



# Online Examination System Based on Face Recognition Technology

Changwei Zhao<sup>1</sup>, Zhimeng Li<sup>2</sup>(✉), Xinjun Ji<sup>2</sup>, and Hongshu Yan<sup>3</sup>

<sup>1</sup> Engineering Training Center, Dalian Polytechnic University, Dalian 116034, China

<sup>2</sup> School of Information Science and Engineering, Dalian Polytechnic University,  
Dalian 116034, China

li867820298@outlook.com

<sup>3</sup> Information Technology Center, Dalian Polytechnic University, Dalian 116034, China

**Abstract.** The online examination system uses biometric recognition technology, through the biological characteristics of the organism itself to distinguish the biological individual, the computer on the face image in turn for preprocessing, feature extraction, feature comparison and finally give the results to determine whether it is in line with. In the technology to eliminate the “proxy test” and other cheating events, to ensure the authenticity of the identity of candidates. It has important research significance in ensuring the fairness of examination and improving the quality of teaching in colleges and universities.

**Keywords:** Face recognition · Biometric recognition technology · Java

## 1 Introduction

The system based on face recognition technology increases the face recognition technology on the basis of the old examination system, uses the deep learning algorithm and the face key point detection method to recognize the face biometric features, to meet the needs of the face recognition login examination system. The system for teacher module and student module increases and improves the user management, question bank management, paper management and other functions, to meet the system in the face of a variety of large and small examination requirements.

## 2 Face Recognition Online Examination System Research Status and Objectives

### 2.1 Research Status at Home and Abroad

The earliest form of online examination system is the computer aided instruction system designed by IBM [1]. However, China’s online examination system research time is not long, the scope of application is small. Many online tests have emerged in our country: NIT and ATC [2]. Software companies also develop online examination system, such as Tianbai online examination system, Guanbao online examination system and so on [3].

© The Author(s) 2023

D. Kumar et al. (Eds.): IEIT 2023, AHSSEH 10, pp. 1053–1060, 2023.

[https://doi.org/10.2991/978-94-6463-230-9\\_127](https://doi.org/10.2991/978-94-6463-230-9_127)

## 2.2 Research Objectives

The research of computer technology has played an important role in the economic development of the country, and brought a lot of convenience to People's Daily life [4]. Due to such social background and surging market demand, examination needs to break through the traditional examination form of cumbersome process, complex organizational process, intensive contact, consumption of a large number of manpower and other difficulties [5].

## 3 System Development Environment and Technical Realization

### 3.1 Development Environment

Development language: Java, JavaScript, HTML

JDK: JDK1.8

Database: MySQL

Development tool: SpringToolSuite4

### 3.2 Overall Structure Design of the System

The overall structure design of online examination system based on face recognition technology is shown in Fig. 1. The system obtains the examinee's face image information through the camera, and preprocesses the face region in the obtained face image to eliminate the influence of light, block, face deflection and other external factors to get a clearer face region image. Face features are extracted, and face key point detection algorithm and deep learning algorithm are used. Finally, it is connected with the student's face database to calculate the similarity to get the score or the feature comparison to judge whether the image is in line with, and at the same time, the corresponding student information is compared to give the result, so as to complete the face recognition function. Face recognition success into the online examination system, the examinee needs to choose the examination questions, through the keyboard to answer the required papers, submit the papers within the specified time, so as to complete the online examination.

### 3.3 Online Examination Process

The online test flow chart is shown in Fig. 2. The system displays the test paper data to the examinee pagination, and starts the test. When the examinee has answered all the questions, click Submit, and the score of the exam paper will be displayed on the page according to the students' answers.

### 3.4 Face Recognition Technology

Face recognition function realization, as shown in Fig. 3.

Extracting facial features is the most critical step of face detection, which requires face key point detection [6]. The locations of key points of 68 human faces extracted by Dlib are shown in Fig. 4. 5 key points were marked on the left and right eyebrows, which

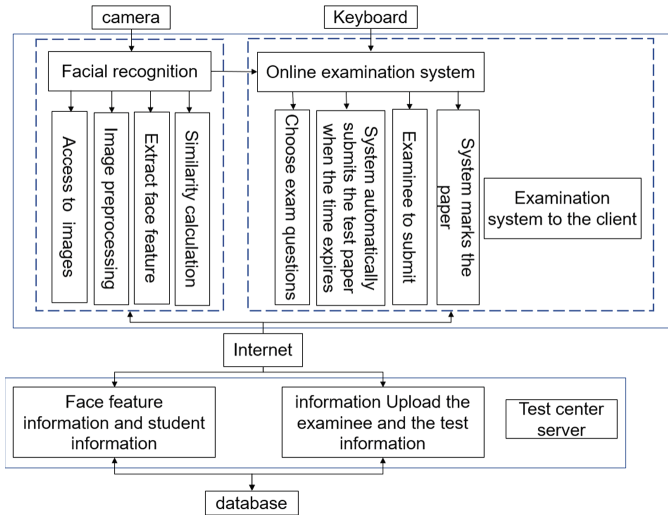


Fig. 1. Structure design of online examination system based on face recognition technology

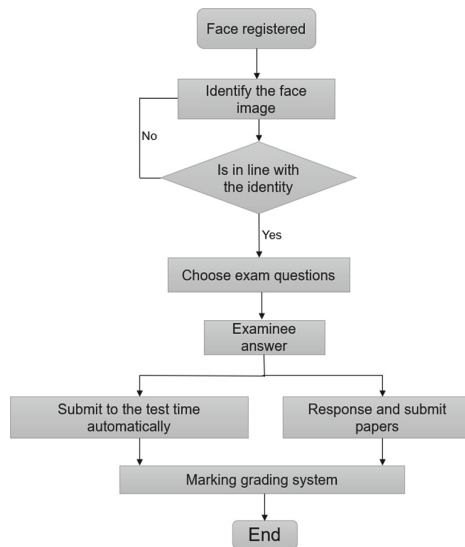
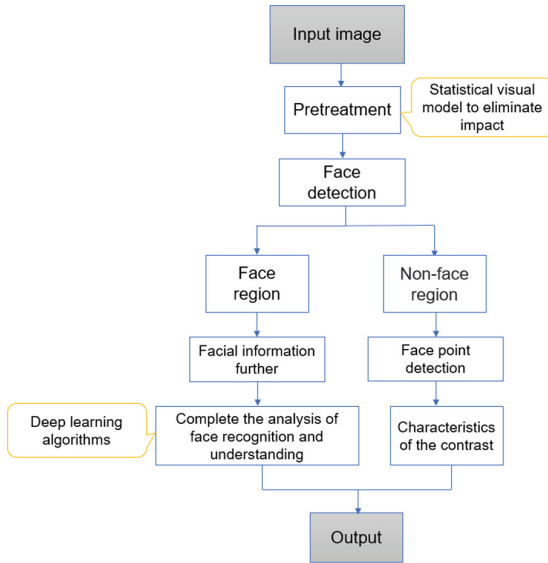
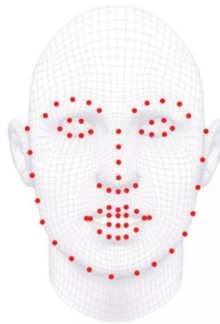


Fig. 2. Online test flow chart

were evenly collected from the left boundary to the right boundary of one eyebrow, with a total of  $5 \times 2 = 10$  key points. Six key points were marked on the left eye and right eye, and evenly collected from the left and right borders and upper and lower eyelids, with a total of  $6 \times 2 = 12$  key points. Twenty key points were marked on the lips, which were divided into two at each corner of the mouth, five evenly collected from the outer boundary of the upper and lower lips, and three evenly collected from the inner boundary



**Fig. 3.** Realization of face recognition function

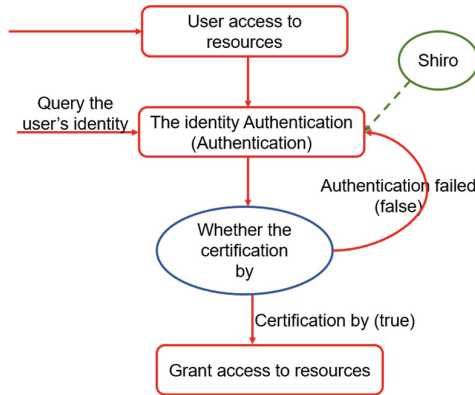


**Fig. 4.** Location of key points on 68 people’s faces

of the upper and lower lips. The marking of the nose was divided into the bridge of the nose and the bottom of the nose. 5 points were uniformly collected from the bridge of the nose and 5 points from the bottom of the nose, a total of 9 key points [7]. 17 key points were collected for uniform facial contour. More face keys can be obtained by adding forehead and ear or increasing the number of evenly collected key points in each part.

### 3.5 User Login Function Design

The implementation process of user login function is shown in Fig. 5. This module uses Shiro framework to authenticate user identity and verify user identity, user name and



**Fig. 5.** User login function implementation process

password. If the verification is successful, users are allowed to access resources and jump to different home pages of student and teacher roles.

## 4 System Design Achievements

### 4.1 Teacher Module

Teacher module function, as shown in Fig. 6. The teacher function module includes three core functions: user management, question bank management and examination paper management.

The user management interface is shown in Fig. 7. Its main function is user management, including adding users, modifying user information and managing user rights. User rights management is mainly about locking and normal use of user accounts. After locking, users cannot log in normally, and only after opening permissions can they be used.

The question bank management interface is shown in Fig. 8. In addition to providing examinee questions, the question bank also contains learning materials for examinee to do exercises. The question bank is maintained by the teacher and the question maker. The question maker can increase, modify and query the questions in the question bank, and the question maker can also adjust the question type. If a question is added, the question maker should add options and answers, and if the corresponding question is modified, the question number should be marked. If the title is deleted, the title number should also be marked. The teacher will audit according to the request of the title maker to add, modify or delete the title, and save the modification result and update the question bank after the approval.

The test paper management interface is shown in Fig. 9. The function includes the basic information of the paper such as the name of the paper, the subject of the paper, the length of the paper, the total score of the paper to check management and keyword search, fuzzy query; Add questions in the test paper; New papers; Paper paging query, etc.

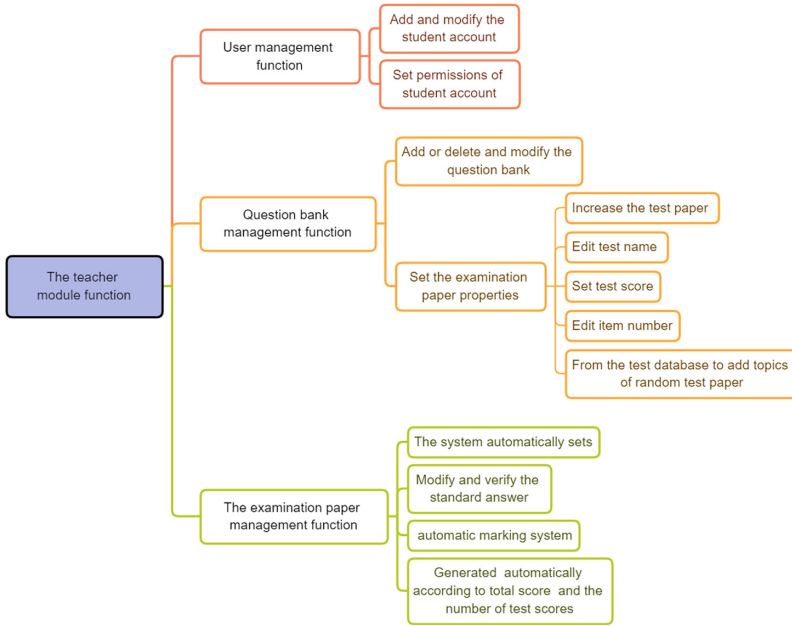


Fig. 6. Teacher module function

Student examination system    Home    User Management    Paper Management    Question Management    Exit

User Management

User Name    Add    Modify

Role ID	Username	Student Name	User Status	Operation
⊙	awzbin	Judy	Normal	Lock
⊙	ppx	Liu	Normal	Lock
⊙	admin	Lillian	Normal	Lock

Fig. 7. User management interface

Question List

User Name    Add    Modify

Option	Question	A. Option Content	B. Option Content	C. Option Content	D. Option Content	Answer	Question Status	Edit
⊙ 1	(Multiple choice) What window event is triggered immediately after the browser finishes loading the page?	A.onClick	B.onChange	C.onBlur	D.onLoad	D	Enable	Disable
⊙ 2	(Multiple choice) In JavaScript, what keywords are used to define functions?	A.void	B.var	C.function	D.fn	C	Enable	Disable
⊙ 3	(Multiple choice) HTTP provides seven submission methods, among which the two most commonly used are?	A.HEAD, PUT	B.GET, PUT	C.POST, GET	D.POST, HEAD	C	Enable	Disable

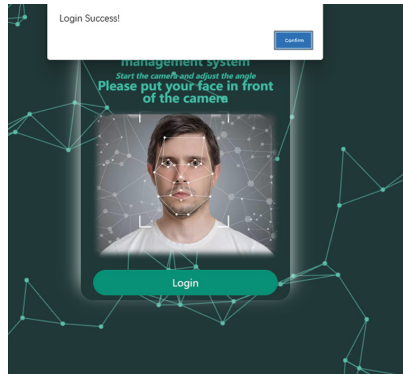
Fig. 8. Question bank management interface

## 4.2 Student Module

The login interface is shown in Fig. 10. Candidates input the face image at the designated location, click immediately login for identity information verification, in line with the identity information page pop-up “login success” prompt box, you can log in to the test system for the test.

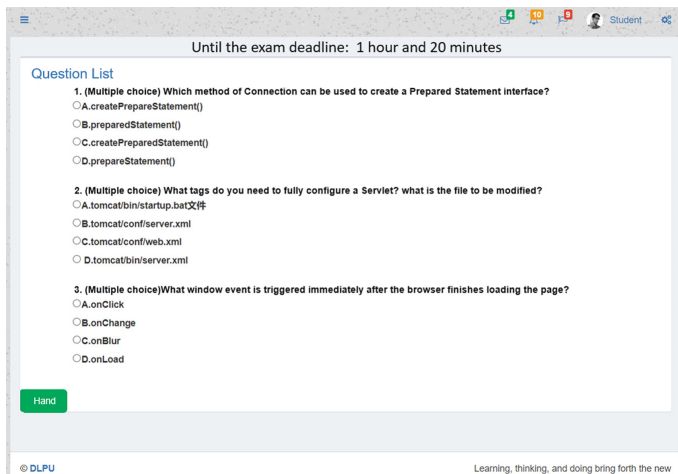
Paper Management		
Paper Name	Search	Add
Paper Name	Question Number	Operation
First set of papers for Java Basics	2	<a href="#">Check the question</a>
Second set of papers for Java Basics	3	<a href="#">Check the question</a>
Third set of papers for Java Basics	3	<a href="#">Check the question</a>

**Fig. 9.** Test paper management interface



**Fig. 10.** Login interface

The answer interface of online test is shown in Fig. 11. The examinee enters the answers to objective and subjective questions via mouse and keyboard. After finishing the answer, the examinee will click to submit the test paper or be forced to submit the test paper automatically by the system at the end of the specified test time.



**Fig. 11.** Online test answer interface

## 5 Summary

The online examination system based on face recognition technology can well make up for the traditional examination steps cumbersome, a large number of loss of manpower, anti-cheating effect is not significant. The design of the online examination system, most of the online examination system appeared on the market through account, password registration login to improve, combined with face recognition technology, not only can improve the efficiency of discrimination, ensure the examination fair and just, effectively prevent cheating, but also to ensure the examination fair, improve the quality of teaching in colleges and universities.

## References

1. Zhao Shanghui. Based on the depth study of dynamic facial recognition technology research [D]. Nanjing university of posts and telecommunications, 2022. <https://doi.org/10.27251/dcnki.GNJDC.2022.001110>.
2. Shen Yunmei. Based on baidu AI photo facial recognition technology of intelligent search system [J]. Journal of modern information technology, 2022, 6 (21): 17–20. <https://doi.org/10.19850/j.carolcarrollnki.2096-4706.2022.21.004>.
3. Yang Zhou. Design and Implementation of Intelligent Examination System Based on B/S Mode [D]. Fuyang normal university, 2022. <https://doi.org/10.27846/dcnki.gfysf.2022.000244>.
4. Liu Shuli. Design and Implementation of Library Face Recognition System Based on Java [J]. Science and Technology Innovation and Application, 2021(07):86–88.
5. Yu Qiang. Application and Research of Face Recognition Technology in Intelligent Examinee Identity Verification System [J]. Journal of Yichun University, 2011, 33(04):64–65+87.]
6. Yang Jianhua. Research and Implementation of Examinee Identity Verification System Based on Face Recognition Technology [J]. Journal of Hefei University (General Edition), 20,37(02):81–85.
7. WANG Andong. Research on the Application of Face Recognition Technology in the Intelligent Identity Verification System of Examinees [J]. Electronic components and information technology, 2022 (10): 209–212. <https://doi.org/10.19772/j.carolcarrollnki.2096-4455.2022.10.051>.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

