Victim identification application with face recognition based on android

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Abstract. The increase in the population causes the problems faced are also increasing. Problems that arise include that, the number of accident victims who have recently often occurred on the highway, where the victims of the accident suffered minor injuries to severe and some even have to take lives due to accidents on the highway. And the second is crime, like a murder case that can take someone's life. Often victims do not carry identities, making it difficult for the police or related parties to identify victims of accidents and killings. This system is made in the hope that it can help the police or related parties to be able to recognize the face of the victim without an identity just by using the android application. So that it can save more time in identifying the identity of the victim. Victim face recognition algorithm using Facial Landmark Detector and for its implementation using the Dlib library. To do facial recognition, it is done by taking Figures of victims using an application on android which is then sent to the server for the recognition process. After the image is sent to the server, the recognition process will be carried out, the results of the introduction process are sent back to android to display the results. The level of accuracy of the victim's face recognition with a wound if using a tolerance of 0.35 is 100%, but if using tolerance 0.2 the level of accuracy is only 25%.

1. Introduction
Increasing population, the problems faced were also increasing. Two problems include the first, the number of accident victims who have often happened on the highway lately, where victims of the accident suffered minor injuries to severe and some even have to take lives due to accidents on the highway. The second problem is criminal acts such as murder cases that can take someone's life. Often the victim does not carry an identity so that it is difficult for the police or related parties to identify the victim's identity if the victim is unconscious or dies.

Currently there are many applications that use face detection features. Like applications used for door security systems using face recognition technology [1]. However, this application has not used facial extraction feature, which is a feature based on the shape and placement of facial attributes, such as eyes, eyebrows, nose, lips, and chin, and the relationship between attributes, so that the level of accuracy is still less than optimal. Then there are also mobile applications as monitors and controllers on embedded building security systems [2]. This application uses Eclipse IDE to build applications and java as the programming language. But this application uses IP Camera as a device to take Figures. The disadvantage of this device is that if the network connection is not stable, then this device cannot be used optimally, so an internet connection is needed that is fast and stable if using an IP camera as a medium to take facial Figures. Next is the Student Attendance application with Face Recognition [3]. This application can identify student faces and store the data as attendance data in Excel files so that it...
can facilitate relevant parties to recap student attendance data. But there are a few weaknesses in this application, that is the photos taken must be in the same lighting conditions as the condition of the face photos stored in the database, this will be a little difficult if the student is absent in the afternoon or when the weather conditions are minimal and not in accordance with the light conditions photos in the database, so that the face cannot be recognized by the system. Subsequent research is the application of face recognition and gender information which is a computer application to identify faces automatically or verify someone's face from the camera to capture someone's face [4]. This is usually used in access control systems and can be compared to other biometrics such as fingerprint recognition systems or iris. This application can help the process of increasing security in obtaining information on someone's identity by detecting faces. But in this application can only display the results of the introduction in the form of name and gender only, and for data storage has not used a database so that the data stored is limited. And the last is a computer vision based application with the aim of detecting visual hacking [5]. The application created can recognize the user's face and will issue a warning window if a peeping face is detected. However, the weakness of this application is that it cannot detect faces facing the right or the left and the face with the head tilted even though the face position is still facing forward, so the accuracy level will be reduced.

The purpose of this study is to build an Android-based face recognition application. This application is used to identify the face of the victim and determine the identity of the face in accordance with the data already stored in the database on the server. Based on several existing face recognition applications, many still use desktop or PC media to run the application. To make the application more practical, the Face Recognition application will run on the android platform. Because at this time most people already use Mobile with an Android system so that it will be easier and more practical if this application can be run on Android. And this application not only displays the identity in the form of a name, but this application will also display the victim's identity in full which includes name, address, place of birth date, and religion.

2. Research methods
The method used in this study is the Waterfall method which includes analysis, design, writing program code, and testing. The stages described in more detail in this section are the design process. The design process for the development of android-based face recognition applications includes a general system description, context diagram, and ERD.

2.1. System overview
"Face recognition" Victim Identification Application with Android-based Face Recognition is an Android-based application system where the interface and android functions are built using Java, and Python, while for data storage, the system uses a MySQL database. The working principle of this system is to recognize the face of the victim without an identity and display the results of the identification of the identity of the person. This application runs on the Android operating system.

The stage of face recognition includes taking Figures / photos from the Android phone through the face recognition application to then be sent to the server then the server processes the data to be able to recognize and display the results of identification of the victim's face in the form of the victim's identity to the android application that was used to take previous Figures. But this application has restrictions that can only recognize faces that are still intact, if there are accident victims who suffered severe injuries in the face, then this application cannot accurately identify the face.
Figure 1 is an overview of the Face Recognition System for Victim Face Recognition Applications. From the Figure, the process starts from number 1, that is the user captures images from the android application, then goes to processes 2a and 2b where the user can choose to take Figures from the camera or from the gallery. Then on the 3rd process the image is sent from the android application to the server, then on the server the face recognition process uses the Dlib library. Then the server also updates the process data in the MySql database in process number 4. Then on the 5th process, the face has been identified and the recognition results are displayed in the Face Recognition application on android.

This system has 2 entities involved, namely the user (user) who will run and use the Face Recognition application and the admin who is tasked to enter the identity data of people who are recognized into the database. The introduction data includes data on Photo, Name, Address, Place of Birth Date and Religion. Figure 2 will describe the tasks of the admin:

Figure 2. Admin enters data.

Then for the flow of the process of running the application the author describes using a flowchart as follows:
From the Flowchart system in Figure 3 it can be explained that the face recognition process begins with capturing images from an Android application, then face detection is done through the application, if the face is detected, a box image appears on the face that can then be captured. This face detection facility is used so that users do not come from sending random images and there are no drawn faces to be sent to the server, so the purpose of this face detection facility is to streamline the face recognition process for a person's face image. Furthermore, if the face is not detected, the process will return to the previous stage until a face is detected. Then after the face image is captured, the image will be sent to the server, then this image data will be compared with the training data that the admin has entered into the face recognition database. After being compared and processed using a certain tolerance, if the face can already be identified, the face recognition result will be sent to Android and then displayed to the android application used to capture the image. But if the face is not recognized, then the process will be repeated to the image capture process for later recognition process (Face Recognition) again. Tolerance is a server-defined limit value to limit the maximum distance value on facial recognition results. The smaller the tolerance, the smaller the distance generated, the greater the level of accuracy. And vice versa if the tolerance is greater, the distance generated is greater so that the level of accuracy will decrease. Tolerance values range from 0.1-0.7 and can be set on the server.

2.2. ERD
Database relations or ERD indicate a mechanism used to manage or organize data physically. The linkages between tables used in system design can be seen in Figure 4.
Figure 4. ERD of face recognition application.

The process table relates to the parent tables whose data will be retrieved. The user_id field in the user_data table is related to the id_product field in the order table, then the data_output field in the process table. And the id_proses field in the process table is related to the id_proses field in the detail_detail table. This relation functions at the time of determining the identity data of the victim that is recognized by the system to be displayed to the Face Recognition application.

3. Results and discussion

3.1. Functional testing

Functional testing is done on android and server applications. Functional testing on the features of the android application is shown in Table I.

| No. | Testing                                       | Status  |
|-----|-----------------------------------------------|---------|
| 1.  | Receive photos from the Android Application   | Succeed |
| 2.  | Insert process data into the Database         | Succeed |
| 3.  | Recognize the face of the victim without injury | Succeed |
| 4.  | Recognize the face of the victim with a wound | Succeed |
| 5.  | Choose the recognition results with the smallest distance | Succeed |
| 6.  | Update status of process in the Database      | Succeed |
| 7.  | Send introduction results to the Android application | Succeed |

Table I shows the results of server functionality testing from the Face Recognition application. From the test results there are 7 functions that have been tested and succeeded. The server can already recognize the victim's face without the wound and face of the victim with a wound (on a certain scale). It can be concluded that the server from the Face Recognition application has been running well to recognize the faces of victims.

Then functional testing on the android application is shown in Table 2.

| No. | Testing                                      | Status  |
|-----|----------------------------------------------|---------|
| 1.  | Access the camera                            | Succeed |
| 2.  | Take photos from the camera                  | Succeed |
| 3.  | Access photo storage (gallery)               | Succeed |
| 4.  | Take photos from the gallery                 | Succeed |
| 5.  | Upload photos to the server                  | Succeed |
| 6.  | Showing the results of facial recognition    | Succeed |

The table above shows the results of testing the functionality of the Face Recognition application and there are 6 functions that have been tested and succeeded. Testing of Android-based Face Recognition applications includes taking Figures from the gallery or camera, sending images to the server and
displaying facial recognition results. It can be concluded that the android-based Face Recognition application has gone well.

Some functional tests on the Face Recognition application will be shown in more detail in some images. Tests that will show details of the Face Recognition application include taking Figures from the camera, taking Figures from the gallery, uploading images to the server, displaying the results of recognition. Then for the server test display includes receiving images from android, processing facial recognition and displaying facial recognition results.

**Figure 5.** Take a Figure from the gallery.

Figure 5 is a Figure capture detail from the gallery. On the 3 menu options, click "Select from gallery" then the application will display the permission window to access the gallery and take Figures from the gallery. If successful, it will look like the lower right Figure.

**Figure 6.** Take a Figure from the camera.

Figure 6 is a Figure capture detail from the camera. On the 3 menu options, click "Take from kamrea" then the application will display the permission window to access kamrea and take a Figure of kamrea. If successful, it will appear as shown in Figure 8 on the right.
Figure 7. The process of uploading images to the server & the face recognition process.

Figure 7 shows the process of uploading images to the server, if the toast appears that contains "upload successfully" then this indicates that the image from android was successfully uploaded to the server.

Figure 8. Face recognition results appear on android.

Figure 8 will appear when the server is able to recognize the victim's face. And the identity displayed includes name, place of birth date, address and religion. If the server cannot recognize the image uploaded from the Face Recognition application, it will display results like the right part 10 image.

Figure 9. The process of receiving images from Android.

Figure 9 shows that the server successfully received the images uploaded from the Face Recognition application. the server also managed to add process data to the database. Which is used to distinguish the process of drawing one with the other drawing process.
Figure 10. The introduction process and the results of the introduction.

Figure 10 shows the victim's face recognition process. After getting the recognition result, the server will update the process data that the server has added to the previous database. Then the victim's identity will also appear on the server in accordance with the results of his introduction.

3.2. Testing with several conditions

In testing the Face Recognition application, there are 3 types of testing, namely testing the face with wounds, facial recognition with minimal light conditions, and face recognition taken directly using an android smartphone camera. The results of facial testing with wounds that use a tolerance of 0.35 are all image can detect and recognized.

The following are the results of facial testing with a wound that uses a tolerance of 0.2 are any image can recognized successfully.

Based on the results of the test, the percentage obtained to recognize the victim's face with a wound if using a tolerance of 0.2 is 25%. And if using tolerance 0.35 the success rate reaches 100% (based on 4 data that has been tested).

Then test with photos with less brightness. On the server, the server can detect faces in the image but the server cannot recognize the face.

Then test with photos taken directly from the camera. Recognition results taken directly from the camera can be recognized but use a tolerance of 0.4.

Based on testing with 5 data set can be seen that the results of testing image produce using photos taken directly with the camera, successfully identified the 5 people with a tolerance of 0.4. When using a tolerance of 0.2, the five people cannot be recognized by the server, and if using tolerance is 0.3, there are 3 of 5 people who are known, and the remaining 2 are not recognized by the server.

4. Conclusion

Based on the results of testing "Android-based Face Recognition Application", it can be concluded that:

- The victim identification application with Android-based face recognition has been successfully created on Android devices and has gone through the process of testing functionality with the results of all functions running properly.
- The success rate for testing the victim's face with a wound that uses 0.2 tolerance is 25% of the 4 experimental data. For the success rate of the victim's face with a wound that uses a tolerance of 0.35 reaches 100% of the 4 trial data.
- The number of pixels in the image that is known to greatly affect the length of the introduction process, in this test, there are 50 known images from 10 different people. And the pixel of each image is 2048 x 1536px. Then the average time of recognition is approximately 2 minutes
- Lighting when taking Figures that will be recognized also greatly influences the recognition process. If the light is lacking or dark, the system cannot recognize the face.
- For testing with a face with a wound, it is recognized that the tolerance is set to 0.35. When using a tolerance of 0.2, there are several faces with wounds that the system cannot recognize.
- Introduction using photos taken directly with the camera, successfully identified 5 people with a tolerance of 0.4. When using a tolerance of 0.2, the five people cannot be recognized by the server, and if using tolerance is 0.3, there are 3 of 5 people who are known, and the remaining 2 are not recognized by the server.

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