Stress v/s energy) model plotted on two axes with emotions which is depicted by a 2-dimensional co-ordinate system and that is lying on

either 2 axes or the 4 quadrants formed by the 2-dimensional plot is proposed by Thayer [16].

Jung Hyun Kim [17] tested and analyzed tags of music mood and A-V values from a total 20 subjects, the analysis results classified the A-V plane into 8 regions using k-means clustering algorithm.

In [18], the author uses Correlation Method (EEG), which knows as nearest neighbor method. Actually this method gives score between two types of similar images and also converts the images into column vectors.

The author used PCA algorithm [19] [20] for facial expression and to classify this expression for an individual face from [21] [22]. Using this facial expression we can play a song from the music playlist.

Most of the facial expressions depend on size and shape of the facial parts such as eyes, lip, mouth, eyebrows, nose etc. Geometric and Appearance Based Methods [23] [24] also follow in this process. This method also uses characteristics point on the face for classifying the expressions some shape models [25] [26].

2.3 Comparative Studies

Some Authors paper work and their proposed system, why our system is better than their system are given below in summarized:

Table 2.1 shows the comparative studies between our system and existing system.

Types of system	Another System	Our System
Brain Computer Interface (BCI) [7]	i) EEG hardware need. ii) Need manpower to continue the multimedia. ii) Hardware is costly and huge.	i) Software base. ii) Don't need manpower. iii) Don't need any types of hardware.
Voice/Speech Recognizer [8]	i) Surrounding noise can affect the performance of the system. ii) Voice activity detection algorithm has been integrated for reduce noise.	i) Noise can't affect our system. ii) Don't need any types of integrated hardware and software.
Electroencephalography (EEG) [9]	i) This system uses our brain signal to find facial expression.	i) Our system uses Universal Dataset to find facial expression.
Face recognition smart attendance system [23]	i) This system can't detect and recognize side views of the face. ii) This system can't detect a face from the far distance. iii) Poor light and lower resolution of images can depend on the recognition.	i) Our system designed for side views of images which gives better results. ii) Our proposed system detects a face from the far distance. iii) Our system recognized properly in poor light and works on lower resolution of an input image.
RFID based system [11]	i) Using RFID tag type ID card the unauthorized person can enter into the organization.	i) Our system is risk-free and more secure.
Finger print based attendance system [10]	i) This system has portable fingerprint device. ii) It may distract the attention of the students.	i) Our system doesn't need any types of portable devices. ii) Our system doesn't affect the attention of the students.

2.4 Scope of the Problem

- Face recognition algorithms with openCV and python.
- Image processing using python.
- Working with Cognitive face API using python.
- Accessing MS Excel spreadsheet in python using openpyxl.

2.5 Challenges

- To collect data and create a dataset.
- Ensure system higher accuracy.
- To ensure the system will predict all facial expression and task.
- Find out algorithm for processing Data.
- Ensure security for all type of user and students.
- Ensure that the attendance will work properly.
- Ensure that avoid the fake attendance.
- Process of each dataset and image information for human interpretation.
- Preparing of image data for transmission, storage and representation for system perception.

CHAPTER 3

METHODOLOGY

3.1 Development Approach for face detection

Facial recognition is now easier procedure than ever. There are three steps to facial recognition, which are similar to the steps that our brains follow for recognizing faces. The system architecture is as shown in figure 3.1. These steps are:

Data Gathering: Gather faces data of the persons we want to identify.

Train the Recognizer: Feed that face data and respective names of each face to the recognizer so that it can learn.

Recognition: Feed new faces of that people and see if the face recognizer trained recognizes them.

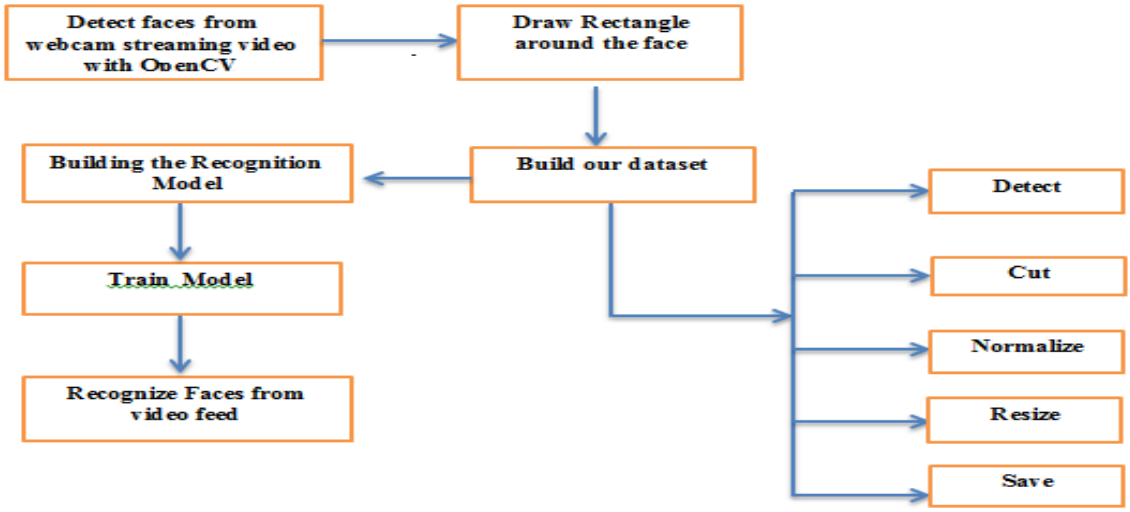


Figure 3.1: Proposed Face detection and recognition framework

3.1.1 Prepare Training Data for Face recognition

If we use more training image then the system gives more accuracy. Being thorough with this principle is important because it is the only way for training a face recognizer so it can learn the different 'faces' of the same person for example: with glasses, without glasses, laughing, sad, happy, crying, with a beard, without a beard, etc.

Figure 3.2 shows the procedure of creating dataset.

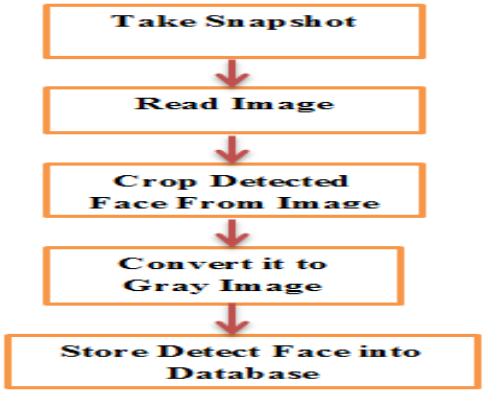


Figure 3.2: procedure of creating dataset

3.2 Automated Attendance Management System Based on Face Recognition Using Cognitive Face API

The model consists of a camera that captures the images of the classroom and sends it to the Face Detection and Recognition (using face API) modules and then the attendance is marked on the database server. This is shown in the block diagram in figure 3.3. At the time of add student templates of face images and information of individual students are stored in the Face database. All the faces are detected from the input image and the face API compares them one by one with the face database. If any face is recognized the attendance is marked on excel sheet. A timetable module is also attached to the system which automatically gets the date and time.

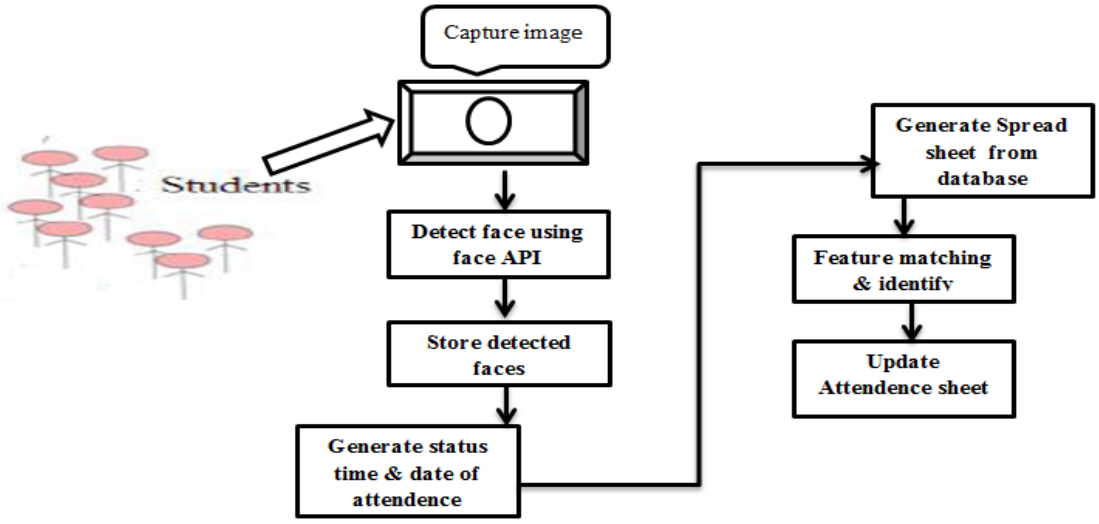


Figure 3.3: Proposed Automatic Attendance framework

3.2.1 Add Student Module

Information about the student's such as their names, id store in the database. Then the system takes almost 20 photos of corresponding student and store image in image dataset. Using face API an id is generated to the corresponding student and create a group then all face of each student added to the record. Figure 3.4 shows how this module works.

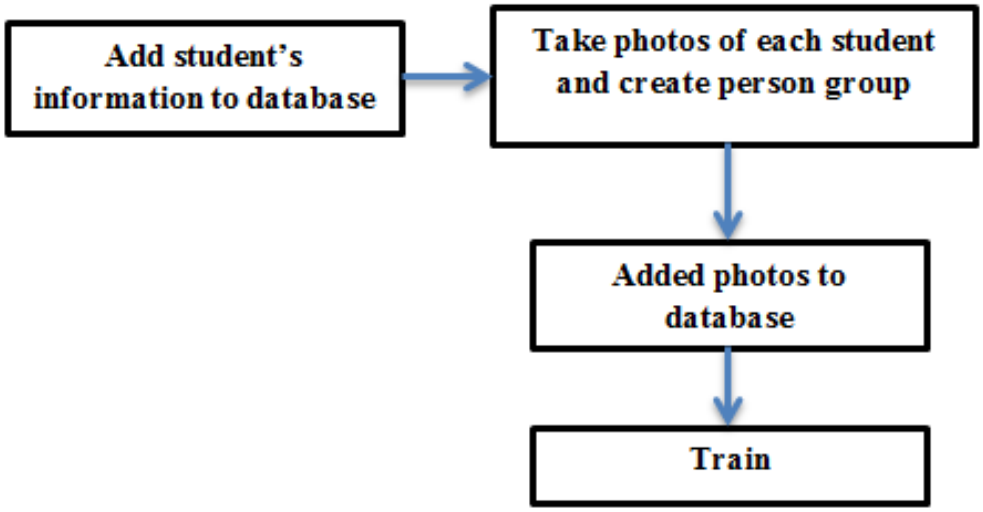


Figure 3.4: Add student information and face module

3.3 Development Approach for Music playing and Wallpaper changing system based on Facial Expression

Our proposed system framework is as shown in figure 3.5. The proposed system is based on face recognition algorithm. When a person starts using his/her personal computer and if our system process is running then Detecting his/her face on the webcam then the face image is captured and pre-processed for further processing. The system takes some images of user's image and updates the emotion model over time. The user must be given facial expression according to particular emotions to create the model. As not more than one person can enter in the system if more than one person in front of webcam then the system can find emotion but the main problem is the system can't play songs for multiple emotions. The user must build another model playlist of songs and wallpaper model and trained all model.

The system detects emotion on user's face then it will play songs fitting to user's mood and changing the desktop wallpaper. In term of changing the wallpaper, it takes a value from the user that indicates the wallpaper changing time interval.

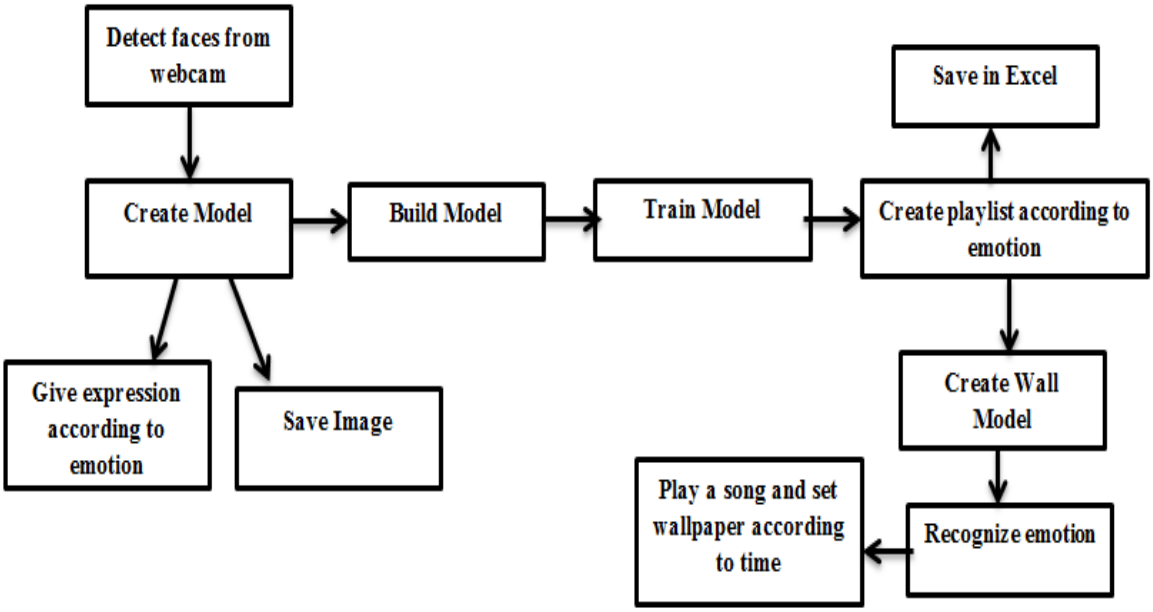


Figure 3.5: Proposed diagram model for Emotion Awareness Music Player and changing Wallpaper based on emotion

3.3.1 Detecting User's Face on the Webcam & Processing the Face for Building Emotion Dataset

Face detection is the most important part of this project. For detecting human face Haar classifier cascades first be trained. To train this classifier, PCA algorithm and Haar feature must be implemented. We will use trained HAAR cascade classifier with openCV. We can get it from OpenCV [7] library called 'haarcascade_frontalface_default.xml'. This XML produce the best result from testing. It can detect faces in a certain condition such as facing camera directly. It gives better accuracy of the recognizer and requires less training data.

Using this classifier, face is detected from the webcam stream and crop the face and convert the image to grayscale to improve detection speed and accuracy. Figure 3.6 shows the procedure of face detection and processing the face image.

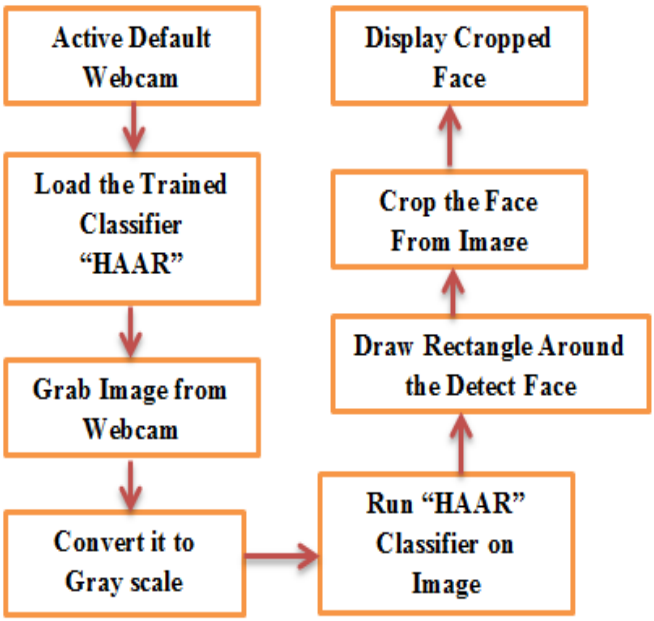


Figure 3.6: Block diagram of face detection & processing face image

Using this principle, we build emotion dataset and detect particular emotion figure 3.7 shows the block diagram of creating emotion dataset.

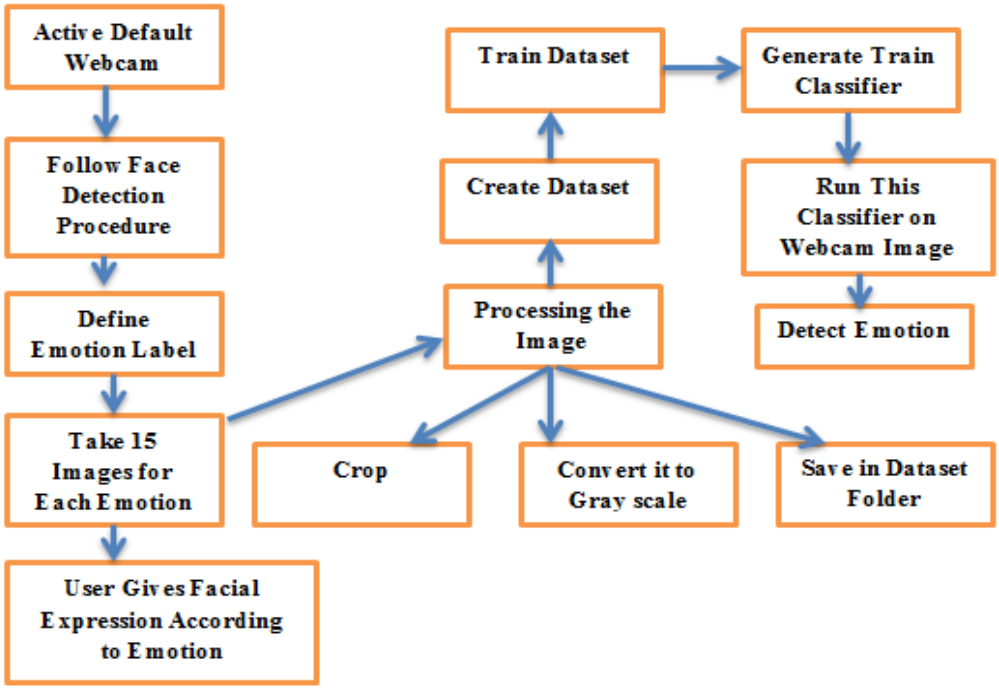


Figure 3.7: Block diagram of creating emotion dataset.

To create dataset user must give facial expression in webcam streaming according to the particular emotion. Then train the model and system will generate a trained XML file.

3.4 Data collection Procedure

To implement our system, we need huge amount of data. For attendance system we need each student information and about 20 face image to build dataset. For recognize facial expression we use universal dataset and emotion awareness music player we need device user facial expression for each particular emotion. We collect all the data and image with the help of three volunteers. For more accuracy we can increase the number of training images but with a compromise in the speed of calculation.

3.5 System Requirements

This section covered the requirements analysis. It's the most important because of it shows how the requirements are interacted with the system. It focuses on the business processes that are taking place and how these requirements can be fulfilled more efficiently to accomplish the project.

3.5.1 Hardware Requirements

1. A standalone computer needs to be installed in the class room where the system is to be deployed.
2. A camera must be positioned in the classroom to obtain the image and Secondary memory to store all the images and database.

3.5.2 Software requirements & necessary tools

- Python Version 2.7.13
- Windows XP or higher.
- Ubuntu 16.x.x or higher.
- Pycharm.
- Notepad++.
- SQLite database tools.

3.5.3 Necessary libraries

OpenCV: Open CV (Open source computer vision) is a library of programming functions based on real-time computer vision. C++ is the implementation language of this library. The JavaCV library is derived from OpenCV using this we can easily implement face detection algorithm. Face detection is important as it will classify only if a face is present. Expression recognition is also done using this classification method.
We can create a dataset, processing dataset and trained dataset using some pre-defined function of this library.

NumPy: NumPy is a useful lib of python and it supports large, multi-dimensional arrays, and matrices with a large collection of high-level mathematical functions to operate on arrays.
Matplotlib: Matplotlib is a plotting lib of python and it is an extension of NumPy normally works on numeric mathematics.
Openpyxl: Openpyxl is a useful lib of python for reading and writing in Excel xlsx, xlsm, xltx, xltm files.

Dlib: Dlib is a useful cross-platform lib and c++ toolkit that contains machine learning tools and algorithm for creating complex application to solve real world problems.

Cognitive Face API: This API can detect multiple faces and return a graphical rectangular box it also verifies two faces belong to the same person. We use this API to implement attendance system.

3.6 System Implementation and Dataset Development

3.6.1 Face recognition from webcam stream

The process of face recognition from webcam stream involves following steps :

1. Read image from webcam stream which we want to identify.
2. Detect faces from webcam stream and draw a rectangle box around the face.
3. Using recognizer method to match with the stored dataset of images.
4. Matching will be performed with each image one by one and matching percentage with each image in database is calculated.
5. Whose matching percentage is highest that image label will be returned as recognized face.

Training dataset is the most important topic in project. Dataset is the set of images which will be used to train our system. Our dataset contains 20 images of each respectively.

Each person has an individual dataset shown Figure 3.8. Each time we train our system with each person's images. All the images are in Gray scale mode and all are in JPEG format. Every image are in same resolution. All the images are captured by laptop webcam.

Figure 3.8: Example of the training dataset.

In openCv lib there are some face recognizer methods:

- EigenFaces
- FisherFaces
- Local Binary Patterns Histograms (LBPH)

We use all the method but give more priority in Eigen Face Recognizer.

Eigen Faces considers the fact that not all parts of a face are important or useful for facial recognition. When we look at someone, we actually recognize that person with his distinctive features, such as eyes, nose, cheeks, or forehead and how they vary from one another. In this sense, we focus on areas of maximum change. For example, eyes in the nose, there is a significant change and goes from nose to mouth. When we look at different faces, confront them by looking at these areas because, using the maximum variation between the faces, we help distinguish faces from each other. That way, it works like Eigen Faces Recognizer. Look at all the practices of all people and try to extract relevant and useful components and throw away the rest. These important features are called major components. Eigen Faces Recognizer is trained by extracting the principal components, but also provides an overview of what it belongs to. Then, we introduce a new image into the algorithm; repeat the same process as follows:

1. Extract the principal components from the new picture.
2. Compare those features with the list of elements stored during training.
3. Find the ones with the best match.
4. Return the 'person' label associated with that best match component.

3.7 Real-Time Expression Recognition from Video

We combined the face detection and expression recognition into a system that operates on live digital video in real time. Face detection operates at 24 frames/second in 320x240 images on a 3 GHz Pentium IV. The expression recognition step operates in less than 10 msec. Figure 3.9 shows the sample face expression images from the Cohn–Kanade database.

3.7.1 Facial Expression Data

In an experiment, facial expression system had been trained and tested On CK+ datasets. This experimental datasets consist of 100 students where 15% were African Americans, 15% were African Americans, 65% were women and 3% were Asian and their age range between 18 to 30 years. Camera directly takes in front of the students and videos were recorded in S-video analog using a frontal camera. This experiment tries to perform a series of 23 facial expressions. Real faces are displayed as a neutral face. Image sequences were digitized into 640 by 480-pixel matrices with 8-bit. Image sequences work with grayscale values. For our survey, we take 313 sequences of images from the data set which based on six fundamental feelings were labeled. 1 to 6 emotions came from 90 students. For training images first and last frames were used and testing generates to new subjects. Later trained classifiers were later applied to the sequence.

Figure 3.9: The sample face expression images from the Cohn–Kanade database

3.8 Automated Attendance Management System Based on Face Recognition Using Cognitive Face API

3.8.1 System Pre-Requisites

The first step is implementing this system is to create database of all registered student. We have to collect necessary information about student then store it in a database.
In Attendance system, we created a module named add student. This module works as follow:

1. Information about the student such as name, id are store in database.
2. Then the system takes almost 20 photos of corresponding student and applies dlib classifier to detect face then store the detected face image in image dataset of that student.
3. Then the system creates a person group of each student images and generate face id and store it on database.
4. Then trained all database and student image dataset.

Figure 3.10 shows student information database that given below:

	ID	Name	Roll	personID
	Filter	Filter	Filter	Filter
1	80	Protik hosen	141-15-3380	1611070a-d...
2	16	Nuruzzaman	141-15-3375	ae9acbe8-8...
3	2	md a adil	141-15-3214	8e7c38a1-c...
4	27	sanaur raha...	141-15-3362	d9b43cd2-2...
5	32	sajal khan	141-15-3379	547e0a7d-c...
6	14	rawfun islam	141-15-3235	dc710e73-3...
7	9	Asadur	141-15-3186	2e5b1c60-0...
8	38	Kamrul	141-15-3333	1f8da088-c...
9	50	Karim	141-15-3381	1e6fa410-c...
10	37	Rahim	141-15-3382	edc2a60c-e...

Figure 3.10: Student information database

Figure 3.11 shows all student image dataset folder and one student image dataset as an example.

Figure 3.11: Student face image dataset

3.8.2 Capture Image for Give Attendance

We take an image of the classroom in such way that faces of all students are captured efficiently. This image is used for further processing of our system. We used our mobile camera with a resolution of 1360 X 760. For more accurate processing of a larger classroom, we need to use camera with higher resolution.

3.8.3 Face Detection and Cropping

An input image is passed through identify module. Then this module detects faces (Face API) in the input image and crop detected faces and store. Face API detect all the faces clearly visible in captured image in classroom.

3.8.4 Get Status and Update Attendance

All the faces are cropped from the input image and the face API compares them one by one with the face database. If any face is recognized the attendance is marked on excel sheet. A module is also attached to the system which automatically gets the date and time. After identifying all faces the system generates an attendance excel sheet. For update excel sheet index we use openpyxl library.

3.9 Music playing system and Wallpaper changing system based on facial expression.

3.9.1 Emotion Dataset

In emotion dataset, we keep image for train the system. We use 20 images of each particular emotion of user to create database. Initially all the images were color images webcam stream then all images converted to gray scale. The train images were stored in according to a specific emotion folder. The images of dataset without any modification are shown in the figure 3.12.

Figure 3.12: Emotion dataset

3.9.2 Create Playlist and Emotion links

Organize particular emotion based songs to play create a playlist in .m3u file format and set the emotion based playlist on an excel sheet. Figure 3.13 shows the playlist .m3u file format.

```
#EXTM3U
F:\music\1.mp3
F:\music\2.mp3
F:\music\3.mp3
F:\music\4.mp3
F:\music\5.mp3
F:\music\6.mp3
F:\music\7.mp3
F:\music\music.mp3
```

Figure 3.13: Playlist file.

Figure 3.14 shows the emotions links file on an excel sheet.

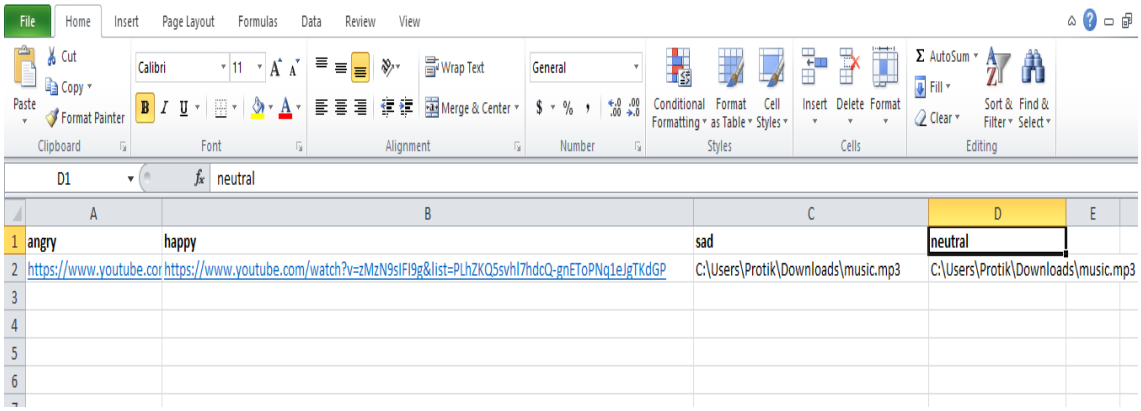


Figure 3.14: Excel sheet.

3.9.3 Emotion Extraction Module

Using emotion model actual emotion on user's face can be detected. The model trained for a single person so this work is much better when it used to that same person. Emotion can be detected using facial features comparison.

3.9.4 Select Proper Music and Wallpaper Based on Detected Emotion

When the system detects the emotion then it picks a proper playlist for the user and executes the playlist. In order to change the wallpaper, it adds timer function that indicates changing wallpaper time interval.

CHAPTER 4

EXPRIMENTAL RESULT AND DISCUSSION

In this section, we tested our all features for face detection & facial expression recognition. We tested all features using test images and web cam streaming in real-time. The screen shots of the output of different features are given in this chapter.

4.1 Face detection and Recognition

Figure 4.1 shows the face detection and recognition module interface and read image from webcam then crop it and convert it to gray scale, dataset creation procedure and recognition procedure.

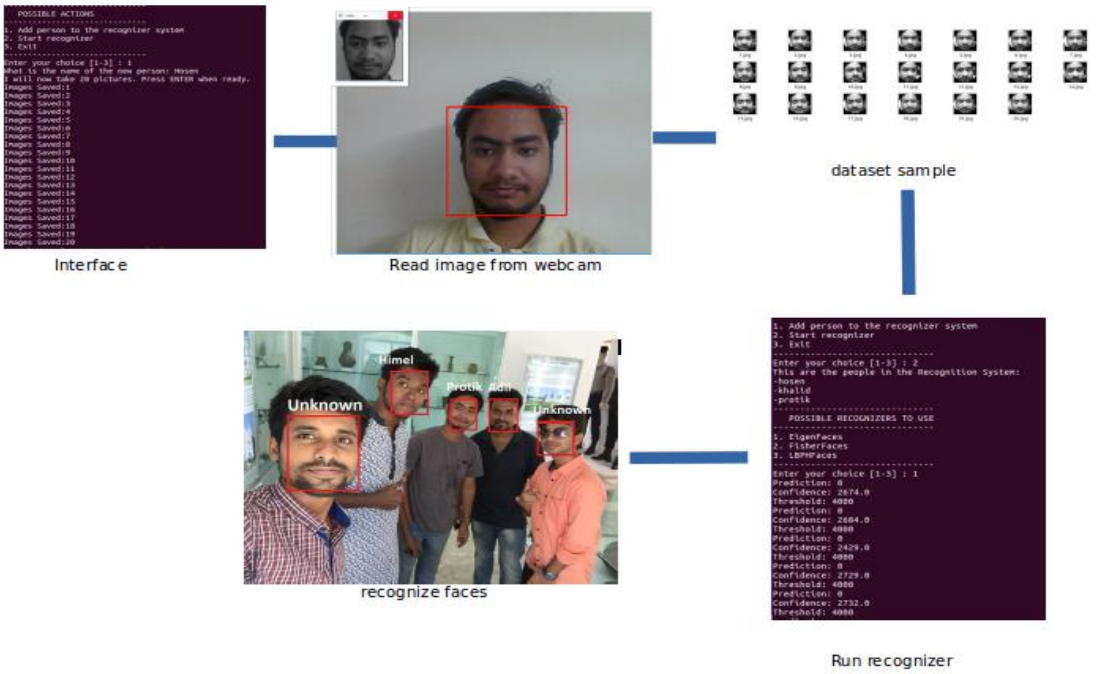
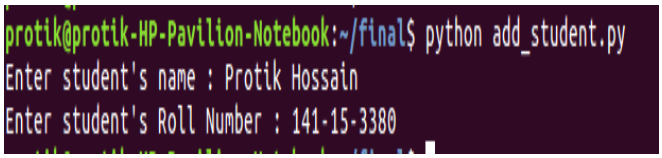


Figure 4.1: Face detection and recognition procedure

4.2 Attendance system

4.2.1 Add student module

We create a database of the enrolled students which is stored in the student database.



80	protik hossain	141-15-3380	9ac36ffc-29...
5	khalid	1501cs05	088640af-9...
7	md a adil	1501CS07	64110087-c...
6	himel	1501CS06	6d8837ed-8...

Figure 4.2: student information store in database

4.2.2 Face detect, crop image and save into folder

In this section, faces are detected and all detected faces are marked by rectangular box. After the detection of all faces from the test image next step is to cropping of each detected faces and store in a folder. Figure 4.3 shows the detected faces of the test image.

Figure 4.3: Capturing of the classroom image and face detection

Figure 4.4 shows the all cropped faces from test image that are given below:

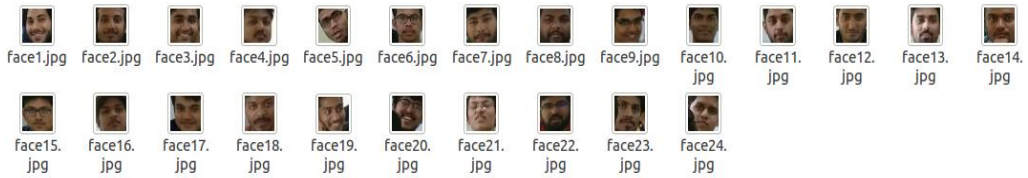


Figure 4.4: Cropped faces

4.2.3 Face recognition and update attendance

The cropped face images which are detected and stored in a folder. Instead of storing complete image only store the face image. Next step is face recognition this can be done by cropping the detected face and compare with the student face dataset. If any face is recognized the attendance is marked on excel sheet. Figure 4.5 shows the attendance excel sheet.

1	Roll Number	Name	23_03_17
2			
3	1501CS02	Abdul mohaimin	
4	1501CS04	Rawfun islan	1
5	1501CS05	Protik hosen	1
6	1501CS09	Nuruzzanma	1
7	1501CS10	Md a adil	1
8	1501CS11	kamrul	1
9	1501CS13	masud	
10	1501CS14	Rudro	1

Figure 4.5: Output obtained in the excel format

4.3 Facial expression recognition & replace emotion with emoji

In this section, we use CK+ dataset for emotion recognition. Using this dataset we recognize our emotion and replace the emotion with emoji. Figure 4.6 shows the demonstration of this feature.

Figure 4.6:.Replace emotion with emoji

4.4 Emotion based music player

In this section, we use our own emotion dataset for detect emotion then play song according to emotion playlist that store in an excel sheet. Figure 4.7 shows the demonstration of this feature.

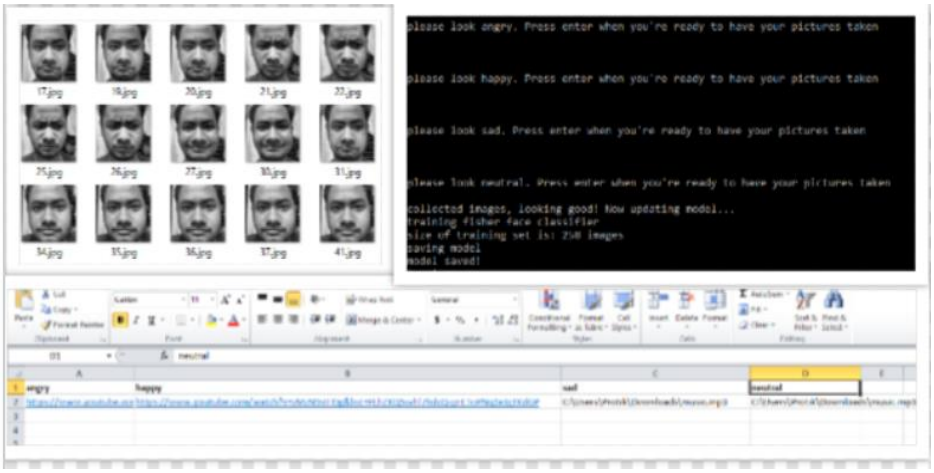


Figure 4.7:.Buid dataset model and emotion links

4.5 Descriptive Analysis

This section will cover the presentation of dataset analysis and interpretation of system result. The dataset analysis and interpretation were based on project output. Analysis of all dataset represents the system accuracy.

4.5.1 Face detection

Table 4.1 shows the accuracy details of face detection.

Test Case 1	Person Present in Webcam Stream	Detected Face	Fail to Detect	Accuracy
Case 1	3	3	0	100%
Case 2	5	4	1	83%
Case 3	6	5	1	83%

The above Table 1 indicates that there were total 14 person faces for input. This module can detect 12 faces. The following Figure 4.8 shows the graph of table 4.1

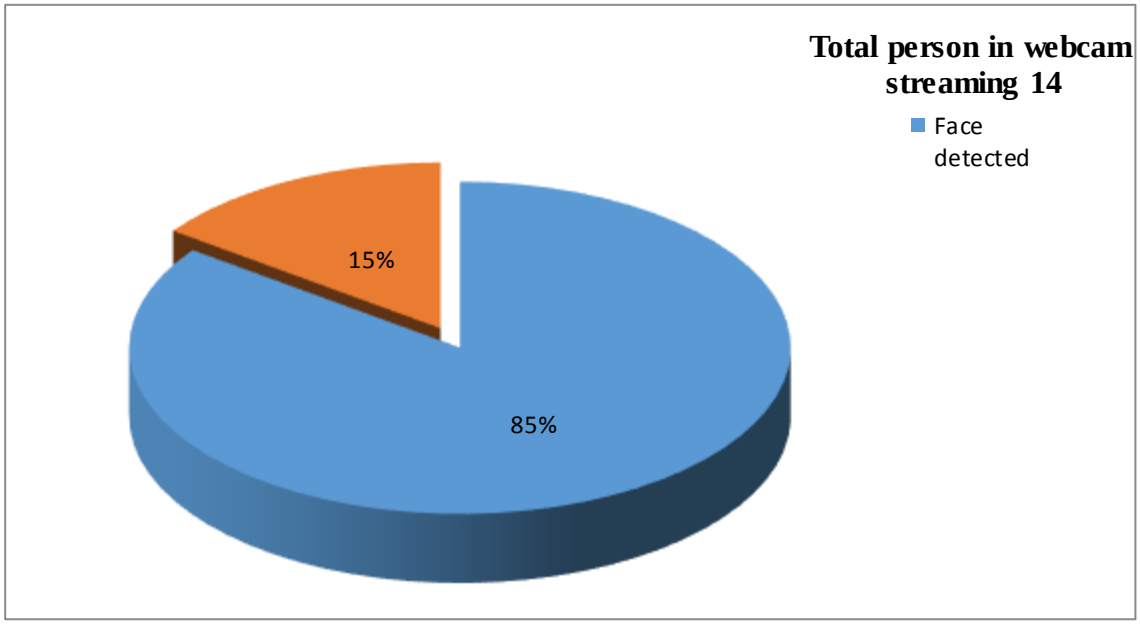


Figure 4.8: Accuracy graph of face detection.

4.5.2 Face Recognition –Trained person

Table 4.2 shows the accuracy details of face recognition of trained person.

Test Case	Person Present in Webcam Stream	Detected Face	Recognize	Accuracy
Case 1	3	3	3	100%
Case 2	5	4	4	80%
Case 3	7	6	4	57%

The above Table 4.2 indicates that there were total 15 person faces for input. This module can detect 13 faces and recognize 11 faces. The following figure 4.9 shows the graph of table 4.2

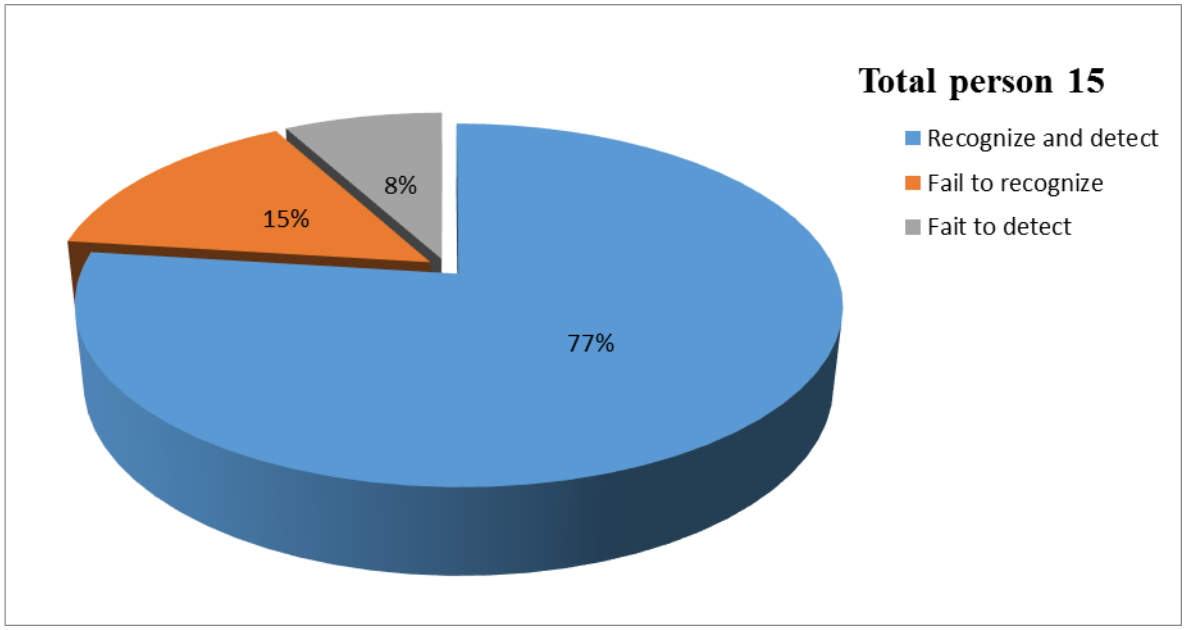


Figure 4.9: Accuracy graph of face recognition – trained person.

4.5.3 Face Recognition –Person independent

Table 4.3 shows the accuracy details of face recognition of combined person (known and unknown).

Test Case	Known	Unknown	Successfully Recognize (Train)	Successfully Recognize (Unknown)	Accuracy
Case 1	4	1	4	1	100%
Case 2	6	2	4	1	50%

The above Table 4.3 indicates that there were total 13 person faces for input. This module can recognize 8 trained person face and identify 2 people as unknown. The following figure 4.10 shows the graph of table 4.3

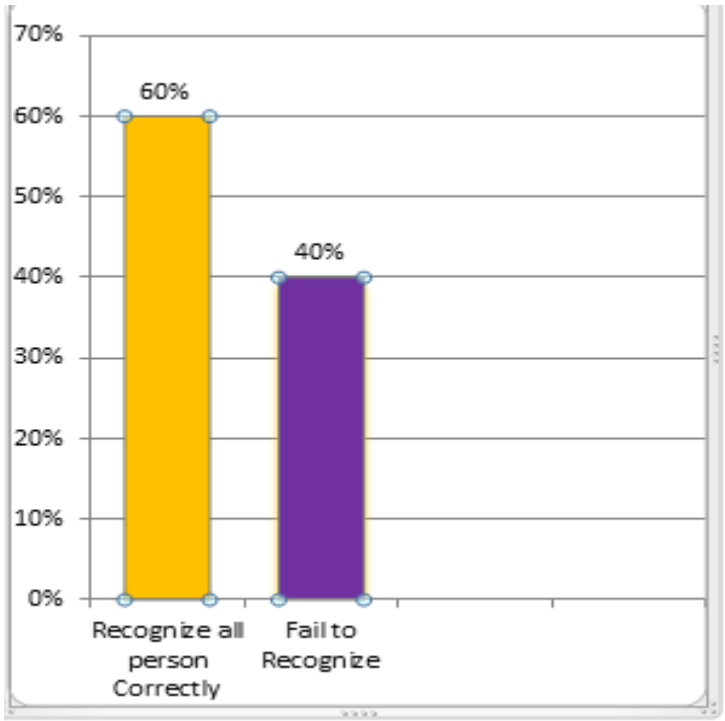


Figure 4.10: Accuracy graph of face recognition – Person independent.

4.5.4 Attendance system

4.5.4.1 Face Detection using Face API

Table 4.4 shows the accuracy details of face detection using face API.

Test Case	Person Present in Test Image	Detected Face	No Face Detected by API	Accuracy
Case 1	10	10	0	100%
Case 2	20	18	2	90%
Case 3	35	29	6	83%

The above Table 4.4 indicates that we have taken total 3 images that contain total 65 of different person's faces for input. Face API can detect 57 faces. The following figure 4.11 shows the graph of table 4.4

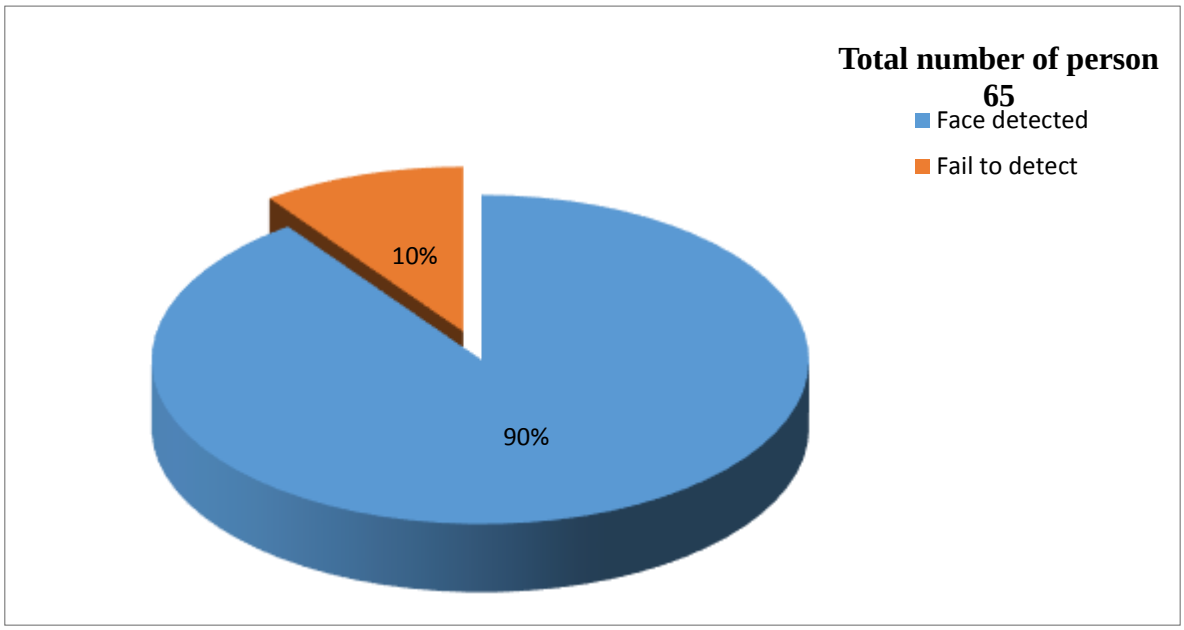


Figure 4.11: Accuracy graph of face detection using Face API.

Table 4.5 shows the accuracy details of attendance system.

Image Name	Present	Detected	Recognized	Unknown	No face detected by api	Percentage recognized
test1.jpg	24	19	18	0	1	75.00%
test2.jpg	24	22	20	0	2	83.33%
test3.jpg	20	17	15	1	1	75.00%
test4.jpg	24	23	23	0	0	95.83%
test5.jpg	23	23	20	2	1	86.95%
test6.jpg	18	18	16	2	0	88.88%
test7.jpg	24	24	23	0	0	95.83%

We tested it on a class filled with 24 students at different part of the classroom and it marks the attendeanc of all of them. The following figure 4.12 shows the graph of Table 4.5

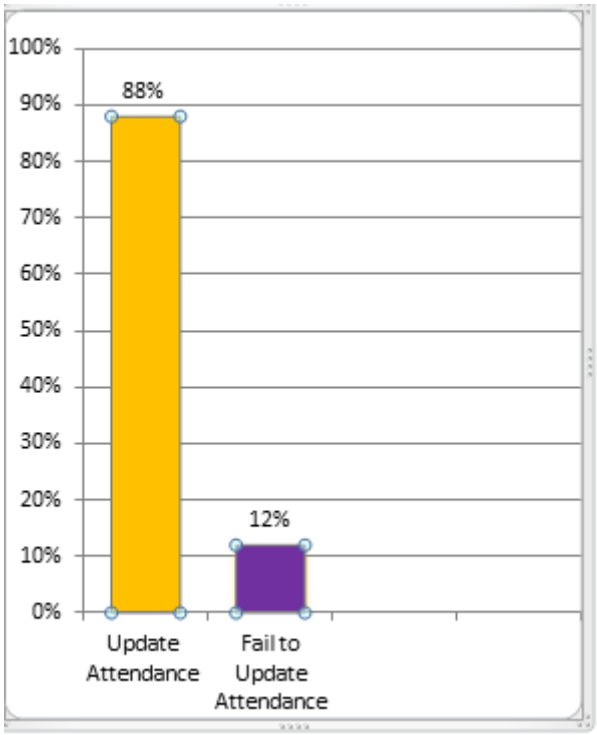


Figure 4.12: Accuracy graph of Attendance system using Face API.

4.5.5 Emotion Detection from Facial Expression (Music playing and Wallpaper changing system)

The proposed system is tested against built in camera. Happy, neutral, sad, angry are the perticular emotions in this module.

4.5.5.1 Working with Different Categories of Emotions

We tested 20 times for happy emotion. User builds his own dataset according to emotions. This module successfully detected the happy emotion on user's face 17 times using his own dataset. So, estimated accuracy for detecting happy emotion is 85%. We tested 10 times for neutral emotion. This module successfully detected the neutral emotion on user's face 7 times. So, estimated accuracy for detecting neutral emotion is 70%.

We tested 10 times for sad emotion. This module successfully detected the sad emotion on user's face 7 times. So, estimated accuracy for detecting sad emotion is 70%.

We tested this module 20 times for angry emotion. This module successfully detected the angry emotion on user's face 17 times. So, estimated accuracy for detecting angry emotion is 85%. Figure 4.13 shows the accuracy graph of different Categories of emotions emotion using personal dataset.

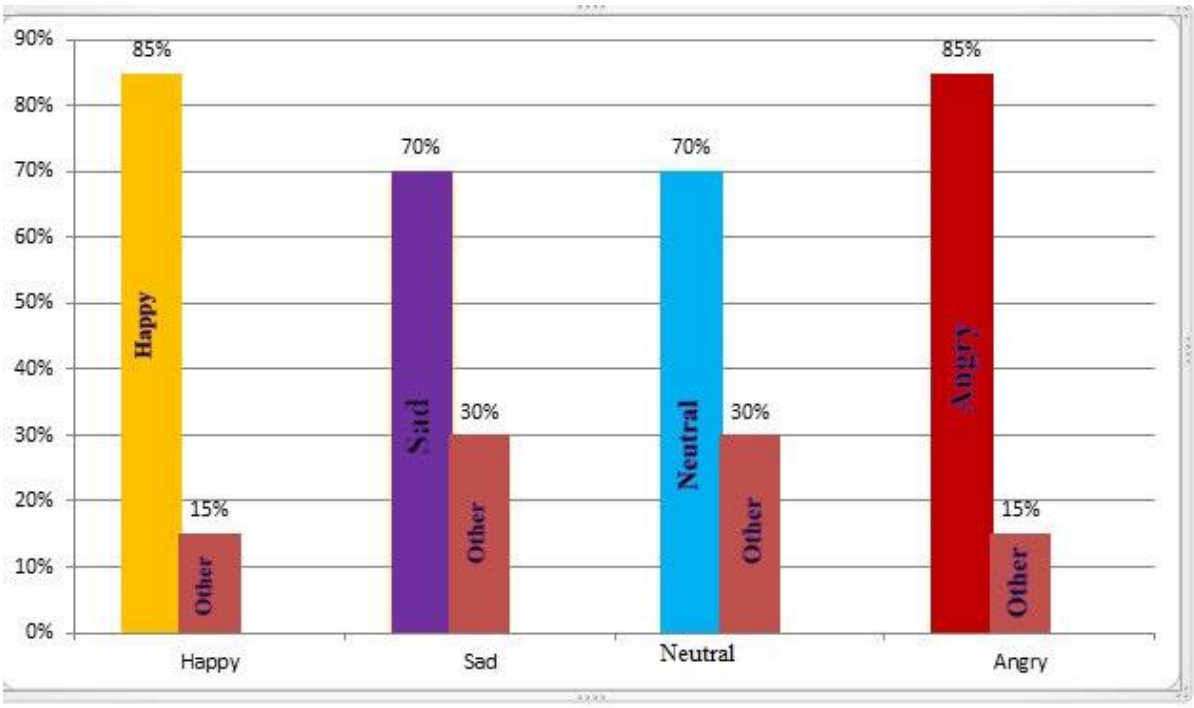


Figure 4.13: Accuracy graph of detecting different categories of emotion

4.5.5.5 Working with CK+ dataset

We use CK+ dataset for detect emotion from facial expression. Table 4.6 shows the estimated accuracy for different emotions.

Table 4.6 shows, estimated accuracy for Different Categories of Emotion.

Emotion	**Accuracy**
Happy	85%
Sad	75%
Neutral	70%
Angry	80%

4.5.6 Overall Analysis

After the analysis of each feature, we can say that our system works properly and the average accuracy up to 85%. Figure 4.17 shows the overall analysis of our project.

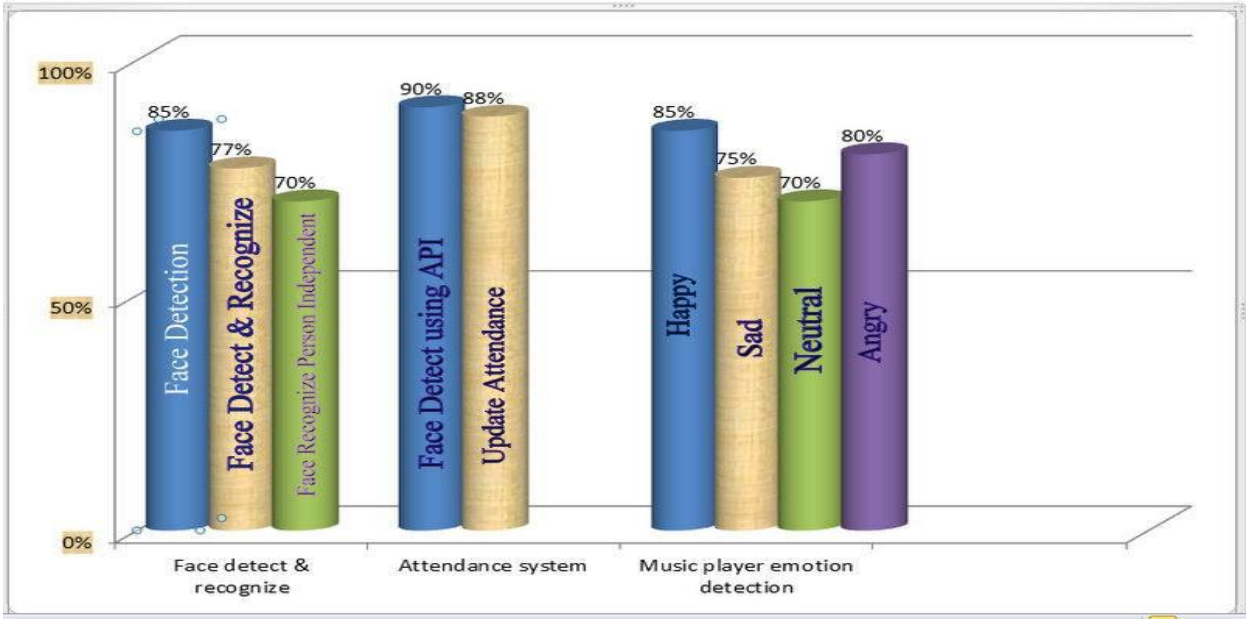


Figure 4.14: Bar chart of our overall analysis.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 Discussion and Conclusion

Experimental results we have shown that our Automated Attendance Systems can be identified and recognized a face even in poor light condition and low resolution. It gives better accuracy. It can be detected and recognized a face from the side view of the face, wear glass and bread in student's face. This system provides us better results to the management of attendance and leaves. Which saves class times and uses of stationery material, and manpower. This system is a great opportunity for music listeners which reduce the searching time and unnecessary computational time, with better accuracy and efficiency. It also acts as the therapy system when our mood is in adversely situation.

5.2 Drawbacks and Limitations

- Our systems only perform on windows based operating system platform.
- To implement we use full logical part but we don't create any graphical user interface.
- That's why our system only running by using Command Prompt.
- For Face detection and recognition wed use free version API key which limitation only 6 month.
- In case of music player and wallpaper changing system, windows based platform and webcam must be needed.
- As we live in a Muslim country most of school, college and varsity girls using pelisse in that case our system fail to detect and recognize their faces.

5.3 Scope for Future Developments

In the future improvement we will be overcome that limitation and also add the newer features with the changing communication technology.

- As our AAMS system only generate and calculate attendance of student's, and we think that it will direct send over email to course teacher.
- As we use android phone available so our future step to build our emotion based music player and wallpaper system in android platform.
- Using this method our further work is face detection based login system.

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