FACE RECOGNITION IN E-ATTENDANCE SYSTEM

BY

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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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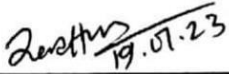**DHAKA, BANGLADESH**

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APPROVAL

This Research Based Project titled **"Face Recognition In E-Attendance System"**, submitted by Moniruzzaman, ID No: 201-15-13918 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 19-01-2023.
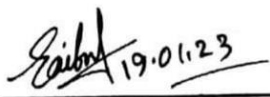
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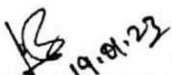Daffodil International University

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Professor Dr. Touhid Bhuiyan, Head, Department of CSE** Daffodil International University. I 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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Finally, I must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

I offer a theoretical explanation for the neurological, perceptual, and cognitive variations that are discernible in the individuation of faces and the categorisation of objects at the entry- and subordinate-levels. After providing an overview of the general theory, we go over some of the behavioral and neural phenomena that can be used to compare face recognition to object recognition. We then present a neurocomputational account of these differences, paying particular attention to the perceptual representation of faces. Finally, we describe and test a few original experiments that test a key assumption of this account. We must choose what we need and figure out how to apply it to our projects from among the items currently included in the Programming OpenCV concept. I want to change the traditional attendant system, like school, college and universities, and also the corporate office here has a lot of employees. So that needed a lot of time using the traditional attendance system, I believed my system took a little time to be there attendant. Specially, it identify the people who are not able to be in thedatabase or unauthorized people, this unknown people can theft in theoffice, and it can protect against theft.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

We are aware that everything in the modern world is based on technology. One of the key things we must modify in order to implement a technology-based attendance system is the general attendance system. Consequently, we are depending more on technology. We aim to create a project that recognizes items, particularly human faces. In After employing a camera, our database which is already limited to a few faces, seeks to match those faces with those in the database. Once our project has identified human faces, it will be able to take action. And after identifying faces, it will talk.

However, the management team can verify and keep track of who actually showed up by using electronic attendance software like Face-App. This system must be installed in accordance with certain technological advancements like face detection and face recognition. Face The computer authentication technology has significantly enhanced the face detection and recognition feature.

1.2 Motivation

One of the frequent issues is the general attendance system, and not knowing the time is the main cause. Both general attendance and RFID-based attendance systems need the same amount of time, and both allow for the possibility of proxy attendance. We made the decision to investigate automatic attendance systems and face area detection in order to decrease proxy attendance and increase accuracy with our system. We suggested a method that compares a test image with our training image after taking a test image. Our technology automatically generates attendance with an accurate date and time, as well as generating these values in an excel sheet, if the test and training images match.

This article's goal is to record video of students, chop it up into frames, link it to a database to verify their presence or absence, then annotate the video to indicate which students participated so that a record may be kept of their participation. In order to address the demand for automated classroom evaluation, an automated class attendance system helps to boost accuracy and speed, finally attaining high real-time accuracy.

1.3 Rationale of the Study

Researchers have studied the fundamentals of image processing, face detection methods, and face recognition systems throughout this major. She then chose the proper methods

for extracting partial facial regions and identifying people after carefully evaluating it. An introduction, a project development strategy, a requirements definition, a technical inquiry, and information on the aforementioned fields are all included in the publication. Last but not least, proper project development processes and project development platforms were chosen, along with appropriate face detection, face recognition, and picture processing algorithms.

The project's objectives are: When it comes to individual portions of the face, there are less distinctive features that aid in individual identification. A facial recognition system will categorize people based on discrete face segmentation elements. This initiative archives the identification of individuals' distinctive features. 2. Improving the local part of the face's feature detection The features of the face segmentation must be extracted using an effective method. 3. Implementation of a strong and effective facial recognition system based on the information gleaned from the study.

1.4 Research Questions

- What are the unresolved issues?

even if openCV is, first and foremost, cost-free. It has certain drawbacks, such as openCV not offering the same ease of use as MATLAB. A flann library is built into OpenCV. When you attempt to use the PCL library with the OpenCV library, this leads to conflict concerns. The main problem with taking pictures of all students is the camera. Additionally, it consistently fails to recognize numerous pupils' faces at once.

- What are the fundamental components of this project?

  -Development of Face Recognition System.
  -Development of Attendance System.

1.4 Expected Output

In order to complete my project, I analyze face photographs and compute eigenfaces, or faces made up of eigenvectors. To determine whether a face is present and to determine its identity, eigenface comparison is utilized. There are five steps in the procedure. The system must first be activated by being fed a set of practice face photos. This is used to define the face space, a collection of like-faced images. Next, it determines an eigenface for each face it encounters. It is possible to establish whether the image being presented is even a face by comparing it to recognized faces and performing some statistical analysis. The algorithm will next decide if it recognizes the face in the image if it is judged to be a face. The optional final stage is for the system to learn to recognize an unfamiliar face if

it is repeatedly observed. A camera is used, with a minimum distance of 50 cm, and the input is the image of the room. The frontal face is taken out of the picture, transformed to grayscale, and then saved. The photos are subjected to an algorithm for component analysis, and the eigenvalues are then saved in an xml file. The frontal face is derived from the video frame that was acquired through the camera when a user requests face recognition. Recalculating the eigenvalue for the test face, it is compared to the closest neighbor's stored information. Due to the issues raised about the techniques used by lecturers to record attendance during lectures, this project is being carried out. This project was initiated by the need to track student attendees using clickers, ID card swipes, and physically writing down names on a piece of paper. This is not intended to disparage the many approaches taken to track student attendance; rather, the goal is to develop a system that can count the number of faces present in a classroom in addition to identifying them.

Additionally, a teacher will be able to tell if a student was being truthful because anyone can use the methods mentioned for keeping track of attendance, but with the face detection and recognition system in place, it will be simple to determine whether or not a student is actually in the classroom. This device will not only enhance classroom management during lectures, but it may also be able to recognize faces to track student attendance. The presence is indicated as "Present" if the Student Id that was retrieved and the Captured Image match, otherwise it is marked as "Absent."

1.5 Project Management and Finance

To acquire digital images by sensing, two factors are necessary.

The first is a physical tool that can detect the energy emitted by the target object.

The second, referred to as a digitizer, is a gadget that changes the physical sensing device's output into digital form.

The digitizer and additional hardware that performs other elementary operations like arithmetic and logical operations make up most specialized image processing gear (ALU). Example: Reducing noise. Sometimes, this category of hardware is referred to as a front end subsystem.

The computer is an image processing system and a general-purpose supercomputer with software that includes specialist modules for image processing that carry out particular tasks. Applications that process images must have mass storage capabilities.

Today's image displays are primarily color TV monitors.

Images can be captured on hard copies using laser printers, film cameras, inkjet printers, and CD-ROM.

1.6 Report Layout

The study of this research is ordered into 4 chapter. Chapter 1 contains an introduction, motivation, and purpose of this research. In chapter 2 I have discussed the previous study on face recognition in e-attendance system. I have presented the literature review in this chapter. I have discussed resources and used methodologies and analysis in chapter 3. Chapter 4 contains experimental outcomes and analysis. In chapter 5 I discussed the impact of this project on the society and environment. Finally, chapter 6 contains a conclusion summary and future scopes.

CHAPTER 2

BACKGROUND

2.1 Preliminaries

The process of extracting facial features using a pattern recognition system is known as face detection. Such prototypes and systems can be developed using MATLAB and OpenCV. I wish to use Opencv for this project. because C was used to develop MATLAB, which was created from java. The computer first interprets the code when it is written and run in MATLAB, converts it to Java, and then ultimately executes the script. Open CV, however, makes use of C/C++ library functions. This gives the computer immediate access to the Python language code, which speeds up execution. In OpenCV outputs, image processing takes up more time and resources than interpretation. Since OpenCV is written in C, it may be used on any machine that supports the language. It is compatible with Linux, Macintosh, and Windows. MATLAB costs a lot more than OpenCV. OpenCV is free, whereas MATLAB costs about $2150. Due to its commercial, single-user license, even the most basic version of MATALAB is pricey. Additionally, OpenCV is available for free thanks to the BSD license. Additionally, OpenCV is available for free thanks to the BSD license. Alignment, feature extraction, and matching are steps in the face recognition process, which is comparable to the generic biometric recognition process used in basic facial biometric systems. There are two basic phases to the facial recognition process. Prior to recognition, there is pre-detection processing that involves face localization, normalization, and alignment, followed by feature extraction and matching procedures.

2.2 Related Works

2.2.1. Paper based attendance

This method has a number of drawbacks, including the fact that data cannot be analyzed because paper records are not uploaded to a central system and that the time required for data gathering decreases both true and false attendance of students at lectures.

2.2.2. RFID based attendance system

The conventional technique of collecting attendance, which involves calling names or signing names on a piece of paper, takes a lot of time, is risky, and is consequently ineffective. The Radio Frequency Identification (RFID)-based attendance system is one approach to solving this issue.

It is possible to utilize this method to record students' attendance in school, college, and university. Compared to the conventional method, it makes the attendance process simpler, faster, and safer because it can individually identify each person based on the type of RFID tag they are wearing. Simply insert your ID card as a student or employee, and the reader will be taken and handled right away. Because the system can capture attendance in real-time, it will be more accurate because the processing time will be noted. The system can save the attendance in a database and be connected to a computer through an RS232 or USB connector.

2.2.3. Android attendance system

Mobile attendance systems are made to cut down on time and effort lost while attending classes and universities. Teaching teachers to attend students on mobile phones benefits schools, colleges, and universities. By using the program, managing attendance data requires a vastly reduced amount of paper.

2.3 Comparative Analysis and Summary

The pupils will be seated in front of a camera, which will then record them as they are doing their work. The teacher and everyone else in the room will also be captured on camera. The information will then be categorised and solved before being transmitted to the disk, where it will then be compared to previously stored information. The result will then be immediately saved in Excel as attendance if the preceding data matches current data.If you use this way, there won't be any issues like there were during the prior participation, which involved phoning in an ID or fingerprint, both of which were time consuming and inefficient. Other attendance systems also waste a significant amount of time. These issues won't arise with my project. By examining the appearance, the algorithm will automatically process and provide the most recent data as attendance.

Whenever my method fails or the electricity goes off. Data will be saved to disk during the entire process as the algorithm analyzes the information it has gathered and provides a suitable solution right away.

2.4 Scope of the Problem

Despite the fact that openCV is mostly free. OpenCV does not offer the same simplicity of use as MATLAB, which is a disadvantage. Owned by OpenCV, the flann library.

When you attempt to use the OpenCV library alongside the PCL library, this leads to conflict concerns. The camera is a major issue when it comes to capturing images of every student. Additionally, it is unable to simultaneously recognize numerous pupils' faces accurately.

2.5 Challenges

The definition of scales of observation that match to the proper ecological scales of species or processes presents a challenge in ecological investigations. As an alternative to pixel-based techniques for scaling ecologically significant units of telemetry data, image segmentation has been suggested. The choice of image object sets has, however, mostly been a subjective one up until now. The variance and geographical dependency of the measured variables (the quantity and range of spatial autocorrelation) are affected by changes in the scale of picture segmentation, and this information can be utilized to choose the right levels of image segmentation. Our goal was to look into how picture segmentation scales the spatial dependence of regression-based predictions of landscape features and see whether these changes could help us decide what segmentation levels are best for a specific application.

In order to evaluate the goodness of fit and geographical dependence of regression predictions of the invasive western juniper's (Juniperus occidentalis) density, we divided the Ikonos picture for southern Idaho (USA) into progressively coarser scales. Scale initially boosted the correlation between juniper density estimations and photographs, but as the scale went coarser, the correlation declined. Regression predictions and residuals typically showed the most spatial dependency on the scales with the highest correlations. When the initial estimates of juniper density were combined by picture objects, the spatial dependency of the estimates varied, and the highest correlation was observed at the point where the spatial dependence started to vary from the initial observations. An easy way to choose the right segmentation levels is to take scaling effects on the spatial dependence of data into consideration. As techniques that eliminate the subjectivity of selection scales are developed, the robustness of ecological analyses will improve.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research Subject and Instrumentation

Need to install all these libraries for python3

- ➢ Pip install cmake
- ➢ Pip install dlib
- ➢ Pip install face-recognition
- ➢ Pip install numpy
- ➢ Pip install opencv-python

To run the java frame need JRE (Java Runtime Environment) the extension of the file is .jar

Then,

- ➢ Video camera- For capture the video
- ➢ Computer
- ➢ facial traits
- ➢ Extractors
- ➢ Face detector- Measures face angles
- ➢ scale
- ➢ Eye localization - Measures location of eyes
- ➢ Face recognizes - *T*raining, database updates, and decision-making

3.2 Data Collection Procedure/Dataset Utilized

The main drawback of the tested attendance procedure is that it performs worse at greater distances from the pupils. In comparison to results for students seated in the back, the findings for students seated in the front are more accurate. Second, the blurring brought on by shaking throughout the photo-taking process may have reduced accuracy rates. Thirdly, in some instances, a student's face may be partially obscured by a student seated in front of him or her, which could make it difficult to successfully identify the student. Given that the classroom images are shot in uncontrolled settings, the lighting and position may significantly impact the accuracy rate. These impacts are minimized by the designed filtering technique.

3.3 Statistical Analysis

The next platform was employed. The cloud server is equipped with a 2.5 GHz, 4-core CPU, 8 GB of RAM, and a 64-bit operating system. In addition to the Viola-Jones face detection technique, OpenCV was used to create the Eigenfaces, Fisherfaces, and LBP face recognition algorithms. the depth and grey-level face pictures' LBP Histogram Sequence (LBPHS). Fisherfaces correspondingly construct the matching linear subspaces. The similarity metric of projected vectors is chosen to be the cosine similarity. The weighted sum rule is used to combine 2D and 3D data. The Equal Error Rate (EER) of this approach, which is significantly lower than the fusion of LBPHS with histogram intersection and that of Fisherfaces with cosine similarity, is only 0.33%, according to the experimental results database, which is available online. Fisherfaces is a strong option for real-time face recognition applications because of its fast prediction time. Local binary patterns, on the other hand, may manage classifier addition, making them suitable for application in dynamic face recognition scenarios.

When we look in the mirror, we can see that our face contains a number of recognizable landmarks that together make up various facial features. These landmarks are referred to as nodal points by software. On a human face, there are around "80 nodal points." This approach utilizes the collection of predefined trainers included in open CV, but if another developer so desires, he or she may easily produce a self-cascade by applying simple code to the compiler. For better understanding, many people choose to prepare a self-cascade.

S. No	Technique	Time consuming	Performance
1	Haar Cascades	It took a lot of time at first, but now that it has been modified, it takes less time.	It is extensively utilized and performs quite well.
2	Cam Shift Algorithm	It is not very time consuming	It does not perform well and costs a lot to purchase.
3	Finding via motion	It is very time consuming	In comparison to any other algorithm, it is not as trustworthy.

Table3.1: Statistical Analysis
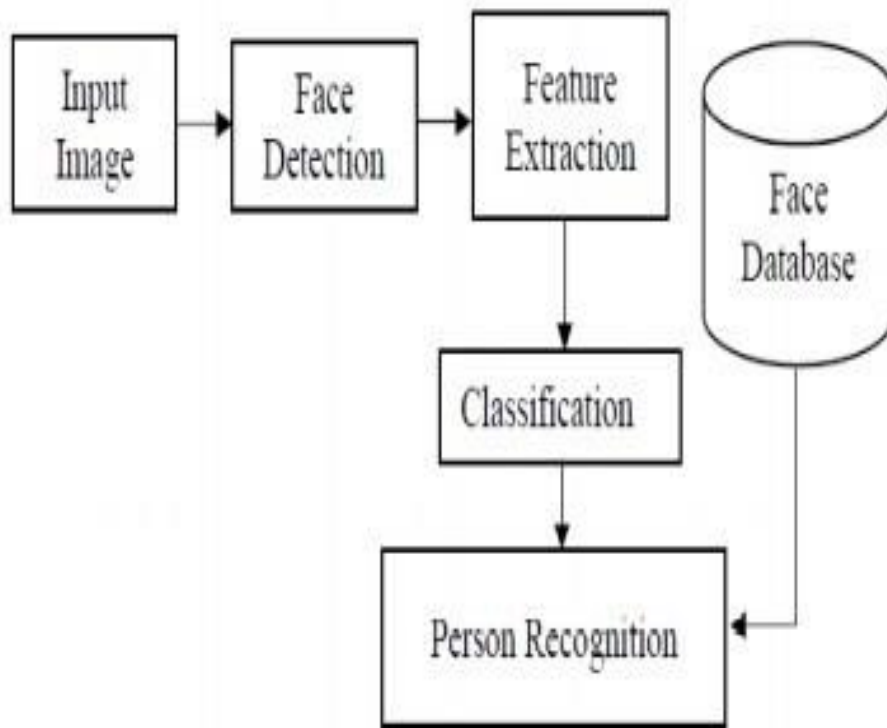
3.4 Proposed Methodology

Block Diagram:

Figure 3.1- Proposed Methodology Block Diagram

Flowchart :

The trained face data is saved, and the discovered faces are identified by comparing them to student IDs. In order to ensure that the system is accurate, face recording is done in real time. This system is incredibly dependent on the state of the camera.
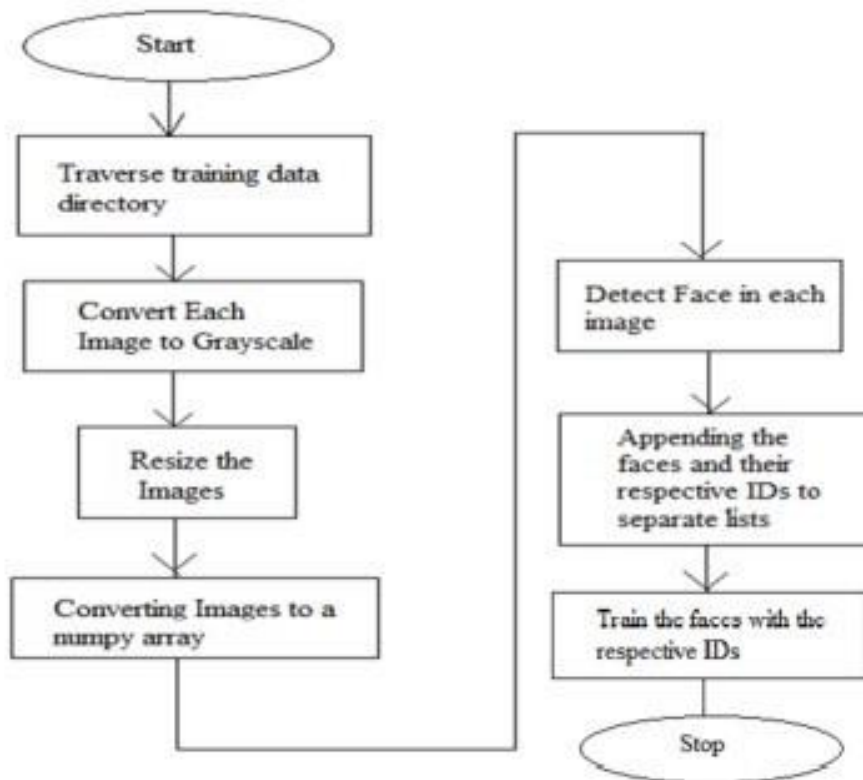
Figure 3.2- Flow Chart of the methodology used for training process

Going to the training data directory is the first step in the training process. Every training data image is turned into a grayscale version. The image's center is chosen, and its surrounding areas are placed in opposition to it. Set it to 1 if the center part's intensity is more than or equal to that of its neighbor; otherwise, leave it at 0. Next, the photos are resized. The dope library's main data structure, a dope array, is then applied to the photos. The faces in the shot are all recognized. The faces are added to separate lists of each face and their corresponding IDs are assigned to them. After that, the faces are trained with the appropriate IDs.

3.5 Implementation Requirements

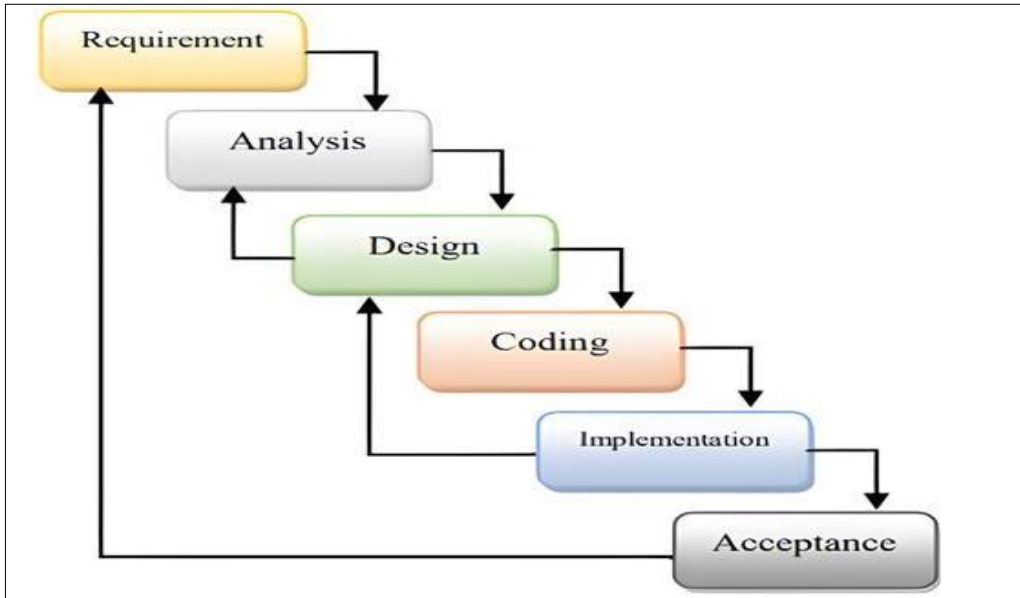We closely resemble the well-known waterfall models in our system, as illustrated below:

Figure3.3 : Waterfall Model

Face recognition is achieved using OpenCV and the basic pipeline used for it is as follows:

A.   Finds face in an image.

B.   Analyses facial features.

C.   Compares against known faces and makes a prediction

MySQL allows to manage easy of databases. The system provides the following functions:

> Name

> Date

> Time

> Attendance: Present/Absent

Excel Sheet is generated when Recognition is completed.

Computer

Visual studio

Processor – i3 – i10

Hard Disk – 5 GB

Camera

Memory – 1-8 GB RAM

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Experimental Setup

- ACQUISITION– It might be as straightforward as receiving a digital image. The primary task entails:
- Scaling

- Color conversion(RGB to Gray or vice-versa)

- IMAGE ENHANCEMENT– It is one of the most straightforward and visually appealing types of image processing; it is also used to draw out some subtle details from an image.

- IMAGE RESTORATION– It addresses image appeal as well, but it is impartial (Restoration is based on mathematical or probabilistic model or image degradation).

- COLOR IMAGE PROCESSING– Digital image processing uses color models that are applicable to both full and pseudo-color picture processing.

- WAVELETS AND MULTI-RESOLUTION PROCESSING– It serves as the basis for varying degrees of visual representation.

- IMAGE COMPRESSION- To carry out this procedure, various functions must be developed. It mostly addresses the size or resolution of images.

- MORPHOLOGICAL PROCESSING- It deals with methods for removing visual elements that aid in representing and describing shape.

- SEGMENTATION PROCEDURE- It involves dividing an image into its individual objects or components. In image processing, autonomous segmentation is the most challenging task.

- REPRESENTATION & DESCRIPTION- As a result of the segmentation stage's output, selecting a representation is just one component of the solution for turning raw data into processed data.

- OBJECT DETECTION AND RECOGNITION- It is a procedure that labels an item according to its descriptor.
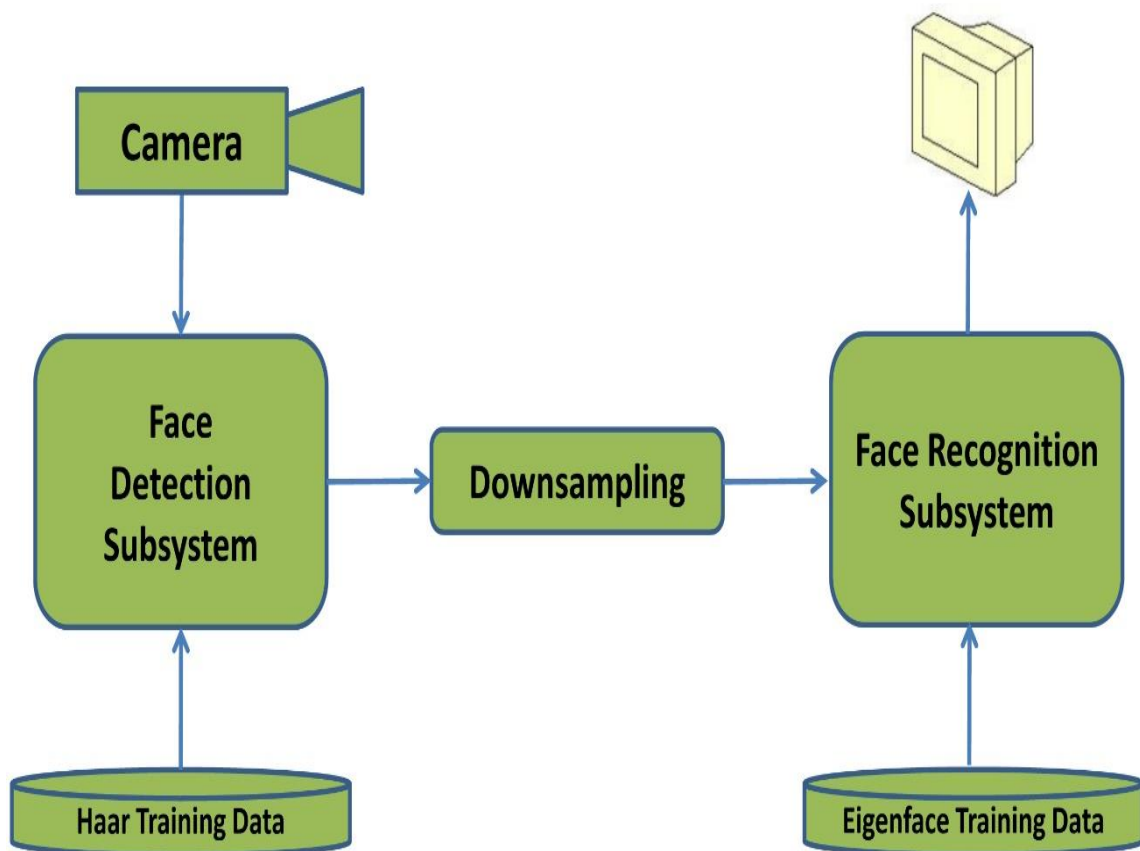
Figure 4.1-Experimental setup

The system will be put into action using these simple, fluid steps:

- The camera sends the drive with the room's footage..

- identifies and extracts face images, saving the face data in an xml file for further use.

- Calculate the Eigen value and Eigen vector of the facial image after learning and training it.

- Recognize faces in photos and match them to face information already present in an xml file.

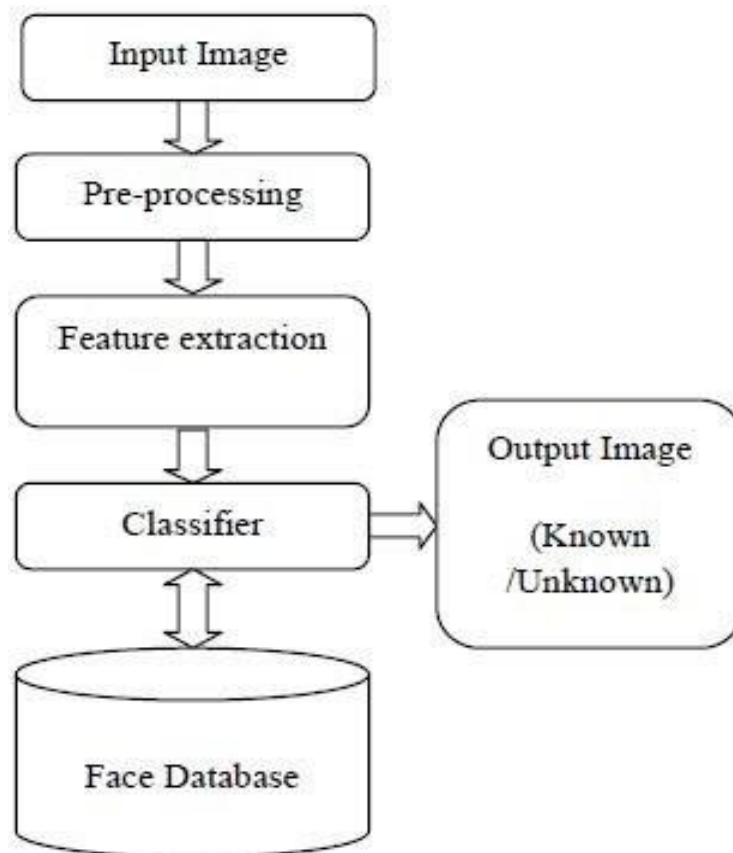- The final product is saved as an excel file with the attendance.

Figure 4.2-Experimental block Diagram

It displays the system architecture. Face recognition software used in the classroom for attendance. The kids are seated in the classroom, where the camera is located. Photographs of students taken by a camera from video frames. an automated face recognition system that tracks a person's identification from a video source to a video frame. We made use of an OpenCV module that could recognize structured photos or confirm every student seated in front of the camera using a database of saved faces. steps for the facial recognition e-attendance system's suggested attendance scheme. A video frame of the entire class is captured by the camera, which is positioned within the classroom at a reasonable distance from the students.

Figure 4.3 : Processing Sample 1

Sample stimuli from the single-feature and whole-face conditions in Tanaka & Farah (1993). When asked to identify one feature, subjects were shown, for instance, the upper pair of noses and asked, "Which is Larry's nose?" In the whole-face condition, participants had to identify which of two faces was Larry out of two that were similar but for one feature that was shown in the face condition. With permission used.
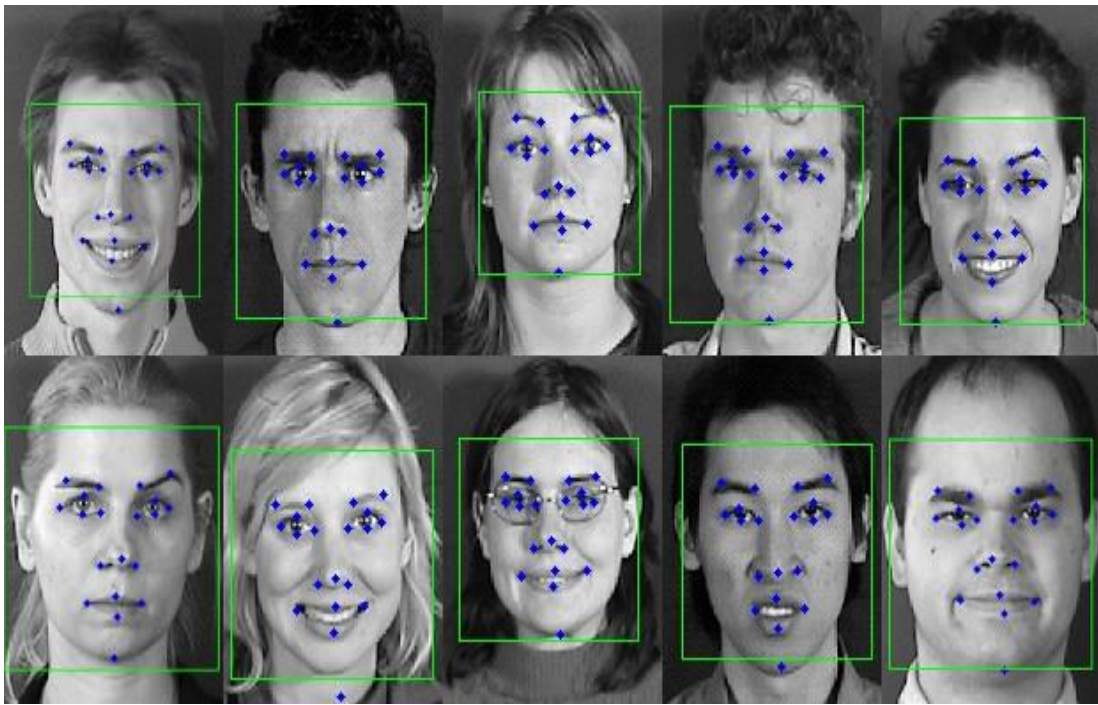
Figure 4.4- Processing Sample 2

Examples from Kalozza, Biederman, and Cooper's (1994) experiment using Lades et al. (1993) lattice deformations placed on various pairs of the same subject's photos. The original image's lattice's position is depicted in the left column (a), and the deformed lattice is presented in the right column (b). Changes in expression, orientation (60), and expression and orientation are depicted in the top, middle, and bottom rows, respectively. When there were varied orientations and expressions, Lades et al(1993) .'s model's measure of similarity was substantially linked with the effectiveness of paired-image matching (Kalocsai et al., 1994).
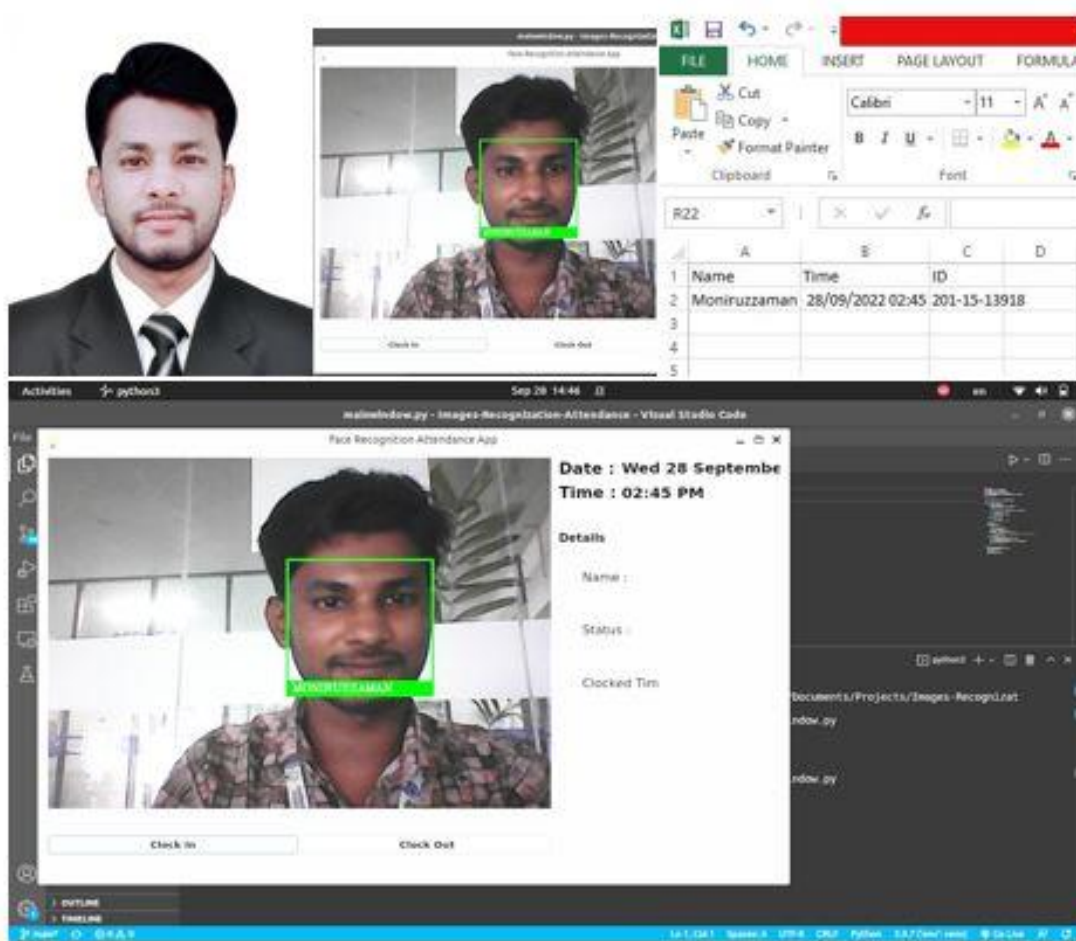
4.2 Experimental Results & Analysis

Figure 4.5 : Final Result

This employee is one of those whose presence or absence in the database is correlated with attendance.This attendance system will work with the camera to verify if someone is present or not.

We implement in there **Linear Searching Algorithm:**

A very straightforward search algorithm is linear search. In this kind of search, each item is sequentially searched through. Each item is examined, and if a match is discovered, that specific item is returned; otherwise, the search is carried out until all the data have been collected.
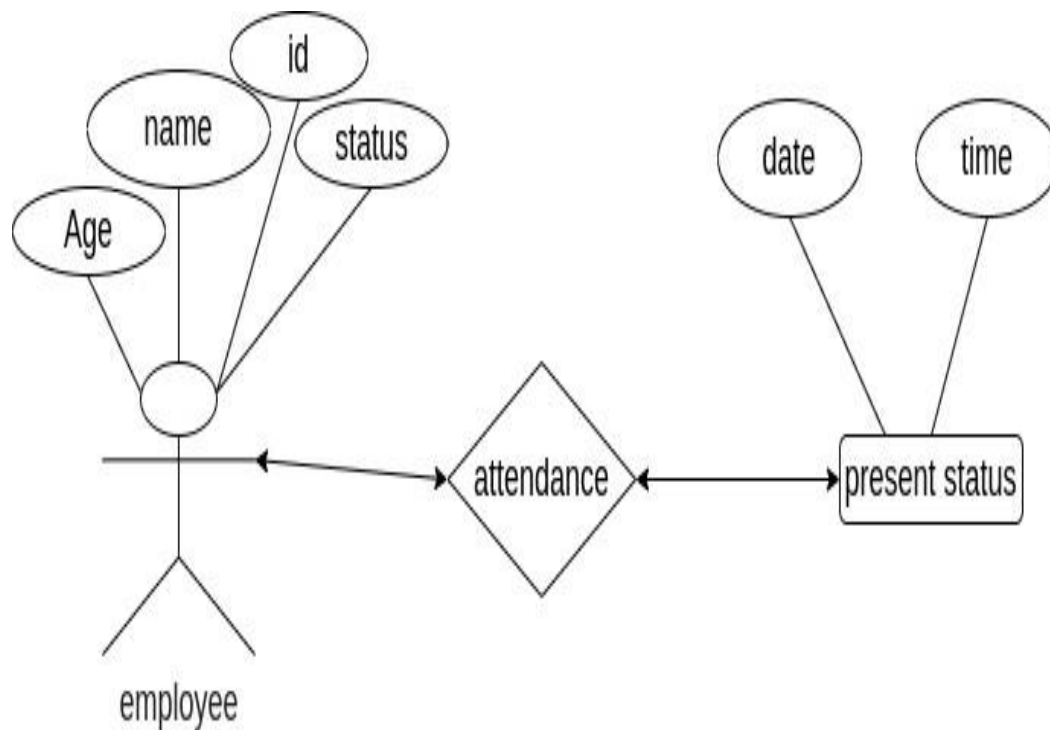
Data Flow Diagram:

Figure 4.6-Attributes of Data flow diagram

Performance testing is often a testing procedure used in software quality assurance to assess how a system performs in terms of responsiveness and stability under a specific workload. Additionally, it can be used to look into, gauge, confirm, or evaluate other system quality characteristics like scalability, dependability, and resource utilization.

Python is the best tool for learning and using machine learning, thus it will work nicely. Our database and methodology need to be updated so that we may search for something that works better.

Maintainability: The Software Maintenance Life Cycle is a software maintenance procedure that is used to apply changes in a software system (SMLC). The problem identification, analysis, design, implementation, system testing, acceptance testing, and delivery phase are the seven steps that make up this life cycle.

4.2 Discussion

The specifics of the course will be covered by a number of instructors each semester. The camera will immediately start participating after sending the information. The face recognition processing window is depicted in the picture. After the system recognizes the registered students, or "unknown" if they are not registered, the attendance is updated in an Excel file with a CSV format, and the names of the absentees are saved. The systems for the particular college.

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

5.1 Impact on Society

We can see on our faces the characteristic marks that make up the various facial features if we look in the mirror. These landmarks are referred to as node points by the software. The average human face has 80 nodules. The system measures the following important aspects: the separation between the eyes, the depth of the eye socket, the width of the nose, chin, jaw, and cheeks.

database creation: Because I chose a biometric-based system, each person must be registered. The biometric feature of each person's face is captured and extracted during this step of database processing, then enhanced using pre-processing techniques and saved in the database.

5.2 Impact on Environment

The widespread use of face/masks in response to the COVID pandemic has started to alter the field of facial recognition technology since various types of masks obscure certain features of the human face. Experts in facial recognition claim that algorithms are typically less accurate when a face is hidden by an obstruction, a camera angle, or a mask since there is less data to compare (WIRED).

5.3 Ethical Aspects

The database of procedures in the London borough of Newham's plan, according to technology critics, fails to identify a few specific offenders and suppress procedures that have been in place for years. According to the police, Newham's automatic facial recognition technology never once picked up a live target.However, it is possible to explain that even while people frequently claim that they are being watched by sophisticated face recognition technology, this worry can only serve to lower crime rates because facial recognition technologies don't actually operate. It serves as the foundation for numerous facial recognition security systems, where the technology itself performs mediocrely but the user's perception of the system performs admirably. Because they are frequently applied in studies that are considerably smaller than necessary for large-scale applications, the approaches are sometimes touted as being almost entirely correct. Facial

recognition generates a list of potential matches because it is not entirely accurate. These potential matches must be examined by a human operator, who will only choose the right match from a list correctly 50% of the time, according to research. As a result, the incorrect suspect gets targeted.

5.4 Sustainability Plan

Image Processing Hardware: Hardware designed specifically for image processing is utilized to process the commands received from image sensors. The outcome is sent to a general-purpose computer.

Image Sensors: Image sensors gather information about the images' amplitude, location, and other characteristics and send it to an image processing device. It addresses the area of the issue.

Computer: The general-purpose computer we use every day is the one that is used in the image processing system.

Image Processing Software: All the techniques and methods utilized in an image processing system are included in the software known as image processing software.

Mass Storage: As photos are processed, their pixels are stored in mass storage.

Hard Copy Device: After processing, the image is saved on the print device. Any external ROM device or a pen are both acceptable.

Image Display: It also includes the monitor or screen used to show the edited photos.

Network: All the aforementioned components of an image processing system are connected by a network.

CHAPTER 6

SUMMARY, CONCLUSION, RECOMMENDATION AND IMPLICATION FOR FUTURE RESEARCH

6.1 Summary of the Study

A camera will be present, and after the pupils have sat in front of it, it will record a video of them. The teacher and everyone else in the room will also be captured on camera. The data will then be transferred to a drive, solved, and categorised, after which the given data and the prior data will be compared. The output will automatically be saved in Excel as attendance if the prior data matches that data.If you use this method, there won't be any issues like there were when attendance was collected by calling an ID or a fingerprint. It was previously observed that fingerprints worked frequently and took up a lot of time. Other attendance systems also waste a lot of time. These issues won't arise with my project. By examining appearance, the algorithm will automatically recycle and provide current data as attendance. Whenever my process fails or the current fails. The algorithm will then review the data it is gathering and provide a prompt resolution. All data will also be permanently kept in the drive.

Figure 5.1- Future study block diagram

6.2 Conclusions

Prior to beginning this project. For practically all organizations, the outdated way of recording attendance has led to numerous issues. There were numerous escapes throughout the procedure, which took a long time and was less effective, creating numerous challenges.

In this work, we offer a facial recognition-based real-time attendance system that is time saving, highly secure, simple to use for automatic time tracking, requires no interaction from agents, is simple to maintain, intelligently integrates, and provides more accurate service. The proposed technology will be able to recognize faces in order to determine presence. Using the face camera, it will identify faces and then recognize them. Once a user has been recognized, their attendance will be calculated, and the attendance record will be updated.

Future recognition levels will be higher, with increased security, dependability, usability, ease of system integration, high levels of privacy, usage of cost-effective, modern technology, and the ability to modify an existing project using an infrared camera interface.

6.3 Implication for Further Study

Thus, facial recognition-based attendance systems and class monitoring systems have shown to be secure and time-efficient. With a higher recognition rate and a lower false positive rate in practical situations, LBPH performs better than algorithms. The existing Raspberry Pi project can be upgraded with an infrared camera interface and used in smart surveillance monitoring security systems. Future work will focus on increasing the identification speed.
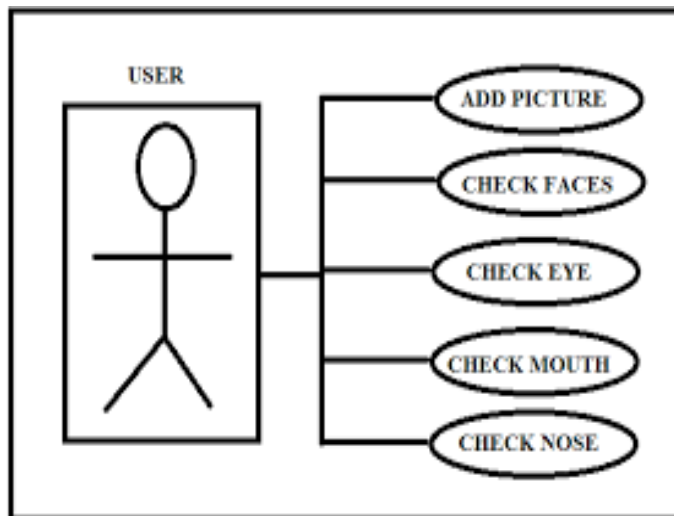
APPENDICES

Figure 5.2 : Admin Role

The ability to check a user's information is only available to super users.

1. Take a picture

2. Verify faces

3. Verify eyes

4. Verify mouth

5. Check my mouth and keep everything current.

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