Face Recognition Method for Online Exams

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Binus University
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Binus University
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Face Recognition Method for Online Exams

Arief Agus Sukmandhani
Computer Science Department,
Binus Online Learning
Bina Nusantara University
Jakarta, Indonesia 11480
arief.sukmadhani@binus.edu

Indrajani Sutedja
Information Systems Department,
School of Information Systems
Bina Nusantara University
Jakarta, Indonesia 11480
indrajani@binus.ac.id

***Abstract*—In the development of this technology, biometric systems are highly developed for use in various applications. Biometric systems are usually used to identify and analyze the characteristics of the human body such as fingerprints, retina, sound patterns, facial patterns and other body structures that can be used for system authentication. As well as facial recognition technology more and more used and developed for various applications including security systems, attendance systems or other things. As well as attendance system that is a recurring transaction because it is associated with controlling the presence of a person in activity. in the field of education, the attendance system is very important because the presence of students is part of a good assessment for teaching and learning. This research is to develop a prototype of face-based online exam application using the Eigenface method to detect student attendance.**

Keywords— face recognition, eigen face, prototype

I. INTRODUCTION

Attendance system in the world of education is an important thing in a lecture as proof of the presence of students. In one of the educational institutions that the author analyzes, the presence of students determines whether a student has the right or not to take a lecture Final Examination (UAP) with a percentage of 80% of 13 meetings in one period. Attendance activities that have been running so far have used the system but there are still weaknesses, namely accuracy in ensuring that the student who does it himself or other parties who do attendance and the teacher only looks at the student login activities.

Current technological developments are experiencing very rapid progress marked by increasing sophisticated and complex use of technology in everyday life along with it as humans as users of technology continuously improve and influence human activities themselves, so that every action and activity can run effectively and continuous efficiency with current technological advancements.

Biometrics is a developing technology, which has been widely used in forensics, safe access and prison security. Biometric systems are basically a pattern recognition system that recognizes someone by determining authentication by using different biological features, namely fingerprints, retinal scanning, iris scanning, hand geometry, and facial recognition that causes physiological biometrics and behavioral characteristics are speech recognition, keystroke - scan, and signature scan [1].

at this time the exam system that takes place in the Binus online runs manually, where students come to several branches of Binus that are near their place, then carry out the test according to the time specified. it is not efficient because more and more online students are scattered in several regions and several Binus branches that have not been able to cover it.

The aim to be achieved in this study is to make a prototype of an online exam application design in order to recognize students who will take the exam with face recognition methods. As for the expected results in the design of this exam application prototype:

- Perform feature extraction process used in face recognition
- Learn the basic principles of facial recognition using the Eigen Face method
- Computerize student attendance so that it is more valid and easier in controlling.

the benefits generated in this study are expected to overcome the weaknesses of student absenteeism which currently runs manually on Binus Online and prevents misuse of the existing attendance system, for example occurs with attendance manipulation by entrusting accounts / logins to other students or other people.

II. LITERATURE REVIEW

According to Bathia [1] Biometrics is an automatic method for recognizing someone based on physiological or behavioral characteristics. The past of biometrics includes identification of people with body characteristics, scars or groupings of other physiological criteria, such as height, eye color and style. Current features are facial recognition, fingerprinting, handwriting, hand geometry, iris, vein, sound scan and retina. Biometric techniques are now the basis of a variety of very safe personal identification and verification.

Face verification is a process of recognizing and matching faces. The use of biometrics for recognition systems has the aim of increasing human comfort and security in the scope of personal privacy and in a wider scope such as for an agency, the advantages of biometrics have many benefits and advantages compared to traditional systems such as: manual signing, use of passwords, PINs, cards and the key that has been applied to: entrance access, attendance, ATM machines and others. According to Syed Navaz & Mazumder [2] Face identification systems also have advantages such as: Accurate, Cost-effective, non-invasive, using legacy data, the only biometrics suitable for use and made as a backup mechanism.

According to Dhavalsinh [3] The face is the mind index. This is a complex multidimensional structure and requires good computational techniques to recognize. When using an automatic system for facial recognition, computers are easily confused with changes in illumination, variations in poses and

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changes in the angle of the face. This attendance application with face recognition uses the Eigenface method to carry out facial recognition processes [4].

Eigenface is the name given to a set of eigenvectors when used in face recognition in the field of computer vision. In Layman's terms, Eigenface is a set of standardized face ingredients from statistical analysis of many facial images[5].

The Eigenfaces approach to facial recognition was developed by Sirovich and Kirby (1987) and was used by Matthew Turk and Alex Pentland on face classification [6]. In addition to designing systems for face recognition, Matthew Turk and Alex Pentland also showed how to calculate eigenvectors to carry out compositions on most face images. Eigenvector comes from covariance probability distribution matrices in vector spaces of face images [7]. The face dataset used must be taken in the same lighting conditions and resolution as when performing a new face recognition[4].

The face recognition algorithm with the Eigenface method is carried out through several stages, namely [8]:

- Arrange the Flat vector Image Matrix
- Calculating Middle Values or Mean (Ψ)
- Calculating the Difference between Training Images with Middle Values or Mean (Ψ)
- Calculating the Covariance Matrix Value
- Calculating the Eigenvalue Value and Eigenvector
- Finding the Eigenface Value
- Identification Process

Emgu CV is a cross-platform image-processing library. It is related to OpenCV as Emgu CV is a .NET wrapper to OpenCV. We can say Emgu CV is OpenCV in .NET. The amazing wrapper makes it possible for OpenCV functions to be called from .NET programming languages. C#, VB, IronPython, and VC++ are some of the languages supported. Emgu CV can be compiled in Mono too, and it runs on Linux, Windows, Mac OS X, and popular mobile OS platforms such as Android devices, iPhone, iPod, and iPad.[9]

III. Design Process

In this research, we divide two main processes, which are the training and the testing processes. On the training process, training sets are extracted by Eigenface. The work system of this program uses a webcam PC to take pictures of a person's face then a face recognition process is performed. the overall program design of the system can be seen in Figure 1 and Figure 2. The process in this system starts with the mode settings that will be used.

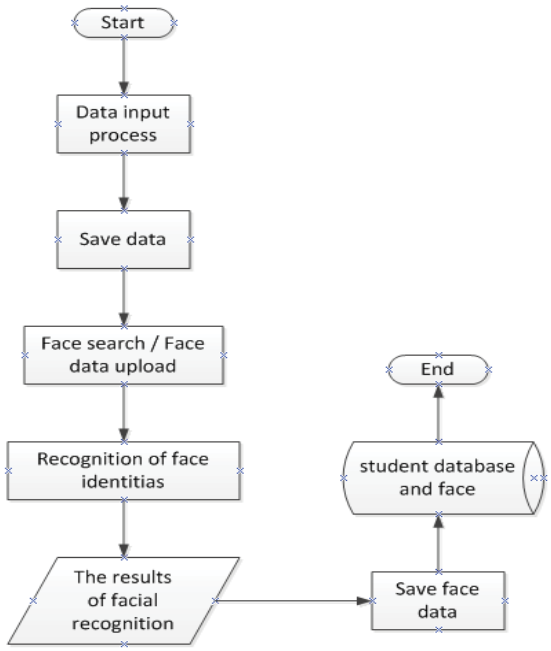


Fig. 1. Backend Process

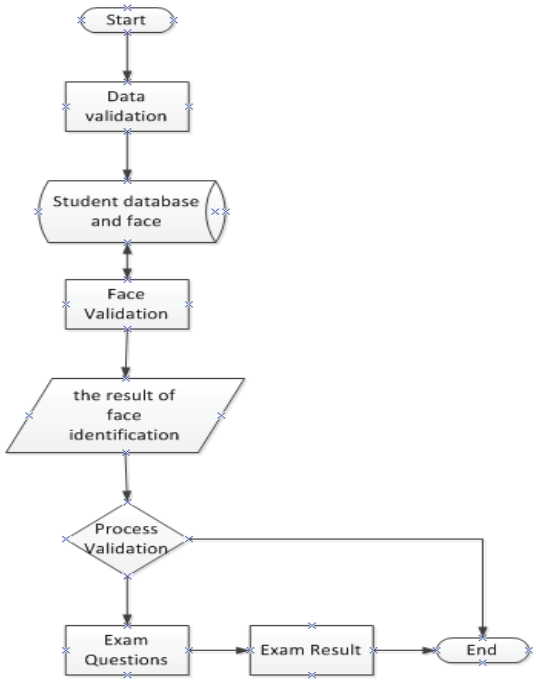


Fig. 2. Frontend Process

A. System Design

User identification defines entities that are involved and interact directly with the system. Based on the general description of the system described in the previous section, there are 2 mode who will use this application, namely:

1)Backend

that admin can enter student data and faces that will be used for the face recognition process into the database.

2)Frontend

is a mode where the user matches the ID and face data that will be used to proceed to the exam process

B. Implementation

This application is built on a desktop basis, using the Python programming language, Emgu CV library, and SQLlite relational database management system. Emgu CV Library is used as a tool to implement the Eigenface method that is used in the process of detection and face recognition of students to record attendance status. And SQLlite database management system is used as a database server to store data in the application.

Users are faced with the front view below

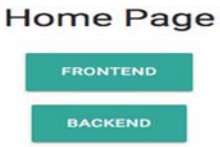


Fig. 3. Front view of the application

Frontend for students to carry out examinations and backend is inputting student data and student faces.

Fig. 4. Student Registration

Fig. 5. Face registration using webcam

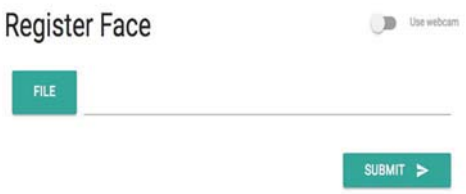


Fig. 6. Face registration using upload file

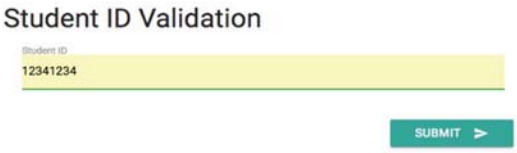


Fig. 7. ID validation process

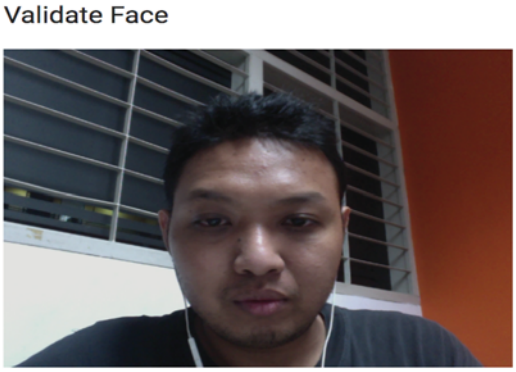


Fig. 8. Face validation process

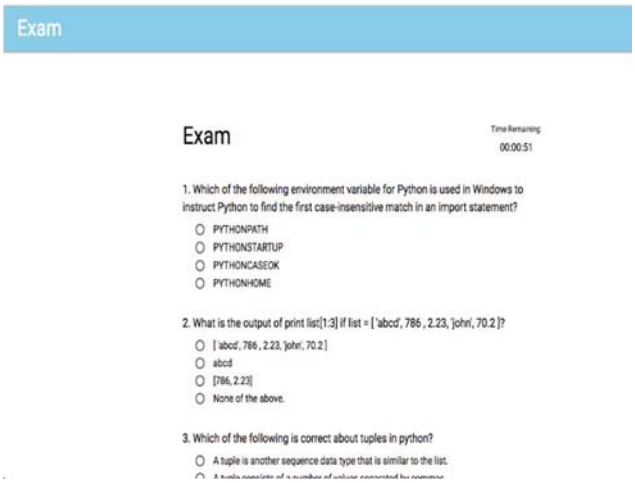


Fig. 9. Examples of exam questions

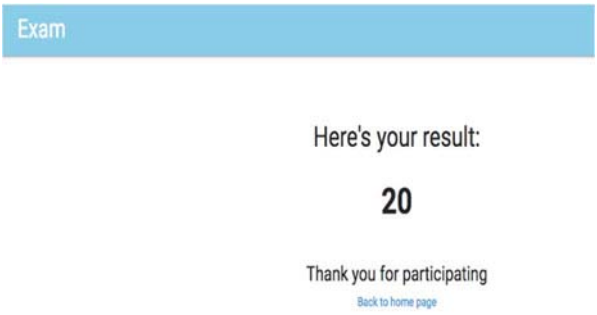


Fig. 10. Examples of test score results

IV. RESULT AND DISCUSSION

Test results on several samples. The test results in the form of the accuracy of the face recognition program using the eigenface method for the samples tested and the level of accuracy of the introduction and time of the testing process. In conducting testing on the application prototype carried out on a laptop computer with the specifications of the Inter (R) Core (TM) i5-825OU CPU @ 1.60GHz, the Windows 10 64-bit operating system, the screen size is 1366 x 768 pixels, and 8.00 GB RAM.

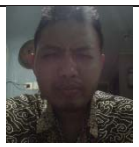
The test that the researcher is doing testing uses the black box method. This method emphasizes the suitability of the system output.

The system has several stages. The first stage, the attendance process begins with students logging into the attendance system, then using webcam clarification on the computer. The application will detect and recognize student faces if the face dataset in the database has the same lighting and resolution when capturing images. When the face is recognized by the application, the application will confirm whether the face that is recognized by the system is the face of the student concerned. If students confirm correctly, the exam questions will come out and students take the exam. the second stage, the process of inputting face data on the system can be seen in the first user selecting the input method, that is, from existing photo files or directly via webcam, then it will be displayed on the Image Box Webcam. The system will detect faces.

Examples of faces inputted to the system.

Fig. 11. Examples of face

TABLE I. EXAMPLES OF TEST RESULTS

No	Pic	Result
1		Identify
2		Identify
3		Identify
4		Not Identify

In the trials that have been carried out using the Eigenface method as well as several things obtained, namely:

- This method recognizes changes in facial expressions.
- Changes to the face such as the original file without glasses inserted in the system then the face is displayed on the camera using glasses, the system does not recognize it.

Researcher do experiment if the photo file that we entered in the system then the photo file is also inserted into the smartphone, the system can recognize the photo file on the smartphone. it is contradictory because it can be a hole to get into the system.

V. CONCLUSION

The research process that has been carried out, it can be concluded that the existence of this application exam is carried out with an online system that aims to gain flexibility of time and space in its implementation and clarification of face recognition methods that aim to avoid defects. jockey / user. in the future, further application development is expected by using updated algorithms for face recognition with a higher degree of accuracy. Trials for this method are only carried out with the same level of lighting, not yet done at different lighting levels and distances.

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