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Student Attendance System Using Biometric System

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Abstract: Attendance is an essential aspect of learning process in every tertiary institution. Attendance taking in every class is a day to day activity in a tertiary institutions and organisations. The traditional ways of taken the student attendance by signing of papers or calling of students name in the class is also time consuming and unconfident. The contemporary academic procedure of repeating or calling names of student in a class attendance compete a substantial role in eminence of teaches and performance evaluation of the students. The administration of the attendance may also lead to enormous problem if administer manually. This paper intends to design attendance monitoring system using artificial intelligent. To solve the problem of attendance in class, camera will be used for capturing faces of student individually; recognize each student and update the database accordingly. Face geometry algorithm, features invariant and machine learning based methods will be applied to solve the problem. Extraction and pre-processing of face region is conducted for advanced processing. Resizing and extraction of face image involves histogram equalization and pre-processing. The image contrast is improved and clearer, since the image intensity is stretches.

Keywords: Attendance, Face Geometry, Artificial Intelligent, Face Image

1. Introduction

Attendance is an essential aspect of learning process in every tertiary institution, by attending class; students are able to get valuable information from the lecturer, so that the students are able to improve in knowledge and understanding towards a particular field or even some skills [1].

Recently, scientist has automated the innovations that intensify accuracy and saving of labor. However, Attendance System is the advancement can be taken in replacing traditional attendance marking activity.

In an educational organization, attendance is of great significance for the students and the lecturers. Using the traditional method of getting attendance in the lecture room, some problems might occurs such as, time mismanagement (Calling students' Id number or roll number for attendance) these does not wastes time alone, but similarly it entails much energy. Hence installing an automated attendance system will resolve the entire problems [2].

The most common attendance records in most organisations are still manual. There are two common ways for presence record: Lecturers call students one by one and record into attendance paper and Students sign attendance paper on their own. Of the two attendance record approaches, there are several shortcomings, including: calling the students' name one after the other takes a lengthy time, Student can easily falsify their friends' signatures and Attendance record paper can be easily lost if not properly stored and managed.

An automatic attendance marking system by facial recognition using machine learning will be adopted in this paper [3]. This approach will eliminate the hindrance of the physical input of attendance and saves time. This automatic method of attendance will be more efficient, by implementing the electronic, incorporated time and attendance system which results in profit for all aspect in any institution [4].

Machine learning is a process that offers the system with the capacity to acquire and progress from previous experiences with distinct programming not required. Developing computer programs is the core notion of machine learning which can access the data and learn by it. The system training begins with the monitoring of the data. Training the system to absorb spontaneously without human interference is the main aim of machine learning. Depends upon situations the system requires some additional resources

to get trained. Face detection is an application that recognizes human faces into digital images [5].

2. Review of Related Works

This review aims at examining the results available through the distinguished authors relating to the area of this study. Additionally, this study concentrates on limitations of the proposition by those authors and results. Introduction of lecture attendance system using a novel technique named continuous monitoring and automatic student attendance marked using camera, such that it captures the photo of each student in the class, this was conducted by [6]. The system architecture is simplified using double camera properly attached to all the class. One of the cameras captures the student image while the other is a sensor camera used for student seated in the class [7]. More so, it will capture the image of each student and compare the image, faces in the database for perfection of the attendance.

Real-time computing vision algorithms in AAMS were introduced by [8]. It is a non-intrusive system installed camera that snaps any image present in the classroom and comparing the extracted faces from the image of the camera in the system.

More so, it uses machine learning algorithms used for computer vision, Haar Classifier used for training images captured by the camera. Finally, the captured faces will be converted into grayscale for subtraction consideration of the image and transferring the image to the database on the server later for processing.

AAMS using face recognition technique combining with principal component analysis for implementation of the system, using of double libraries Open CV and FLTK was introduced by [9]. Designing of the interface was aided by Open CV support algorithms and FLTK basically. Matching of request and addition of fact to database was conducted.

A smart attendance marking system that combines double algorithms which includes principal component analysis (PCA) and artificial neural network (ANN) was proposed by [10]. The author aim at solving the outdated attendance marking system that could also reduce the time inefficiencies. PCA was implemented; extraction and identification of similar faces are acquired while ANN was used to solve input data. Back propagation was also combined mathematical function in the system. Their result shows different environment can be recognized.

A method which uses Eigen-face and Principal Component Analysis that has the architecture was proposed by [11]. This method uses the following steps. Installing the camera in front to enable capturing the whole face of the student in the classroom. The initial stage after the image has been captured; the image captured was moved into the system as input. Occasionally, the captured image from the camera could come with brightness or darkness which requires to be enhanced, such as transform to gray images. Histogram Normalization which is used in the system to eliminate the contrast of the image is the next step, it is easier to identify when the students sit in the rear row. Median filter can be used to eradicate noise from the image if the camera is high definition, however occasionally it still has noise. Skin classification was implemented; this changes the whole pixel to black excluding the pixel which are near the skin [12]. Proposed International Automatic Attendance Management System which uses Facial Recognition. Face detection is an application that recognizes human faces in digital images. The digital image is self-possessed of picture elements in the form of pixel values. It is an application that is designed for computer vision technology. Automatic Attendance System which uses Facial Recognition Method [13] Deep face recognition is a type of face detection. Deep face recognition uses the CNN algorithm to classify the faces. Deep face recognition uses an open set protocol where the features are extracted into smaller maximal classes. To overcome this problem angular soft max is also called A-soft max.

It is used for neural networks to get variant features. Geometrical loss in A-soft max can strike constrains like hyperspace manifold.

The present attendance system is time-consuming and requires human energy for taking attendance. If attendance is marked manually is manipulated easily. Finally, this application will rectify all the problems. Class Attendance Auto-management based on Deep Learning", Improvements in Education, Humanities and Social Science Researches [14] Instance-based learning is a machine learning algorithm. In this algorithm, the new problem instances will be compared with the dataset that is trained during the training. In instance-based learning, the system will be facing the problem to resolve which instance to be stored in the memory which will be used for the generalization process. The algorithm will store too many instances which results in huge memory instances that slow down the execution speed. To overcome this problem two methods are proposed.

The first method is to survey the existing algorithm which is used to reduce the storage capacity for the instance-based algorithm. And the second method is to propose six reducing algorithms. Counterpart Approach to Attendance and Feedback System using Machine Learning Technique [15]. Face detection is an application that recognizes human faces in digital images. The digital image is self-possessed of picture elements in the form of pixel values.

Facial recognition is a vital role in identifying human faces. This approach currently uses many applications such as human-computer interaction, automatic gate control and video monitoring system. Every Institute uses different type of methods for taking a record of attendance for students who attends the particular class. To overcome the problem face recognition technology using binary histogram pattern Haar cascade and distance based approach which recorded the attendance of the individual students in the class and converts the attendance into a spread sheet. Singular value decomposition takes the input as a matrix format. The input will be taken in a rectangular format. The SVM is mostly used for factorization Using linear algebra. The SVM is used for solving the problems of image processing. The algorithm

provides an illustration of face images in facial recognition. The Eigen-face method uses a grey-scale image but these grey-scale images cannot be used in the SVM algorithm.

3. Research Methodology

This automated attendance management system (AAMS) focuses on face recognition. Firstly, camera will be used for capturing the face of individually student; it will recognize each student and update the attendance in the database. An algorithm for face detection that enhances the routine of performance in face recognition system was used efficiently. Face geometry based method is the proposed algorithms, features invariant method and machine learning based methods.

Extraction and pre-processing of face region is conducted for advanced processing. Resizing and extraction of face image involves histogram equalization and pre-processing. The image contrast is improved and clearer, since the image intensity stretches. The proposed system will be designed using Microsoft Visual studio as frontend. Microsoft SQL Server backend and a Data Manipulating Language (SQL).

4. Approaches of Facial Recognition

The two leading methods to the face recognition difficulty are Geometric (feature based) and photometric (view based). Researcher attention has been properly drowned to face recognition, such that several diverse algorithms were developed and three of them have been well studied in face recognition literature.

Recognition algorithms can be divided into two main methods:

1. Geometrics:

This approach is centered on geometrical relationship amid facial landmarks, otherwise known as the spatial outline of facial structures. It means that the core geometrical structures of the face like the nose, mouth and eyes are located first then the face is categorized on the basis of several geometrical angles and distances among features.

2. Photometric stereos:

In order to recover the form of any object from a number of images captured under different lighting circumstances, this approach is used. A gradient map is used to define the shape of the recovered object is defined by, this include an array of surface normal [16].

Common recognition algorithms include:

1. Linear Discriminate Analysis;
2. Elastic Bunch Graph Matching via the Fisher-face algorithm;
3. Principal Component Analysis via Eigen-faces (PCA).
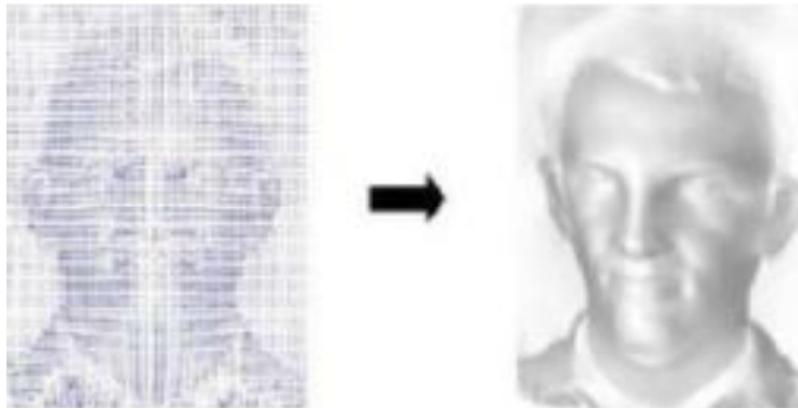

Figure 1. Photometric stereo image.
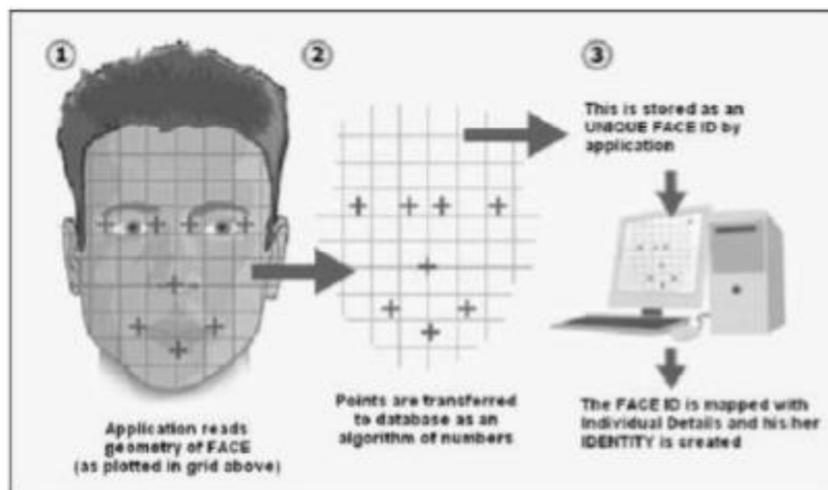
Figure 2. Geometric Facial Recognition.

5. Reason for Chosen Face Recognition over Other Biometric

There are number reasons for choose face recognition. This includes the following:

1. It requires no physical interaction on behalf of the user.
2. It is accurate and allows for high enrolment and verification rates.
3. It does not require an expert to interpret the comparison result.
4. It can use your existing hardware infrastructure, existing cameras' and image capture Devices will work with no problems.
5. It is the only biometric that allow you to perform passive identification in a one to.

Many environments (e.g.: identifying a terrorist in a busy Airport terminal.

Table 1. *Types of Face recognition.*

System Type	Advantages	Disadvantages
RFID	Simple	Fraudalent
Finger print	Accurate	Time comsuming
Voice	Accurate	Less accurate
RIS	Accurate	Privacy invasion

Source: Chin Howard (2018).

Table 2. *Advantages & Disadvantages of Face Detection Methods.*

Face Detention Method	Advantages	Disadvantages
Viola Jones Algorithm	1.High Detention 2. High Accuracy	1. Long training time 2. Limited head pose 3. Not able to detect dark face
Local Binary pattern	1.Simple computation 2. High toleraceagainst the monotonic and illumination change	1. Only used for binary and grey image 2. Overall performance is inaccurate compared to Viola jones
Ada boost algorithm (part of Viola Jones algorithm)	Need not to have any prior knowledgeabout face structure	The result highly depend on the training data and affected the weak classified
SMQT features and SNOW classified Method	1.Capable to deal with lighting problem in object detention 2. Efficient in computation	The region contain very small to grey value regions will be misindentified as face
Neutral NEtwork	High accuracy if only in large size of image were trained	1.Detention process is slow and computation is complex 2. Overall is weaker than Viola Jones Algorith

Source: Chin Howard (2018).

5.1. Components of Face Recognition Systems

An automated mechanism that scans and captures a digital or an analog image of a living personal characteristics. (enrollment module).

Another entity which handles compression, processing, storage and compression of the captured data with stored data (database).

The third interfaces with the application system (identification module).
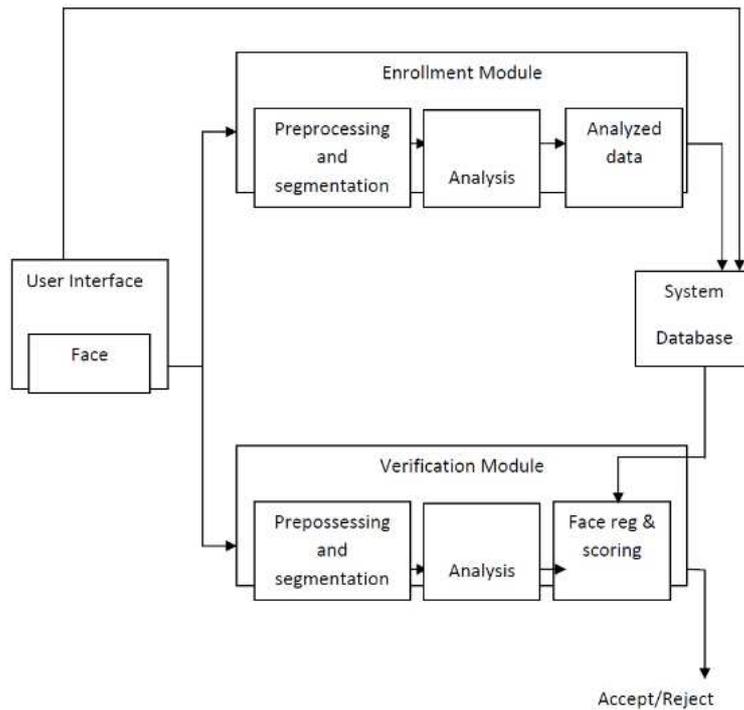
Figure 3. *Component of the system.*
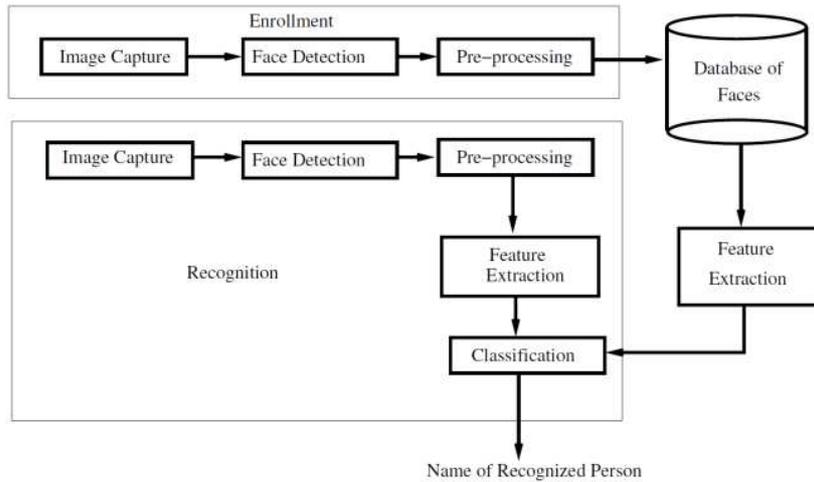
Figure 4. System Architecture.

Image Capture

The Camera is mounted away from the entry to catch the frontal pictures of the pupils.

Facial Detection

A suitable and effective face identification algorithm consistently upgrades the presentation of facial recognition frameworks.

Pre-processing

The detected face is extracted and subjected to preprocessing. This pre-processing step involves with histogram equalization of the extracted face image. Histogram Equalization is the most common Histogram Normalization technique. This improves the contrast of the image as it stretches the range of the intensities in an image by making it clearer.
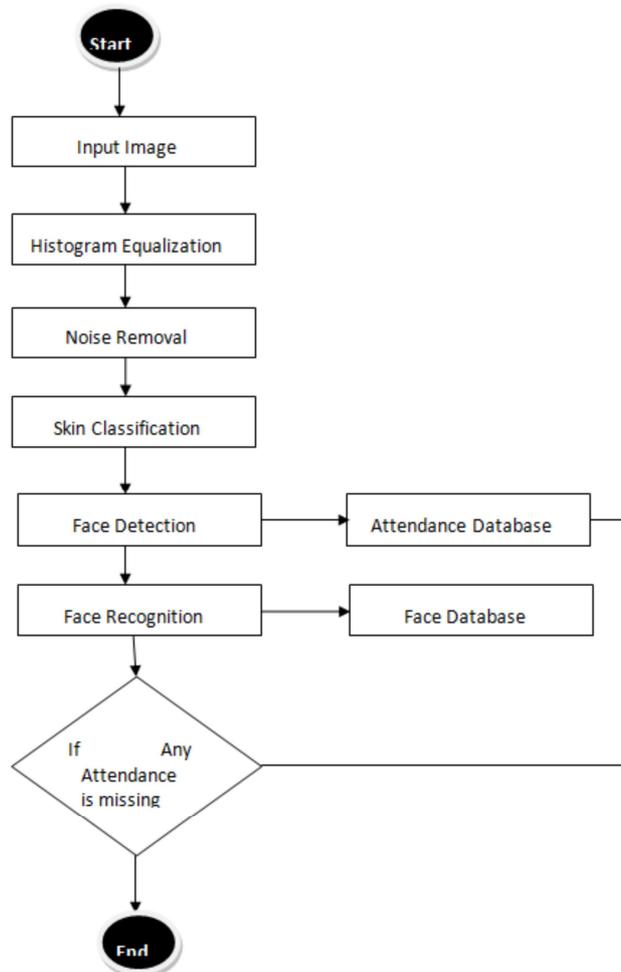
Figure 5. Flowchart of Automated Attendance System Using Facial Recognition.

Post-processing

Once perceiving the faces of the understudies, the names are refreshed into databank. Toward the finish of the class an arrangement to report the names of all understudies who are available in the class is additionally included. This is actualized utilizing text to speech transformation.

Database Development

The facial acknowledgment enlistment of each individual is required. This data bank improvement stage comprises of picture catch of each person and extricating the facial component and later it is upgraded utilizing pre-handling methods and kept in the database.

Feature Extraction and Classification

The presentation of a Face Recognition framework relies on the component extraction and their arrangement to get the precise outcomes. Highlight extraction is accomplished utilizing highlight based strategies or all-inclusive procedures.

5.2. Algorithm for Facial Recognition

The acknowledgement of a human face is trying in a PC human collaboration.. The face is our fundamental focus of thought in cultural life, having a basic influence in appointing ID and feeling of the individual. We can see different appearances that we adjust all through our life expectancy and separate faces immaculately even subsequent to following a long time of separation. This ability is enthusiastic despite of significant assortments in visual lift due to advancing condition, developing, and redirections.

Algorithm 1: Proposed System Algorithm
1. Student's Picture configuration;
2. Algorithm Application of Face recognition;
3. Extraction of the face recognition based;
4. Resizing of image and conversion to normalization;
5. Correction of above normalization;
if
    Updating Database then
    Store in Database
else
    Application of facet Extraction
    Apply Distance Classifier Bayesian
end if
6. Post-processing.

Algorithm 2: Proposed Algorithm
1. Student's Picture configuration;
2. Application of face recognition Algorithm;
3. Extraction from 2 above;
4. Conversion to 100x100 i.e. Apply pre-processing;
5. Correction of the above;
    If Register Phase
    then
    Database Storage
    else
    Application Extraction
    Application Bayesian
   end if
6. Post-processing.
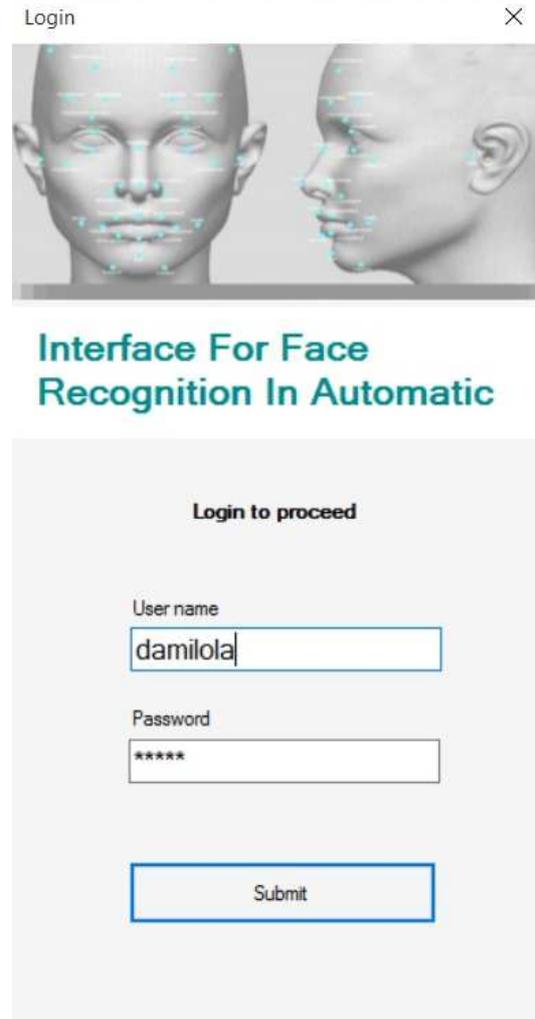

Figure 6. *Login Authentication Display.*
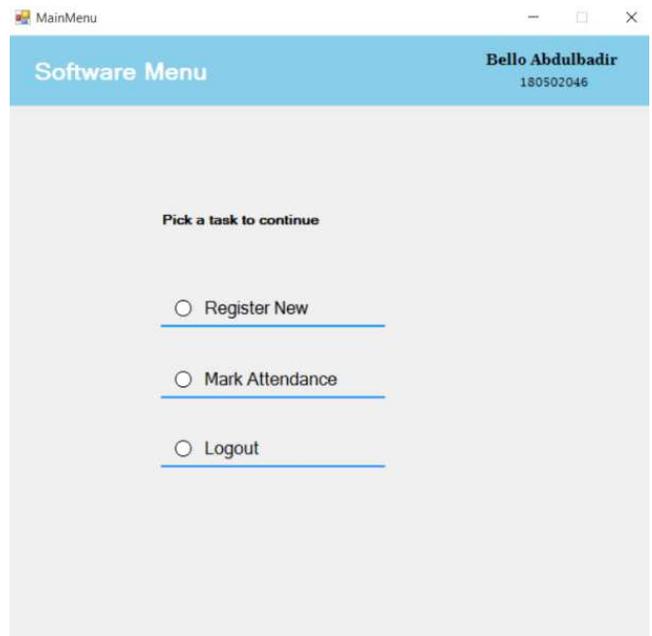

Figure 7. *Main Menu Display.*
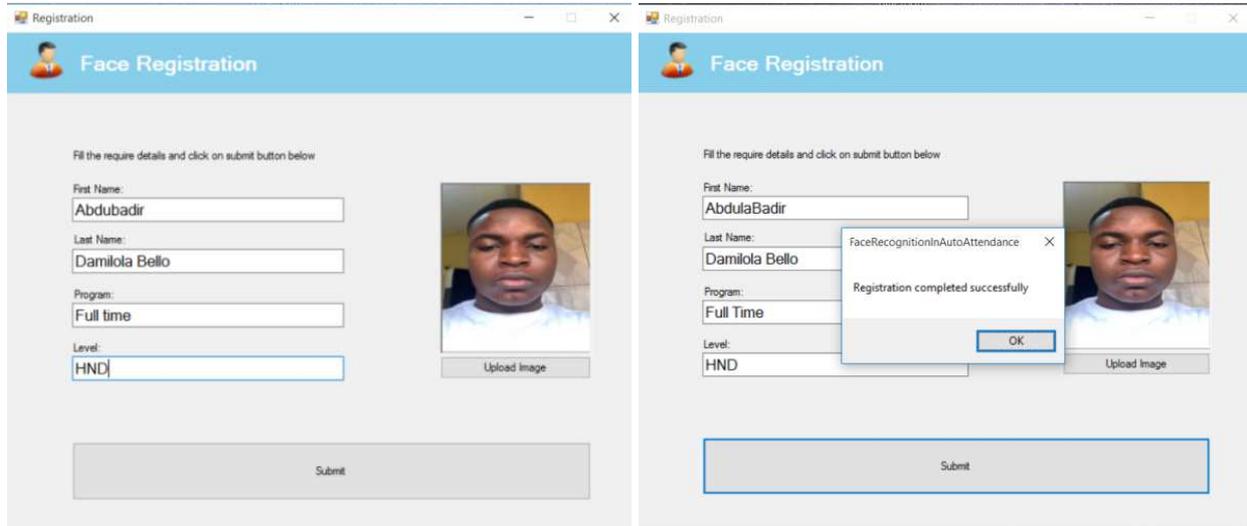
Figure 8. Registration Display.
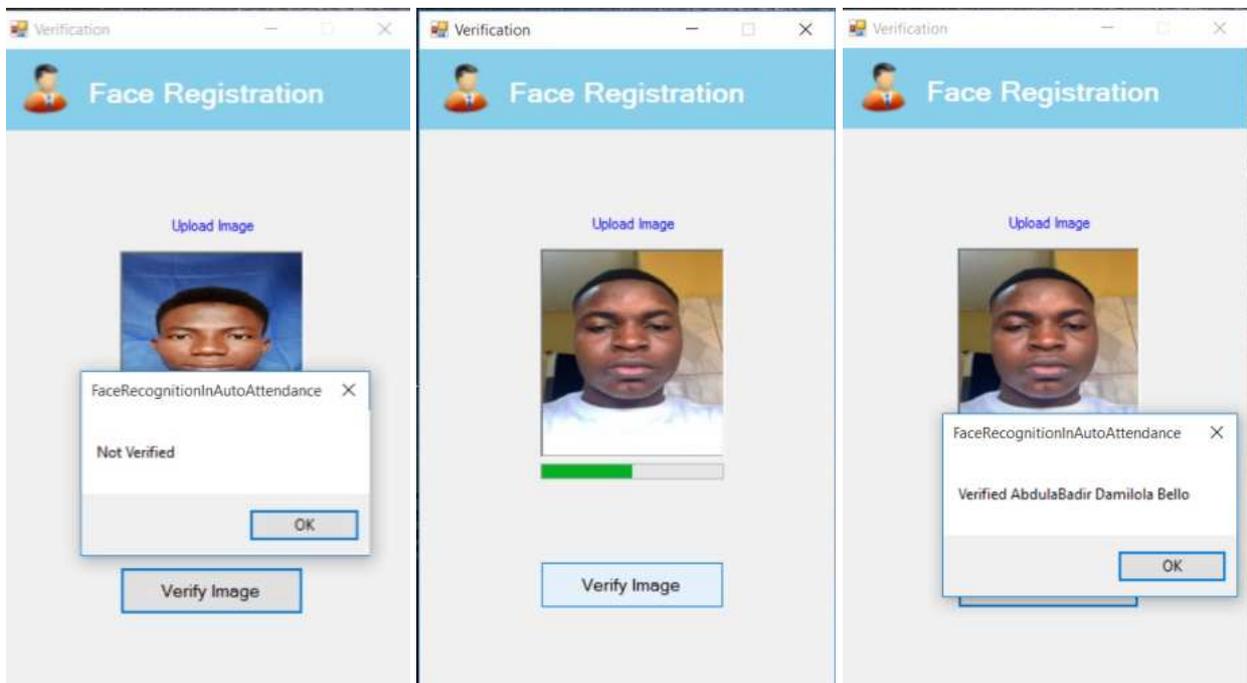
Figure 9. Verification Display.

6. Conclusion

Face recognition innovation was utilized for purpose of this research, before the design of this work there are several problems as regards student attendance in institutions using the old system of class attendance which is tedious and time consuming. The framework has been grown effectively ready to reenact the errand of denoting the participation in the classroom. This is managed without human interface which decreases the hour of mediation. There will be no way for the people to control the proxy participation in the classroom. This face acknowledgment method is executed utilizing Vision Assistance Module all together make the framework more exact one, this notation of student attendance can foster be used mainly in examination to determine who attend the exams and who are not attending.

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