

Facial Recognition Based Smart Attendance System

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Abstract - The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Many problems arise when the authority is unable to enforce the regulation that exists in the old system. The technology working behind will be the face recognition system. The human face is one of the natural traits that can uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a excel sheet. At the end of the day, the excel sheet containing attendance information regarding all individuals are mailed to the respective faculty.

Keywords: face recognition, attendance monitoring, and technology.

I. INTRODUCTION

An attendance system using a camera-based on a face recognition system has been developed by several researchers to produce a face attendance system that is accurate and able to store a large-scale face image database. The design and manufacture of facial attendance systems using cameras are very useful effective and efficient to further improve the accuracy of user data and is useful for the high mobility of users who use it. Facial attendance system using a camera is very safe and accurate for detecting users because it has a more accurate data process and high accuracy so that it can produce a system that is reliable and robust to identify human faces to be used as a time attendance on attendance machines. Research on Face Recognition for human interests has been carried out, especially for various interests such as security systems, surveillance, General identity verification, Image database investigations, Criminal justice systems, "Smart Card" applications, video indexing, Multi-media environments and Witness face reconstruction. According to, based on data

acquisition methodology, Face Recognition is divided into 3 categories, namely Face Recognition Method based on image intensity (Intensity Image), a method that works based on video sequences and Faces Recognition Method which requires other sensors such as 3D Information and infra-red image (infra-red imagery).

There are two categories in intensity mages -based Face Recognition, feature-based and holistic face recognition. Feature-based face recognition based is a face recognition method that processes input images to identify and to extract features of faces such as nose, mouth, eyes, etc. then calculate the geometric relationships between these face points thereby reducing the face input images to geometric features vectors. The initial face recognition research based on feature-based was conducted by, that study uses the Geometrical Features and Template Matching method in identifying a person's face. In that study using the integral projection feature extraction method and the classification method used is the Bayesian Classifier.

II. METHODOLOGY

According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word; the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no enforcement practiced. Supposing the institution establish enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all. Thus, all the recorded attendance in the previous system is not reliable for analysis usage. The problem of the previous system is where it is too time consuming. Assuming the time taken for a student to sign his/her attendance on a 3-4 paged name list is approximately 1 minute. In 1 hour, only approximately 60 students can sign their attendance which is obviously inefficient and time consuming. The third issue is with the accessibility of that information by the legitimate concerned party. For an example, most of the parents are very concerned to track their child's actual whereabouts to ensure their kid really attend the

classes in college/school. However in the previous system, there are no ways for the parents to access such information. Therefore, evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for that legitimate party. The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution. In this project, an application will be developed which is capable of recognizing the identity of each individuals and eventually record down the data into a database system. Apart from that, an excel sheet is created which shows the students attendance.

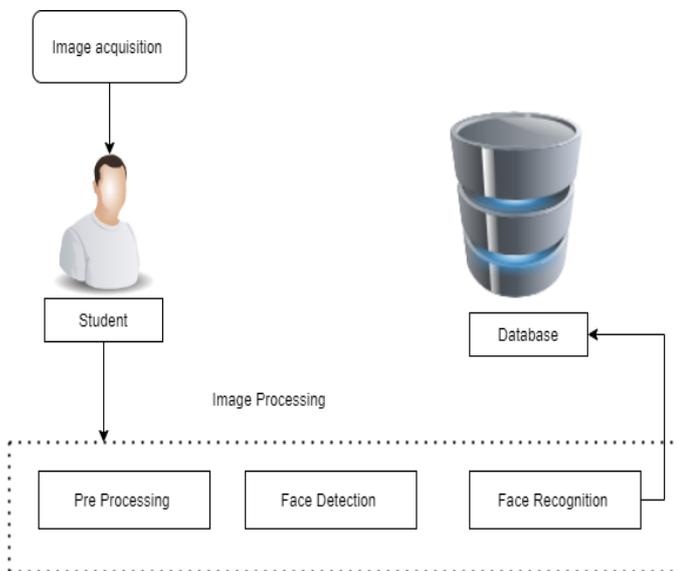


Figure 1: Architecture Diagram

In this research, the development of a face recognition model as a face attendance machine using a hybrid feature extraction method using CNN-PCA was built using a combination of face detection and face recognition framework model using real-time cameras that function as a face detection tool and human face identification. The stages of the facial recognition process that will be carried out consist of the processes performed on data acquisition, face detection process, preprocessing, feature extraction process, and classification processes can be seen in Fig. 2. The camera that used in face detection process is performed using face detection based on the Viola-Jones from the OpenCV package. Face detection is done by a camera to take face images of objects taken. The image taken from the camera lens is a raw image containing a background image and a face image. In this face detection process is carried out the process of detecting and searching for facial features in the camera image, which at this stage the system recognizes patterns as faces or not. The face image detected in the background image produced by each camera lens is marked by the position of the

region of interest (RoI) coordinate point of the face image which is the location point and the size of the RoI face image produced. Normalization or preprocessing is a process that result a face image that has detected on process of face detection.

In this normalization phase, a combination of several face image processing models is used. We used the cropping method, resizing, RGB-Gray, and using histogram equalization as a contrast-brightness adjustment to optimize the facial recognition. The preprocessing method is used to improve the sharpness of the image to anticipate several variations in illumination that commonly appear when capturing facial images.

Convolutional Neural Networks Algorithm

In this research CNN algorithm is used to detect the disease from given ECG image. We have used three layers of the CNN these are Convolutional Layer, Pooling Layer and fully connected layer. Here, convolutional layer and pooling layer, both layer work together. First it represents the image into three-dimension vector space then applies filters to convert that image into 2 dimensions. Again, fully connected layer applies the filters to recognize the image. After training the system when we pass the image to test it, as per the specified categories it classifies the image and detects the disease accurately. After disease detection system suggests the medicine on the detected disease.

The Conv layer is the core building block of a Convolutional Network that does most of the computational heavy lifting. To summarize, the Conv Layer:

Accepts a volume of size $W_1 \times H_1 \times D_1$

Requires four hyper parameters:

Number of filters K,

Their spatial extent F,

The stride S,

The amount of zero padding P.

Produces a volume of size $W_2 \times H_2 \times D_2$ where:

$$W_2 = (W_1 - F + 2P) / S + 1$$

$$H_2 = (H_1 - F + 2P) / S + 1 \text{ (i.e. width and height are computed equally by symmetry)}$$

$$D_2 = K$$

With parameter sharing, it introduces $F \cdot F \cdot D_1$ weights per filter, for a total of $(F \cdot F \cdot D_1) \cdot K$ weights and K biases.

In the output volume, the d -th depth slice (of size $W_2 \times H_2$) is the result of performing a valid convolution of the dd -th filter over the input volume with a stride of S , and then offset by dd -th bias.

$$|a_{i,jk}^l = \sum_{m=-\infty}^{\infty} \sum_{n=-\infty}^{\infty} w_{i,mn}^l a_{(j+m)(k+n)}^{l-1}.$$

| Notations | Description |
|-----------|--|
| a_i^l | Output feature map of kernel. |
| w_i^l | Is the Weight matrix. |
| a^{l-1} | Represents the input feature-map of the layer. |

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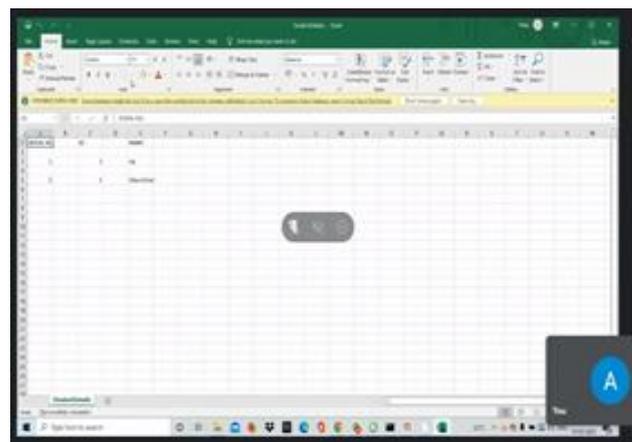


Figure 3: Output Screen

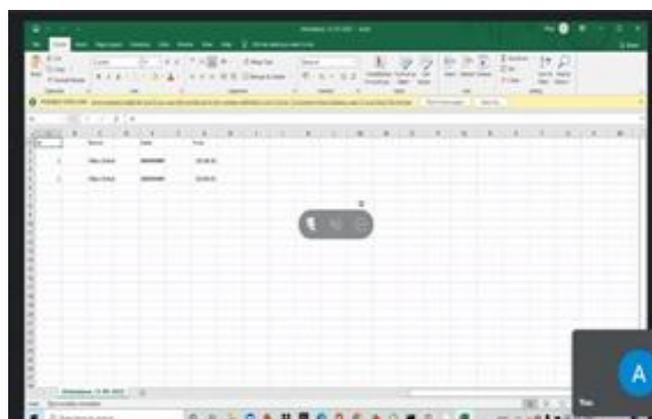
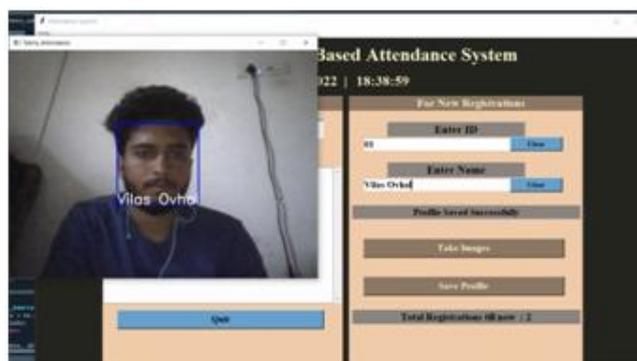


Figure 4: Output Screen



Figure 2: Input data into system



III. RESULTS AND CONCLUSION

In this project, several studies on face recognition, there are still many methods and algorithms that have not been investigated specifically the use of reconstruction algorithms from 2D images to 3D forms that are used as a database in face recognition. In this study, a study of facial recognition using an approach to the development of 2D to 3D image reconstruction models using Convolutional Neural Network (CNN) and the use of PCA are used as the feature extraction method. The CNN method is used to produce a 3D face image from a 2D face image. The PCA method used as a feature extraction method used as a classification method on the proposed face recognition based attendance system can work well. The proposed method can produce a face recognition that has a high accuracy of up to 98%.

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