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Face-Based Attendance Data Using Principal Component Analysis

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Abstract

The face is one of the easiest physiological measurements and is often used to distinguish the identity of one individual from another. This facial recognition process uses raw information from image pixels produced through the camera which is then represented in the Principal Components Analysis method. The way the Principal Components Analysis method works is by calculating the average flatvector pixel of images that have been stored in a database, from the average flatvector the eigenface value of each image will be obtained and then the closest eigenface value of the image will be searched for. image of the face you want to recognize. The test results show the overall success rate of face recognition that the application can carry out face recognition using digital camera hardware for the attendance system by displaying the name of the face owner as well as the date and time of recognition. The average accuracy value of the test with the light intensity level is 96.66%, the accuracy value The average test value with changes in the distance between the camera and the face was 98.33% and the average accuracy value of the test using glasses and hat accessories was 85%.

Keywords: *PCA Method, Facial Image, and Attendance Application*

1. Introduction

In today's modern era, it cannot be denied that the progress of digital technology cannot stop and continues to develop rapidly. Every human being certainly wants to compete to create an invention/tool that can certainly make things easier for humans themselves, such as an attendance application in the form of image recognition. face. In several schools located in remote areas, such as in remote villages, there are still many schools that have not discovered or experienced advances in technology such as digital applications in the form of facial attendance applications which are widely used in schools in urban areas. There are still many schools in villages that still use a manual attendance system, namely by recording attendance in the attendance expedition book. The manual attendance system sometimes has problems that can arise, namely the possibility of manipulation of the recorded attendance data, and if the attendance book is lost there is no backup of the attendance data.

In designing this attendance application, the author uses the eigenface algorithm as facial recognition based on the principal component analysis (PCA) method. PCA is a linear transformation to determine a new coordinate system from a data set. The eigenface algorithm decomposes facial images into a collection of characteristic features. This PCA technique reduces large data information from facial images. This is then said to be the principal component in a training data set. The main feature of the PCA method is reconstructing several original images with the training set using the eigenface algorithm.

2. Research Methodology

In this research, the data source was carried out by observing and interviewing sources, namely the principal and teachers at SMP Negeri 2 Nibung Angus, Lima Laras Village. And also quoted from previous research journals which are related to

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making attendance applications using the Principal Component Analysis method and other data sources such as internet sites.

Based on the analysis that has been carried out covering things that exist in the system, the design is carried out as manufacturing the model for the application that will be created is as follows.

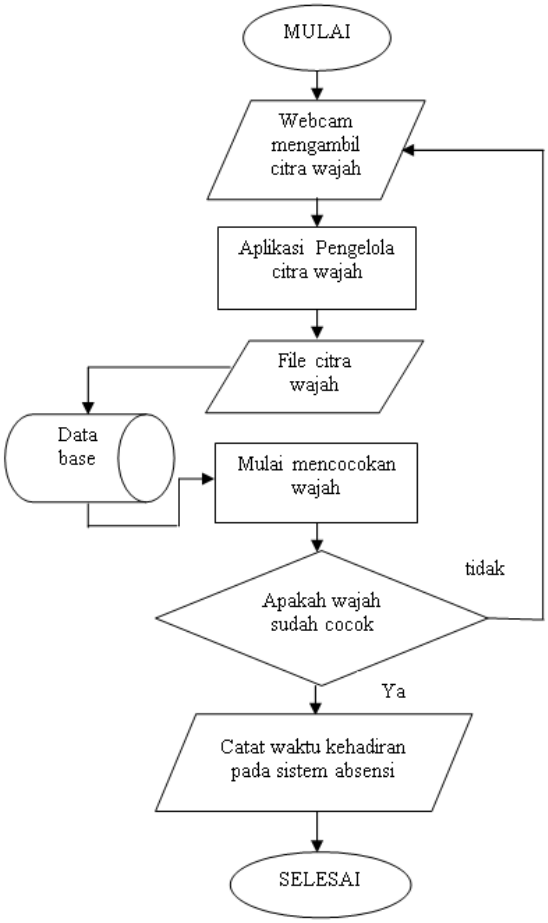

Figure 1. *Design flowchart for application systems*

3. Results and Discussion

3.1. Data Analysis

The data needed in this research is data in the form of facial images which are then processed using grayscale image processing. At the data analysis stage, the input image and output image are determined and the appearance is designed. Then implement Principal Component Analysis (PCA) in the application to perform facial recognition for the attendance system. The Principal Component Analysis algorithm begins by creating a column matrix of faces input into the database. The column matrix will be converted into flatvector form to be searched for the average image vector of facial images or called the average flatvector which is calculated by dividing the sum of all image flatvectors by the number of images stored in the database.

3.2. Image Representation

The initial step before performing feature extraction on an image is image preprocessing, namely:

3.3. Image Resize

Image resizing is equalizing the image size to 100 x 200 pixels as shown in the image:

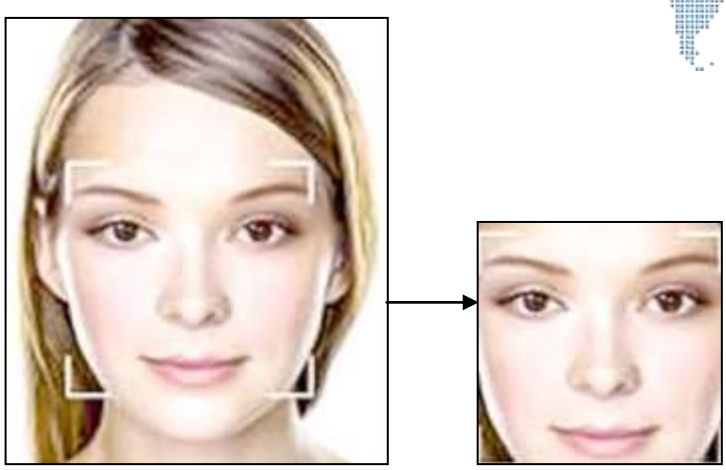

Figure 2. Image Resize

3.4. *Grayscalling*

The image that has been cropped above is then changed to grayish color mode. For example q RGB values of the input image in a 3 x 3 pixel matrix. The RGB value per image pixel in Figure 4.2 above is changed to gray with the following equation:

$$f_0\ (x,y) = \left(\frac{f^R(x,y) + f^G(x,y) + f^B(x,y)}{3}\right) \quad (1)$$

Where f^R : component value *red*
f^G : component value *green*
f^B : component value *blue*

The resulting image gray value is:

Piksel 1 : 130 121 90 = (130+121+90)/3 = 113.66 ~ 114
2 : 160 134 122 = (160+134+122)/3 = 138.66 ~ 139
3 : 154 168 85 = (154+168+85)/3 = 135.66 ~ 136
4 : 145 126 100 = (145+126+100)/3 = 123.66 ~ 124
5 : 155 135 128 = (155+135+128)/3 = 139.33 ~ 139
6 : 156 128 90 = (156+128+90)/3 = 124.66 ~ 125
7 : 165 122 90 = (165+122+90)/3 = 125.66 ~ 126
8 : 142 130 125 = (142+130+125)/3 = 132.33 ~ 132
9 : 165 150 65 = (165+150+65)/3 = 126.66 ~ 127

3.5. Calculating Eigenface Values

By calculating the average flatvector image, the eigenface value for the flatvector matrix that has been prepared can be calculated. The method is to reduce the rows in the flatvector matrix with the flatvector average. If a value is below zero (minus value), the other values are replaced with zero.

3.6. Face Recognition Process

To recognize the test face image, the step is to calculate the eigenface value for the test image matrix in the same way as before, starting from the initial determination of the flatvector value, subtracting the flatvector average (obtained from the training image), and getting the eigenface for the test image.

3.7. Data Analysis Results

After analyzing the data above, it can be seen that face recognition is carried out by calculating the distance of the eigenface values between quji images with training using the Euclidean Distance formula where each training and test face image is made by making a flatvector to get the average flatvector. Next, the distance between the eigenface values is calculated. flatvector q is the average of the training image with the flatvector eigenface value of the test face image. To get facial recognition results, it is done by comparing the smallest distance value with the testi mage.

4. Conclusion

From the results of testing the Attendance Application Using the Principal Component Analysis (PCA) Method for Face Recognition, the following conclusions, the application can perform facial recognition using digital camera hardware for an attendance system by displaying the name of the face owner as well as the date and time of recognition. The average accuracy value of testing with light intensity levels is 96.66%. The average accuracy value of testing with changes in camera distance to the face is 98.33%. The average accuracy value of testing using glasses and hat accessories is 85%.

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