Face Recognition for an Attendance System

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***Abstract*—In the pandemic era, the attendance system needs to be contactless. Moreover, this system needs to be more automatic compare to the existing systems. This paper introduces the visual system using face recognition. The Haar cascade method and Local Binary pattern histogram algorithm is used to recognize the user's identity. To capture the face, a webcam is used. This system enables detection and identifies the users. It also stores the time that check-in and checks out of the users automatically. The proposed system adequate to detect face up to 55 cm in the low lighting condition. Furthermore, this system enables to detection of multiple users in one frame.**

Keywords—attendance system, Haar-like feature, face recognition, LBP

I. INTRODUCTION

To record the attendance using the manual method is not a simple activity also time consumed. To overcome these problems, an automatic system is needed. Moreover, Covid-19 change many habits. One of them is to touch something because this virus could pass to the human through touching. In the previous attendances' methods, there are still need contact to the device, for example, using fingerprint [1], or RFID card [2]

Face recognition has the potential to be used for automatic and contactless attendance systems. There are many methods to detect face and recognize the face.

In [3], the authors propose a face recognition-based attendance system. They utilize the Viola-Jones feature and Histogram of Oriented Gradients (HOG) algorithms, combined with the classifier. The Support Vector Machine (SVM) is used for the classification for their system. Their experiments varying several scenarios for example change the distances between subject with the system, illumination of the environment, are there any obstacles also several poses. These conditions are considered. They used Signal to Noise Ratio (SNR) to analyze the results using MATLAB. Another research in [4], the authors introduce biometric recognition algorithm which are the Eigenface and Fisher face method. They applied their algorithm in Open CV 2.4.8. They compare the Receiver Operating Characteristics (ROC) curve. Moreover, they were implementing these algorithms on the attendance system. They shared that the ROC curve proves that the Eigenface achieves better results than the Fisher's face. the tactic implemented using the Eigenface algorithm achieves with an rate of accuracy between 70% to 90%

Other researchers used a technique which can be apply in an attendance system. This system is applying in a class. They utilized the face recognition technique. They combine the Discrete Wavelet Transforms (DWT) method with a Discrete Cosine Transform (DCT) algorithm [5]. These combined method were accustomed to extract the features of the subject's face. Afterward, the authors classify the subjects applying the Radial Basis Function (RBF). This authors reports that these method has an accuracy rate around 82%. In [6], the authors employ the Haar Like to detect the face with Local Binary Pattern Histogram (LBPH) methods for identify the subjects. This method enables to detection and recognizes the user well [6]. For this study, for the attendee system the Haar and LBPH methods is used.

To present a comprehensive information, this manuscript is arranged as follows: the objectives of the next part is to produce the proposed system to acknowledge the user also therefore the database system. Then continued with the third section. This part, which provides the tests on the proposed algorithm by describing the system's potentials in enabling to spot the face and identification the subject. In the final section presents the concluding remarks also the future work of this study.

II. METHOD

Figure 1 shows the configuration of the hardware of the system. A High Definition Logitech Webcam with type C310 is used. This device is located on the wall. The camera Function is to capture the condition on the front of the wall. The signal from the webcam is proceed to the PC. This information is processed by the computer. When there is/are humans, then the computer will locate the face(s). If the face(s) has already been in the database, then the system will recognize and put the time stamp in the database. Those processes are in the computer utilizing the Haar Cascade algorithm to detect the face then the Local Binary Pattern Histogram method to recognize the user.

Figure 2 shows the flowchart of the system. This system needs a database which is containing the data of the users. Faces of the users are put in the database. If the user is detected first time that day, the system will write to the database that the user is signed in. If the user has been seen yet, the system will report to the database that the user is sign out.

Webcam has transferred the information to the PC. Then the data is converted to a grayscale image. The Haar Cascade methods are used to detect the face of the user. If the face of the subject is located, then this proposed algorithm will tag the face of the subject. To focus the subject face from other images than the face, a green box is used in this system. The math function of the Haar method is the same as the Fourier function. [7-8].

The next step is a cascade classifier process. This process will obtain more accurate results. This process is to calculate the Haar feature in the repetitive process. If the result did not meet the standard, then rejected. While if the results meet the criteria, then proceed to the next step. This process is repeated three times [9-10].

The next step after the face is obtained to recognize the face of the user. The LBPH algorithm is used to do this task. The trained data will be matched with the result of the previous process. LBPH will extract the value of the image histogram. The method of this algorithm is to confront the worth of the binary pixel in central image with values of eight binary pixels around the central image. When the value of the result is more than or equal to null, then the value is assigned to one; other than that, the value is null. Afterward, the values in binary form are set clockwise or vice versa. After that the binary values form is changed into form of decimal. This process is to substitute the value of the pixel of the image center [3].

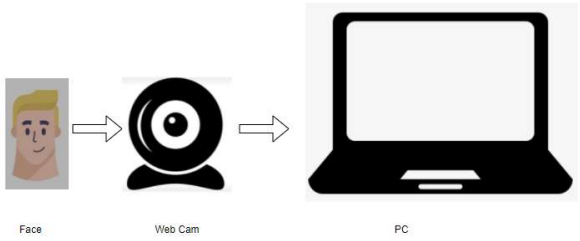

Fig. 1. The system's block diagram

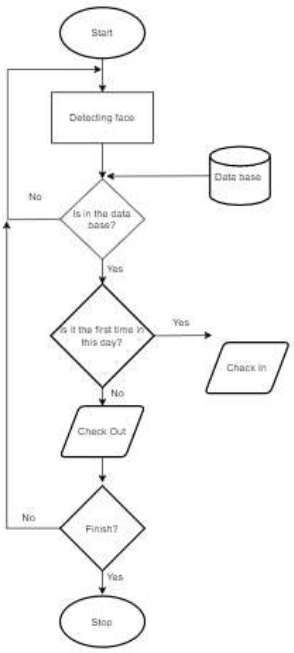

Fig. 2. Software system flowchart

Thereafter arranging binarization clockwise process, then proceed to the next action. When a binary threshold box is worth one enters the binary value in keeping with the rank. In the other hand, when the worth is null, then the output is also null. Finally, the LBP values is added. To comparing the owner's face an equation is used to urge the approach histogram value. This value is used as a prediction value to spot the owner of the face.

This value is employed as a comparison between data of the face contained within the database with the data which detected by the webcam. The database of the faces needs to be stored first. This database will enable for system to identify the owner of the faces. These faces will be converted to histogram values or LBPH. To be able to recognize the face well, the system needs a minimum of 20 input images from the webcam. These images must be trained first. During the training process, the images on the database will be extracted. These images will change to histogram values. Each image will have their own histogram value These values will be stored in form of array data. These values will be together with the positive identification of every subject. On the face detection process, the webcam will obtain the face image input detected is going to be known histogram value. Therefore, the method enable to compare the input image histogram value which come from the webcam with the database of the histogram faces values. This process will enable to identify of the face of the owner by the histogram value which closest to the histogram value within the database.

To the popularity face process in real-time, the LBPH algorithm is applied. During this step, the worth of histogram value within the database face is going to be compared with the number of histogram values of the image detected directly by the camera (real-time). To induce an identical image with the worth the database has stored, it's necessary to match two histograms between the detected image and, therefore, the image within the database and find the space of the closest histogram value. Thus, the output of the algorithm is that the positive identification of every image that's changed with the name of the face owner.

III. Results and Discussion

To test the ability of the system, five subjects are used as a sample of the users. These are consisting of three men and two women. The age is between 22-25 years old. The system is used in the different distances and ambient brightness. The results of these experiments are presented in Table 1. In the bright environment, the system enables to recognize of the face, and the user is also successful in signing in or sign out in the 55 cm to 180 cm range. While in the dim situation, the system is also capable of doing its task with a narrow distance. However, the distance is only around 50 cm from the camera. If the system is able to detect the face, then the system will be capable of doing the absent to the subject.

Figure 3a shows bright lighting while the subject is standing around 180 cm from the camera. In this figure, the system enables the detection of the face of the subject. Moreover, this system is capable to sign out the subject where the subject has sign in before. Figure 3 b gives an example capturing the subject in the dim situation at a close distance. A Subject is at around 50 cm around the camera. This system is adequate to sign in the subject to the system.

TABLE I. Results

Distance	Brightness		Sign In/Out
	Light	*Dim*	
30 cm	Not detected	Not detected	not successful
55 cm	detected	detected	successful
85 cm	detected	Not detected	not successful

180 cm	detected	Not detected	not successful
200 cm	Not detected	Not detected	not successful

(a)

(b)

Fig. 3. The results of the system (a) in bright 180 cm distance and (b) in dim 55 cm distance

IV. CONCLUSION

This study is applying the Haar cascade and LBPB methods in the absence system. Based on the results of the research data above, it can be concluded that the lighting factor significantly affects the accuracy of face recognition and detection; the more significant the brightness level of a place, the easier the system will be to recognize the object to be identified. The indicator of the success of this final project is to be able to make a face attendance application without touching it with a retrieval time of not less than 3 seconds, as well as with various lighting and the success rate of taking face attendance is with a maximum distance of 180 cm and a minimum distance of 55 cm. This system is very well used in recent times. In the current corona pandemic, this system will minimize the touch of a hand on a device.

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