Absent to be Employees Attendance Using Face Detection at Puskesmas Trimulyo Sekampung Lampung Timur

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I. INTRODUCTION

The existence of a computer as a tool that produces information and data processing tools, so that computer technological advances can be implemented in presensi system replacing the presensi system that has not been computerized (manual) [1]. In manual attendance system that is using ordinary filing system (bookkeeping), the problems that often arise when the attendance process is done manually, namely: a) the possibility of manipulation of attendance data, b) the loss of the presence (manual), c) difficulties in the recapitulation of attendance data. Presence system uses face identification as input and analyzes the accuracy level of recognition performed by the system. This technique can be implemented by using a digital camera as a media scanning face, or by using a webcam. Face recognition technology (human recognition) is one of the detection technology that received much attention from the Researchers [2]. The method is to peek at the special gap so that the shadow of the face can be imaged by the computer. But in its development there are still several kinds of problems, in addition to computational problems and data storage capacity, the condition of human face image into input (input) system is also an important problem. Some important aspects that affect human face image conditions include lighting, expression and changes in facial attributes such as whiskers, beard or glasses.

The researcher chose about the process of designing the building of a presence system by using face identification as input and analyzing the accuracy level of system recognition based on eigenface algorithm by PCA (Principal Component Analysis) method. PCA is a widely used statistical technique both in terms of face recognition and pattern recognition of an image. PCA using linear graphs and the base is the correlation value. Several studies were conducted on attendance, ie as research conducted entitled "Implementation of Fisherface Method on Face Attendance Employee Case Study PT. Illuminati Metamorphosis Makassar [3]. In this study discusses the absence system based on digital or mobile. The benefits of this study is to facilitate or minimize errors-mistakes both intentionally and unintentionally when employees perform absenteeism. Method of pattern classification using fisherface method (absenteeism). The result of this research is the application of face recognition to be more leverage in terms of data processing attendance.

Another second study refers to the issues raised by Lazwi and Zainuddin, in 2017 under the title "Implementation of LDA Algorithm for Face-Based Attendance System" [4]. In this study discuss about implementation of computer vision on facial recognition for college attendance system. Facial recognition algorithm used in this research is Linear Discriminant Analysis (LDA). By using this algorithm, the system is able to recognize the participants’ faces both students and lecturers 93% and reject the face of people who are not included in the system by 100%. Another third study refers to the issues raised by Kusumawati in 2017 under the title "Facial Verification Using the PCA Haarcascade & Eigenface Method in RFID Based Time Attendance Systems". In this study discuss about how to do facial verification using computer system help. The method used is using Haarcascade & Eigenface PCA pattern classification. The result of this research is application design Face Verification. Based on the results of research on facial absences that have been described above, then conducted further research with the title "Absent Of Employees Attendance Using Face Detection At Puskesmas Trimulyo Sekampung Lampung Timur". The formulation of the problem of this research is how to design attendance system a bsensi attendance employee use face detection at Trimulyo Sekampung Public Health Center of East Lampung, while the aim to be achieved is to implement attendance system a bsensi attendance employee use face detection at Trimulyo Public Health Center. Output that is produced in the form of attendance system design absent attendance of employees using face detection at Puskesmas Trimulyo Sekampung Lampung Timur. The method used
in this research refers to the [5] ie with Waterfall Model (Linear Sequential Model). Emphasis is made and starts from analysis, design, and system testing.

![Figure 1. Waterfall Model](image)

II. DISCUSSION

Before doing discussion under “Punching The Presence Of Employees Using Face Detection At Puskesmas Trimalyo Sekampung Lampung Timur” this author performs the stage of system design analysis.

A. System Requirement Analysis

1) System Description

System which will be built in this study used for attendance of employees based on face recognition of facial data that has been entered previously. The face matching method used is Principal Component Analysis. The results of the expected research that the system can recognize the face with a high level of accuracy.

2) System Analysis

Information that becomes output dari system to be built that is the accuracy of the recognition of face recognition of employees through attendance. While the process and the results of attendance is one way to implement facial recognition system. To generate an information, the stem processes the data with the help of hardware, software, and User. Collaboration from third component the could explained as following:

a) The user enters the data of Puskesmas Trimalyo employee, face photo (realtime) and consists of several face positions. Users do not have to bother for attendance manually.

b) Web camera or other camera type will support the system by providing User face capture service to be processed by app.

c) The system will process the face data when the attendance process matches the face data that has been previously entered as training data.

3) Device Requirement Analysis

For support in system creation research this is needed device hard enough, and PC with Minimum specifications: Processor Min Pentium Core i3, RAM at least 4 GB, Keyboard and mouse as tool supporters, Webcam as a face capture tool. An addition it is also required, The soft device required to create an application that is MATLAB R2009a.

B. Methods Principal Component Analysis face recognition

1) Training Process

![Figure 2. Flowchart Training Process](image)

2) Identification Process

![Figure 3. Flowchart Identification Process](image)

Based on the flowchart on Figures 2 and 3 can be itemized step-step identification as following:

a. Read image data face to be processed

Image data reading face or digital image will be produce value pixels. If image read is RGB image then value generated pixels numbered A x B x C, where A is wide image, B represents high image and C is component color on RGB image is Red-Green-Blue.
In research this, the author uses sample image face grayscale 3 x 3 for facilitate the calculation process, where processed image have size 200 x 200 pixels.

Results reading value pixels digital image as following:

| x, y | 1  | 2  | 3  |
|------|----|----|----|
| 1    | 29 | 40 | 44 |
| 2    | 39 | 40 | 42 |
| 3    | 62 | 80 | 49 |

b. Thresholding
Constitute apply value threshold and replace value pixels above value threshold with values 255 and below value threshold with 0. For example, specified threshold value = 45, then results of the thresholding process are as follows:

(1, 1) 29 <45 threshold results = 0
(1, 2) 40 <45 threshold results = 0
(1, 3) 44 <45 threshold results = 0
(2, 1) 39 <45 threshold results = 0
(2, 2) 40 <45 threshold results = 0
(2, 3) 42 <45 threshold results = 0
(3, 1) 62 >45 result of threshold = 255
(3, 2) 80 >45 result of threshold = 255
(3, 3) 49 >45 result of threshold = 255
So that results of the thresholding process produce matrix following:

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 0 | 0 | 0 |
| 2    | 0 | 0 | 0 |
| 3    | 255 | 255 | 255 |

c. Reshape image becomes a flat vector
That is change matrix citradari 3 x 3 to 1 x 9. Based on results on the thresholding process, is obtained reshape results as following: 0 0 0 0 0 255 255 255

d. Preparation of flat vector
Flat vector of image to be tested beating image already there is could illustrated as following:
As example results thresholding 3 pieces image face obtained matrix each as following:

Face A

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 2 | 2 | 2 |
| 2    | 2 | 2 | 2 |
| 3    | 2 | 2 | 2 |

Face B

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 3 | 3 | 3 |
| 2    | 3 | 3 | 3 |
| 3    | 3 | 3 | 3 |

Face C

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 4 | 4 | 4 |
| 2    | 4 | 4 | 4 |
| 3    | 4 | 4 | 4 |

Compose the respective flat vector image and find average values like following:

As example results thresholding 3 pieces image face obtained matrix each as following:

Face A

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 2 | 2 | 2 |
| 2    | 2 | 2 | 2 |
| 3    | 2 | 2 | 2 |

Face B

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 3 | 3 | 3 |
| 2    | 3 | 3 | 3 |
| 3    | 3 | 3 | 3 |

Face C

| x, y | 1 | 2 | 3 |
|------|---|---|---|
| 1    | 4 | 4 | 4 |
| 2    | 4 | 4 | 4 |
| 3    | 4 | 4 | 4 |

The average result is a vector characteristic features of third processed image.

e. Projection feature vector
Project the vector characteristic into the face space y aitu with subtracting the respective flat vector digital images with vector features. If results less than 0, then changed to 0.
f. Calculation eigenface for the image being tested

Suppose the image being tested have matrix following:

| x  | y  | 1  | 2  | 3  |
|----|----|----|----|----|
| 1  | 4  | 4  | 4  |    |
| 2  | 4  | 1  | 4  |    |
| 3  | 4  | 4  | 4  |    |

Then change be the following flat vector:

4 4 4 4 1 4 4 4 4

Subtract value pixels with vector traits

| 4  | 4  | 4  | 4  | 1  | 4  | 4  | 4  | 4  |
|----|----|----|----|----|----|----|----|----|
| 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |
| 1  | 1  | 1  | 1  | 0  | 1  | 1  | 1  | 1  |

Find the minimum distance between test images with training results

| Face | Image Test |
|------|------------|
| A    | 0 0 0 0 0 0 0 0 0 |
|      | 1 1 1 1 0 1 1 1 1 |

Distance = abs(0-1) + abs(0-1) + abs(0-1) + abs(0-1) + abs(0-0) + abs(0-1) + abs(0-1) + abs(0-1) + abs(0-1) = 1 + 1 + 1 + 1 + 0 + 1 + 1 + 1 + 1 = 8

| Face | Vector traits |
|------|--------------|
| B    | 0 0 0 0 0 0 0 0 0 |
|      | 1 1 1 1 0 1 1 1 1 |

Distance = abs(0-1) + abs(0-1) + abs(0-1) + abs(0-1) + abs(0-0) + abs(0-1) + abs(0-1) + abs(0-1) + abs(0-1) = 1 + 1 + 1 + 1 + 0 + 1 + 1 + 1 + 1 = 8

| Face | Vector traits |
|------|--------------|
| C    | 1 1 1 1 1 1 1 1 1 |
|      | 1 1 1 1 0 1 1 1 1 |

Distance = abs(1-1) + abs(1-1) + abs(1-1) + abs(1-1) + abs(1-1) + abs(1-1) + abs(1-1) + abs(1-1) = 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 1

So, distance nearest between test image with image of training is with Face C.

III. SYSTEM PLANNING

The system will created could receive input from User in the form of employee data and image face each employee. For the training process can be used image face with different angle. While for the identification process, capture process image face adjusted with system capability within recognize face based on training data. The first stage in the development of this system is doing process development or process modeling. Stages of development process is done by using DFD (Data Flow Diagram)

Figure 4. DFD Level 0 Absence Using Face Detection.

As for derivatives from DFD Level 0 about Attendance Attendance can be seen in the following figure:

Figure 5. DFD Level 1 Attendance Using Face Detection.

IV. SYSTEM IMPLEMENTATION

Digital attendance app by utilizing matching face (face recognition) method of Principal Component Analysis (PCA) created using Matlab Application GUI. The application consists of the Main Form, Form Employees, Training Form, Attendance Form and Form Assistance.

A. Primary Form

Figure 6. Main Menu Form
In the main form there are application title, research identity, navigation button to other form consisting of Employee data button, Pegawain Train data, Attendance Employee, Recap Attendance, Help, and Exit.

B. Employee Data Form
Object of this research is employee data and employee photo. Employee data is required for training and testing (absenteeism). Users can add, change, and delete employee data. Employee data as shown in the form above contains the parent number, employee name, place of birth, date of birth and address. The process of adding data can be done by clicking the plus button and then fill in the employee data completely. If the field is incomplete, then the system displays an error message.

Once the employee data is filled in completely and correctly, then the user can save the data by clicking the save button so that employee data goes into the employee table. The instructions for storing employee data are as follows:

```matlab
if exist('pegawai.mat', 'file')
    cell = struct2cell(load('pegawai', 'identitas'));
    identitas = cell{1}
else
    identitas = {};
    end
baru = {induknamatempattanggalalamat}
identitas = [identitas; baru];
save pegawaiidentitas;
```

C. Form Train Data (training)
In the application or pattern matching system or included in the topic of artificial neural networks requires training data used as a reference in determining the appropriate pattern or model. In this study, the authors used a sample of employee data to perform the process of facial data training. Users of the app can use existing photos in the form of files with JPG/JPEG type or can directly capture through the facilities provided by the application. Photos taken from the file or capture result are processed by going through several stages: grayscaling and resizing and stages related to the PCA method.

Stages of the training process:

1. The user selects the image or captures the photo. The process of selecting the image is click the select button and then will appear the file selection window. Users must select one of the available images. Then click the open button so it will return to the training page. Another alternative to get a face image is by clicking the Preview button then Capture. The system will utilize the cameras available on the computer or laptop to take pictures and save them into the application. The next step, the user selects the employee name and clicking the Save Data to save the training data (training). When finished entering the training data, then is clicking the Training Process button to do training face data that has been stored.

```matlab
[namafile,direktori]=uigetfile({'*.jpg'},'PilihGambarWajah')
if isequal(namafile,0) return; end
I=imread(namafile);
I = imresize(I, [400 500]);
[x, y, z] = size(I) if z == 3 I = rgb2gray(I); end
set(handles.figure1,'CurrentAxes',handles.gbFoto);
set(imshow(I)); imshow(I);
set(handles.gbFoto,'Userdata',

1. Storing training data on the database file that has been created. Saved training data includes location photo data and employee number. Employee photos are stored in the data folder.

```matlab
pegawai = get(handles.dftPegawai, 'Value')
data = get(handles.tTemp, 'UserData');
induk = data(pegawai, 1) random = mat2str(now); namafile = strcat('data', '/', random(end-
• Training Process

The training process is a process for reading patterns and specific characteristics of input images and storing them for use in the testing process. In general, the training process is explained through the following sub processes:

a) Read training data (photo)

```matlab
if exist('foto.mat', 'file')
cell = struct2cell(load('foto', 'datafoto')); datafoto = cell{1}
else
    datafoto = {};
end
baru = [induknamafile] datafoto = [datafoto; baru];
save fotodatafoto;
```

b) Display Training Data

```matlab
[p, q] = size(datafoto)
for i=1:p
str = strcat(path1, '\', datafoto{i, 2});
eval('img=imread(str);')
    [x, y, z] = size(img);
    img = imresize(img, [400 500]);
    img = im2double(img);
    if z==3  
        img = 0.299*img(:,:,1) + 0.587*img(:,:,2) + 0.114*img(:,:,3);
    end
    subplot(ceil(sqrt(M)),ceil(sqrt(M)),i);
    imshow(img); 
    if i==3        
        title('Training set', 'fontsize',18)
    end
    drawnow;
    [irow,icol]=size(img);
    temp=reshape(img',irow*icol,1);
    S=[S temp];
end
```

c) Image Normalization

```matlab
for i=1:size(S,2)temp=double(S(:,i));
m=mean(temp);
std=std(temp);
S(:,i)=(temp-m)*ustd/std+um;
end
```

d) Creating a covariance matrix

```matlab
A=dbx'; L=A*A'; [vvdd]=eig(L);
v= []; d=[]; 
for i=1:size(vv,2)
if (dd(i,i)>1e-4) v=[v vv(:,i)]; d=[d
    dd(i,i)];
end
```

e) Eigenvektor and normalization

```matlab
u=[];
for i=1:size(v,2)
t = u(:,i)';
WeightOfImage = dot(t,dbx(:,h)');WW = [WW;
WeightOfImage];end omega = [omega WW]
```

f) Calculates the weight of each face image

```matlab
global omega; omega = []; for h=1:size(dbx,2) WW=[];
for i=1:size(u,2) t = u(:,i)';
WeightOfImage = dot(t,dbx(:,h)');WW = [WW;
WeightOfImage];end omega = [omega WW]
```

g) Save the results of image processing as training data.

```matlab
save('hasil', 'omega', 'm', 'u', 'M', 'x', 'path');
```

D. Attendance Form (Testing)

Basically, the attendance module is almost the same as the training module (training), but the process is done slightly different with different results. In the absence process required good facial image obtained through the file select menu or via camera capture. Furthermore, the image data is obtained to search the distance euclidean closest to the image of training. The shortest distance is the decision resulting from the PCA process. Display of attendance form is as follows:

![Employee Attendance Form](image)

Figure 9. Employee Attendance Form
b. **Testing** process (testing) by clicking the process data button. In the process of testing, the steps taken are:
1) Read the training result data, 2) Normalize the test image, 3) Counting the face image weights, 4) Looking for an euclidian distance, and 5) Retrieve employee data in accordance with the test results

c. **Employee** attendance data, after going through the process of absenteeism, the results are stored and can be used to calculate the recap of attendance and others related to the provision of reward/punishment, allowances, etc. in accordance with the policies applicable in the agency.

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**Figure 9. Data Recap Absen Employee**

**V. TESTING**

The final stage in designing this system is testing. This test is done to test and know whether the application system with a face absentee well and correctly in accordance with the expected. The researcher uses one type of examiner: Alpha Test. This test performed by 33 servants Puskemas Trimulyo Sekampung East Lampung. Testing Alpha test is necessary because as a means of confirmation of agreement between the developer system with the user attendance system. In addition, this alpha test test also has other benefits that is as an observation to search the findings of mistakes to attendance system detection of this face.

| No. | QUESTION | ASSESSMENT |
|-----|----------|------------|
|     |          | SS | S | KS | TS |
| 1.  | Applications employee attendance Attendance System with face detection can be operated easily | 20 | 13 | - | - |
| 2.  | Display Program Attendance Attendance System employee with face detection is interesting | 30 | 3 | - | - |
| 3.  | Process Attendance System attendance with face detection staff is easy to do | 18 | 15 | - | - |
| 4.  | Information Summary of the results of employee attendance | 20 | 13 | - | - |

Based on the test results, can be obtained percentage assessment of Attendance System with face detection, namely:

- Answer SS : 148/231 * 100% = 64,07%
- Answer S : 83/231 * 100% = 35,93%
- Answer KS : 0/231 * 100% = 0%
- Answer TS : 0/231 * 100% = 0%

From the results of the assessment of the system, it can be concluded that the system is feasible used to perform absenteeism of employees Trimulyo Puskemas Kecamatan Sekampung Lampung Timur, considering some functionality that has been presented above and succeeded well to do absenteeism.

**VI. CONCLUSIONS**

**A. Conclusion**

Based on the results of research and discussion, it can be concluded things as follows:

1) From the research resulted an attendance attendance system employee with face detection at Public Health Center Trimulyo Kecamatan Sekampung East Lampung.  
2) Presence system with face detection built using Principal Component Analysis (PCA) Method. The degree of success of the Presence system can be seen from the percentage of Alpha testing Test to users who show 64,07% Strongly Agree (SS) and 35,93% Agree (S).  
3) The impact of a developed presence system can reduce fraud, help security and attendance procedures.

**B. Suggestions**

Suggestions that can be submitted for the development of this application, among others:
1) Need the optimization of the resources on Systems and Tools for the attendance to be maintained with the performance maintained.

2) Testing is done using webcam with high resolution.

3) This attendance system can still be developed again, such as development on the platform other web or undesktop applications.

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