IEEE Access
Multidisciplinary | Rapid Review | Open Access Journal

Date of publication xxxx 00, 0000, date of current version xxxx 00, 0000.

Digital Object Identifier 10.1109/ACCESS.2020Doi Number

Face Recognition Attendance System Based on Real-time Video Processing

Hao Yang[1, a] and Xiaofeng Han[2, b*]

[1]College of Media Engineering, Communication University of Zhejiang, Hangzhou 310018, Zhejiang, China
[2]College of Mathematics and Systems Science, Shandong University of Science and Technology, Qingdao 266590, Shandong, China
Hao Yang ([a]Email: 415360889@qq.com)
* Corresponding author: Xiaofeng Han ([b]Email: taianhaiyue@126.com)
This work was supported by Basic Public Welfare Research Project of Zhejiang Province (LGF20H180001) and Basic Public Welfare Research Project of Zhejiang Province (LGF20F020001).

ABSTRACT With the advent of the era of big data in the world and the commercial value of face recognition technology, the prospects for face recognition technology are very bright and have great market demand. This article aims to design a face recognition attendance system based on real-time video processing. This article mainly sets four directions to consider the problems: the accuracy rate of the face recognition system in the actual check-in, the stability of the face recognition attendance system with real-time video processing, the truancy rate of the face recognition attendance system with real-time video processing and the interface settings of the face recognition attendance system using real-time video processing. By analyzing the situation of these problems, the concept of attendance system based on face recognition technology is proposed, and the research on face recognition attendance system based on real-time video processing is carried out. Experimental data shows that the accuracy rate of the video face recognition system is up to 82%. Compared with the traditional check-in method, the face recognition attendance system can be reduced by about 60%. The rate of skipping classes has greatly reduced the phenomenon of students leaving early and skipping classes. The face recognition time and attendance system with real-time video processing through the above experimental certification can quickly complete the tasks of students in the time and attendance check-in system, get rid of the complex naming phenomenon, greatly improve the efficiency of class, and play an important role in guiding the development of the time and attendance system.

KEY WORDS Video Processing, Face Recognition Technology, Face Recognition Attendance, Attendance System, Video Recognition

I. INTRODUCTION

In this era of Internet explosion, computer technology has involved many areas of people's lives and work. The occasions where people come into contact with computers are gradually expanding. The frequency with which people use computing is also increasing. One of the most challenging projects in the field has a broad application prospect because of its huge sense of innovation. As an important identity label for people to distinguish different individuals, face recognition technology has gradually entered people's lives. Face recognition is the combination of artificial intelligence and computer. Because of its huge challenging innovation and broad application prospects, it has become the most challenging topic in this field.

In recent years, the face recognition application system has developed rapidly as a computer security technology in the world, especially today, when terrorist activities are rampant, this technology has received more and more attention. Face recognition technology has many typical applications in the field of public safety, civil economy, and home entertainment [1-2]. The pipeline of general enterprises needs to record the attendance of personnel, which has become a basic requirement of the company. However, when these attendance systems are formulated, unnecessary errors often occur. Taking the current fingerprint attendance system as an example, the study has found that The fingerprint attendance system has an error rate of about 5%, and there will be a phenomenon that fingerprints cannot be hit, which seriously affects the efficiency of attendance, especially in large attendance sites, which is more likely to cause congestion. However, the card attendance system has the phenomenon of

This article has been accepted for publication in a future issue of this journal, but has not been fully edited. Content may change prior to final publication. Citation information: DOI 10.1109/ACCESS.2020.3007205, IEEE Access

employees swiping cards for someone else, and it is difficult to achieve the purpose of real time attendance. Compared with the two attendance systems, the face recognition system has higher accuracy and stability, because there are more points for face recognition, which is more accurate than other systems. Greatly improved, it is difficult to congestion [3-4]. Although China's research on face recognition technology started late, our scientific researchers have caught up and some leading figures have established their own industry positions in the field of face recognition. With the advent of the era of big data in today's world and the commercial value of face recognition technology, the prospect of this technology research is very bright and has great market demand [5].

Faces in surveillance videos often suffer from serious image blur, posture changes, and occlusion. In order to overcome the challenges of video-based face recognition (VFR), Ding C proposed a comprehensive framework based on convolutional neural network (CNN). First, in order to learn a fuzzy and robust face representation, Ding C artificially blurs the training data composed of clear still images to make up for the lack of real video training data. Using training data composed of still images and artificial fuzzy data, CNN is encouraged to automatically learn fuzzy insensitive features. Second, in order to enhance the robustness of CNN features to pose changes and occlusion, CNN has proposed a trunk branch CNN model (TBE-CNN), which extracts complementarity from the overall face image and the patches around the face parts Information [6]. Scholars such as Nemirovskiy V B have studied the featureless face recognition problem. The recognition is based on clustering the proximity between the cardinal distributions of the luminance clusters of the divided images. As a proximity measure, Nemirovskiy V B uses three types of distances: Euclidean distance, cosine distance, and Leibler distance. Recursive neural network software model is used for image segmentation and proximity measure clustering [7].

The design of face recognition attendance system with real-time video processing is conducive to the development of enterprises and has a positive effect on the development of enterprises in the future. This article aims to design a face recognition time and attendance system based on real-time video processing. In this experiment, four investigation experiments were carried out. Among them, the accuracy rate of the face recognition system in actual check-in; the stability of the face recognition time and attendance system with real-time video processing; analysis of the skip rate of face recognition attendance system using real-time video processing; interface settings of face recognition attendance system using real-time video processing. The experimental results prove that the time and attendance system achieves the expected time and attendance results through face recognition technology and with the help of a computer, which fully reflects the feasibility design of the overall algorithm. The students who completed the attendance sign-in system quickly completed the tasks, got rid of the complicated sign of roll call, and soon realized the sign of operation and function. The future system time and the form of attendance system conversion have made tremendous innovations, greatly improving the attendance rate and the reliability of face recognition technology. It is worthy of further exploration and realization by our scientists.

II. PROPOSED METHOD

A. REAL-TIME VIDEO FACE IMAGE RECOGNITION

(1)Face recognition

Face recognition is the core of the entire recognition process. Face recognition is a computer vision technology that analyzes facial feature information for identity identification. In a broad sense, face recognition is divided into two parts: face detection and face recognition matching. Face recognition technology is based on the facial features of the person, and the input face image or video stream. First determine whether there is a human face, if there is a human face, then further give the position, size of each face and the position information of each major facial organ. Based on this information, the identity features contained in each face are further extracted and compared with known faces to identify the identity of each face [8-9]. Face recognition technology belongs to biometric recognition technology, which mainly includes four parts: face image collection, face image preprocessing, face image feature extraction, matching and combining hard recognition, combined with hardware cameras, network lines and computing device. The calculation method is as follows:

$$T = \min\{T_1, T_2, \cdots, T_n\} \tag{1}$$

The principle of face recognition. Face recognition technology is a kind of biometrics technology, through the acquisition of camera equipment face information and pre-processing. Face detection. The main purpose of face detection is to collect information to determine whether there is a human face image in the image, and to determine the size and position of the image, and segment the detected human face image into the adult face area. The last link is face recognition, extracting facial feature information and image information to determine whether it is in the repository. If it is, it has matching identity information, otherwise there will be no recognition results [10-12].

(2) Face feature extraction by LDA method

The Chinese meaning of LDA is linear discriminant analysis. This algorithm is to find a set of linear transformations that minimize the intra-class dispersion between each category and maximize the inter-class dispersion. Fisher is a linear judgment method in LDA. The name is called because Fisher function is often used for calculation. LDA can also be used very well in face recognition, but when using this method to extract face

features, some small sample problems often occur. As long as a training sample of the face can be given, and the sample belongs to the other four categories, the total number of faces in the sample is:

$$N = \sum_{t=1}^{M} M_1 \tag{2}$$

The average value among these categories is calculated as follows:

$$\overline{Z} = \frac{1}{M} \sum_{t=1}^{M} Z_t \tag{3}$$

The dispersion within the sample is denoted as Sw, and the dispersion between the samples is denoted as Sb. The calculation formula is:

$$S_b = \frac{1}{N} M_t (\overline{z_t} - \overline{z}) \left(\overline{z_t} - \overline{z}\right)^t = \Phi_B \Phi_B^t \tag{4}$$

$$\Phi_B = \left(M_t / N\right)^2 (\overline{Z_t} - \overline{z}) \tag{5}$$

$$\Phi_b = [\Phi_{b1}, \Phi_{b2}, \cdots \Phi_{bn}] \tag{6}$$

$$S_n = \frac{1}{N} \sum_{t=1}^{M} \sum_{t=1}^{M} (Z_M - \overline{Z}_T) \tag{7}$$

(3) Main face recognition methods

1) Geometric feature method

Since the facial features such as eyes, nose, ears, mouth, etc. are different in structure, different human faces are represented according to different characteristics of the characteristic shapes of these organs. Geometric features were first used in the description and recognition of the side profile of a human face. It determines a number of feature points based on the profile line of the person's side, and then derives a set of feature quantities for recognition such as angle and distance based on these feature points. Its advantage is the use of simple geometric information, so the time cost of storage space and classification is small, and it can still be used when the image recognition rate is low; it is not sensitive to changes in lighting. Its disadvantage is that it is difficult to extract stable features from the image, it is greatly affected by changes in posture and expression, and the stability is not high [13].

2) Subspace analysis method

The analysis method of subspace is to use spatial transformation to map face image data into a certain subspace to achieve dimensionality reduction of face data. It is a huge face data that becomes simple to calculate, and then to the dimensionality reduction data classification. Different subspace analysis methods use different criteria, and different subspaces can be obtained. Common subspace analysis methods for face recognition include: principal component analysis, linear discriminant analysis, independent element analysis, etc.

3) Neural network method

Neural network is a commonly used method in membrane recognition. Its principle is to use a large number of simple calculation units to form a certain hierarchical structure. Each simple unit can only solve simple calculations, but the system composed of units in complex structures can be a complicated question. The neural network algorithm has also achieved good results in face recognition. For example, commonly used BP networks, self-organizing networks, convolutional networks, etc. As long as the network is large enough, there are enough training samples to theoretically recognize all faces. Although neural networks have some advantages in face recognition, they also have considerable defects. The structure of neural networks is huge and complex, and their training requires a huge sample library. The training time often takes days or even months. The speed is not fast enough. Therefore, neural networks are not commonly used in the actual application of face recognition.

4) Support Vector Machine (SVM) method

Support vector machine is a research hotspot of pattern recognition. The basic principle of the algorithm is to use samples to form a lattice in the high-level feature space, select sample points as the support vector near the boundary between the two types of sample points, and use the support vector to make the decision. And finally achieve the purpose of classification and identification. The method of projecting into a high-dimensional space makes it possible to solve many problems that are difficult to linearly classify in the status space. But support vector machines also have their shortcomings. First, support vector machines are a two-class classification algorithm. Although some methods can be used to solve multi-classification problems, their efficiency is often greatly reduced. Secondly, support vector machines want high-dimensional space projection, which requires the support of kernel functions, but choosing kernel functions is indeed a lot of trouble. Finally, although support vector machines can classify independently, the effect of directly classifying faces is not good, and often feature extraction is required for faces.

The dimensionality reduction process is performed before recognition, and the basic flow is shown in Figure 1 [14].

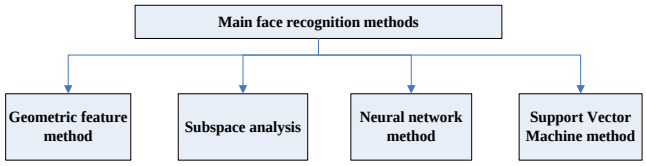

FIGURE1. Main face recognition methods

(4) Video image recognition system

The face detection technology is used to locate and segment a partial face image from the image; the feature extraction technology extracts the amount of data that can characterize the face image, and forms the features to be stored in the feature database. Face recognition process: face positioning and image processing in the image; feature extraction and selection; detecting and recognizing the image, and returning the recognition result. First create a facial image file of the face. That is, use the camera to collect facial image files of the person's face or take their photos to form a facial image file, and store these facial image files to generate faceprint codes. Get the current human face. That is, use the current facial image captured by the camera, or take a photo input, and generate a facial texture code from the current facial image file. Compare with the current facial texture encoding and file inventory. That is, to retrieve and compare the current facial texture code with the facial texture code in the file inventory. The above-mentioned "face coding" method works according to the essential characteristics of the human face and the beginning. This facial coding can resist changes in light, skin tone, facial hair, hairstyle, glasses, expression and posture, and has strong reliability, so that it can accurately identify a person from millions of people. The face recognition process can be completed automatically, continuously, and in real time using ordinary image processing equipment [15]. The video image recognition system is mainly composed of four parts: login module, recognition module, check-in module and background management module [16]. Taking the school system as an example, the functions of each module are as follows:

1) The login module is where the lecturer or background administrator logs in with an account and password to view attendance information.

2) The main function of the recognition module is to receive a face picture, call the system application programming interface (Application Programming Interface, API) to perform face recognition on the picture, and obtain an identification code that uniquely determines the picture.

3) The check-in module receives the identification code obtained in the identification module and compares it with the student information in the database to find and confirm the student information; by querying the current time and the schedule information in the database, the current course information is obtained. After obtaining the student and course information, it is logical to determine whether the student has checked in for this class, if it has been checked in, ignore it; if it has not been checked in, add the check in information to the database check in table. The module will return check-in information, including: whether the check-in was successful; the student's name; the student's student ID; the course that was checked in; if the check-in was unsuccessful, what is the reason.

4) The background management module is responsible for the background administrator, which mainly includes the functions of counting sign-in information, entering or deleting student information, etc.

B. BASIC FACE RECOGNITION ALGORITHM

When designing a system to select a face recognition algorithm, we have to consider the following factors: recognition rate, algorithm robustness, and matching time [17-19]. To sum up, the system selects Gabor features plus Fisher based discriminant analysis method based on orthogonal basis to become a linear discrimination method [20-21]. Face image feature representation is a key part in face recognition, and good feature representation can improve the robustness of image matching. Gabor wavelet feature description method is a comprehensive method that combines gray and local descriptions. It has the advantages of gray-based and feature-based methods [22].

Gabor kernel definition of wavelet transform:

$$\Psi_j(\vec{x}) = \frac{\vec{k}_j^2}{\sigma^2}\exp(-\frac{\vec{k}_j^2\vec{x}^2}{2\sigma^2})[\exp(i\vec{k}_j\vec{x}) - \exp(-\frac{\sigma^2}{2})] \quad (8)$$

$\vec{x} = (x, y)$ is a spatial domain variable, and $\vec{k}_j$ is a frequency vector that determines the scale and direction of the Gabor kernel. We selected an image $I(\vec{x})$, and the Gabor transform at the $\vec{x}_0$ point at a specific position in the picture can be realized by convolution with Gabor kernel at this point. The face image is $I(z)$, and the $z = (x, y)$ picture scale direction is μ, ν, there is a formula:

$$G_{\mu,\nu}(z) = I(z) * \psi_{\mu,\nu}(z) \quad (9)$$

With $z = (x, y)$, the calculation formula can be obtained:

$$G(x, y) = \frac{\mu^2 + \nu^2}{\sigma^2}\exp(-\frac{(\mu^2 + \nu^2)(x^2 + y^2)}{2\sigma^2})[\exp(i(\mu x + \nu y)) - \exp(-\frac{\sigma^2}{2})] \quad (10)$$

Among them, $k = (\frac{\mu}{\nu}), \mu = \frac{k_{\max}}{f^N}\cos(\frac{\pi M}{8}), \upsilon = \frac{k_{\max}}{f^N}\sin(\frac{\pi M}{8}), k_{\max} = \frac{\pi}{2}, f = \sqrt{2}, \sigma = 2\pi$

Fisher discriminant analysis is an improved algorithm based on PCA. It adopts the method of dimensionality reduction to effectively reduce the amount of calculation,

thereby improving the calculation speed [23]. This method can ensure that the projected samples have the smallest intra-class distance and the largest inter-class distance in the new space, that is, the best separability in the space. Introduce Fisher discriminant criteria table:

$$I_{fisher}(\varphi) = \frac{\varphi^T S_b \varphi}{\varphi^T S_w \varphi} \tag{11}$$

Where φ is any n -dimensional column vector. Fisher's linear discrimination method selects the vector φ that maximizes $I_{fisher}(\varphi)$ as the projection direction, so that the projected samples have the largest inter-class dispersion and the smallest intra-class dispersion. Among them, S_b is the inter-class separation matrix, and S_w is the intra-class separation matrix. Let F_k^0, $k = 1,2,\ldots,L$ be the average of the training samples of class φ_k after PCA and LDA transformation. Use the nearest domain classifier for face recognition classification:

$$\delta(Y, F_k^0) = \min \delta(Y, F_k^0), Y \in \varphi_k \tag{12}$$

Among them, δ is judged as the distance. If the distance between Y and F_k^0 is smaller than the distance between the two face images in class F_k^0, then Y and F_k^0 can be regarded as a class of pictures, and the recognition is successful; otherwise, they are not classified as similar pictures and Y is a non-training sample image.

C. BASIC MODULE OF FACE RECOGNITION ATTENDANCE SYSTEM BASED ON REAL-TIME VIDEO PROCESSING

The complete attendance system consists of a combination of multiple modules, each of which performs different functions. In order to reduce the complexity of the program and facilitate the reuse of codes, it is conducive to maintain and manage the entire system. The design of the face recognition time and attendance system in this system mainly includes several modules of video acquisition terminal, cable transmission module, data storage, face recognition module and computer terminal module [24-25], as shown in flow chart2.

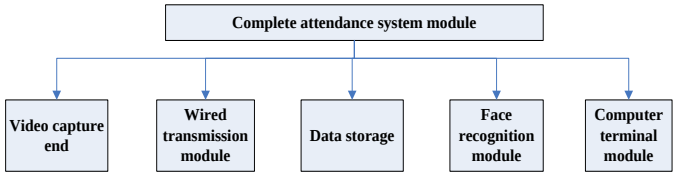

FIGURE 2. Complete attendance system module

III. EXPERIMENTS

A. EXPERIMENTAL SETUP

(1)Experimental background

In order to deeply study the application of face recognition attendance system for real-time video processing, from the accuracy of actual recognition of face recognition system, the stability of background application system of face recognition attendance system, the face recognition system faces some problems; the development status of the role played by the face recognition system in the actual check-in, the factors restricting the development, and the difficulties faced by the development are considered, and many problems are found.

(2)Experiment setup process

The experiment sets up a control group and an experimental group, the control group uses traditional fingerprint check-in, and the experimental group uses a real-time video processing face recognition attendance system. Choose two universities from a province, choose the same number of students for the experiment, collect, count and analyze the experiment, analyze the application space, development prospects of the face recognition system in the actual check-in, and the face recognition system in the actual check-in some problems.

B. EXPERIMENTAL PROCEDURE

(1) Accuracy rate of face recognition system in actual check-in

The face recognition attendance system using real-time video processing is used to count the sign-in rates of students from two colleges and universities, and to compare and analyze the sign-on accuracy rate of the face recognition attendance system using real-time video processing.

(2) The stability of face recognition attendance system with real-time video processing

Taking the manual punch card as the control group, the face recognition attendance system using real-time video processing is used for the check-in statistics, and the number of check-in punch cards is used as the main observation parameter to detect the stability of the face recognition attendance system.

(3) Analysis of the truancy rate of face recognition attendance system using real-time video processing

Taking the manual punch card as the control group, and using the real-time video processing face recognition attendance system to perform real-time check-in statistics, observe the students' skip-rate rate of the two methods.

(4) Interface settings of face recognition attendance system using real-time video processing

By identifying the student's face as the attendance interface, the successful student attendance and time information will be displayed on the screen. By selecting face detection and recognition, the video images of the attendance students can be described by the face recognition attendance system multi-person video.

C. DATABASE DESIGN

This system uses mysql database for data storage. MySQL has the advantages of fast speed, low cost, small size, open source, support for multi-threading and multi-processor, good portability, and at the same time can use ODBC (open database connection) and SQL (structured query language) to increase the data (create), delete (delete), query (select), modify (update) operations.

D. FACE RECOGNITION MODULE DESIGN

This system uses a variety of popular programming languages-Python (Interpretive Language), Java, C ++ and other languages to develop. Python is used for real-time video data collection and face recognition processing. C ++ is used to complete the related system running components such as file operations and client running interface design. Java is used to build a face recognition WEB platform service. Combined with the third-party library Open CV to realize the writing of face recognition module, OpenCV provides rich visual processing and image processing algorithms to analyze and process the facial features captured by the classroom camera. The system is divided into three modules: front-end operation, real-time video face recognition module, and background data management.

V. DISCUSSION

A. REAL-TIME VIDEO PROCESSING FACE RECOGNITION ATTENDANCE SYSTEM IN THE ACTUAL SIGN-IN ACCURACY RATE

By investigating two colleges A and B in a province, we conducted experiments in colleges based on the application of face recognition attendance system accuracy, and selected 200 college students who need to punch cards. The statistical results of the survey are shown in Table 1 and Figure 3. According to the experimental results, the accuracy rate of face recognition in the classroom video of the two colleges is currently high, and the accuracy rate of face recognition in the college video is about 82%. About 15% of the failed card punches due to video blur and other reasons, About 3% of the staff failed to punch in, it can be seen from these data that the accuracy rate of the video face recognition system is relatively high.

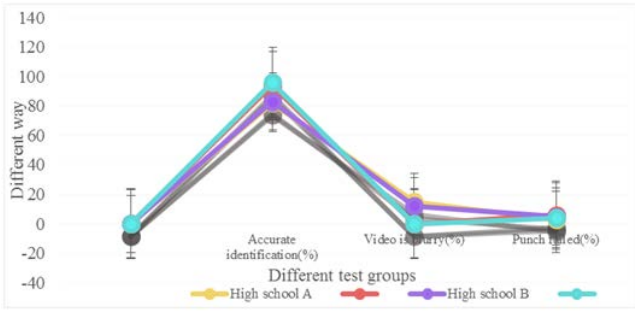

FIGURE 3. Video face recognition accuracy

TABLE I
VIDEO FACE RECOGNITION ACCURACY

Video face recognition accuracy	High school A		High school B	
	Test group	Control group	Test group	Control group
Accurate identification (%)	82	94	83	96
Video is blurry (%)	15	0	12	0
Punch failed (%)	3	6	5	4

B. STABILITY ANALYSIS OF FACE RECOGNITION ATTENDANCE SYSTEM BASED ON REAL-TIME VIDEO PROCESSING

The face recognition attendance system for real-time video processing performs video punching every two hours. Comparing the data of the face recognition attendance system and manual fingerprint punching, the sign-in success is 1 and the failure is 0. The data collection results are shown in Table 2 and Figure 4. An error occurred in the face recognition attendance system from 7 am to 9 am; from 13 noon to 21 pm, the face recognition attendance system and manual fingerprint punch card can correctly identify the check-in. The experimental results show that the length of time when the smart machine is turned on may bring some experimental errors, indicating that the human-machine interactive testing instrument needs to be pre-powered on for two to four hours before the accuracy of the testing data can be guaranteed.

TABLE Ⅱ
STABILITY ANALYSIS OF FACE RECOGNITION ATTENDANCE SYSTEM BASED ON REAL-TIME VIDEO PROCESSING

Time	High school A		High school B	
	Test group	Control group	Test group	Control group
7：00	0	1	1	1
9：00	1	1	0	1
11：00	1	1	1	0
13：00	1	1	1	1
15：00	1	1	1	1
17：00	1	1	1	1
19：00	1	1	1	1
21：00	1	1	1	1
23：00	1	1	1	1

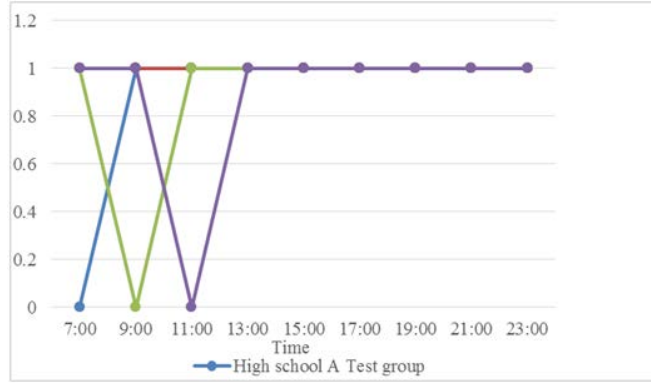

FIGURE 4. Stability analysis of face recognition attendance system based on real-time video processing

C. ANALYSIS OF THE SKIPPING RATE OF FACE RECOGNITION ATTENDANCE SYSTEM BASED ON REAL-TIME VIDEO PROCESSING

Because the face recognition attendance system has a real-time video function, it can count the number of people online in real time. Compared with the traditional fingerprint check-in, students' rate of skipping classes will change. The survey data is shown in Table 3 and Figure 5. The results showed that after using the face recognition system, the skipping rate of the two universities was significantly lower than that of the control group, only about 13%. Therefore, the face recognition attendance system can effectively increase the attendance rate of university classrooms, and is an effective method to restrain students from skipping classes.

TABLE III
STATISTICAL TABLE FOR CHECKING STUDENT ATTENDANCE

Check student attendance	High school A	High school B
Not named	93 (93%)	94 (94%)
Traditional roll call	73 (73%)	70 (70%)
Video face recognition	13 (13%)	12 (12%)

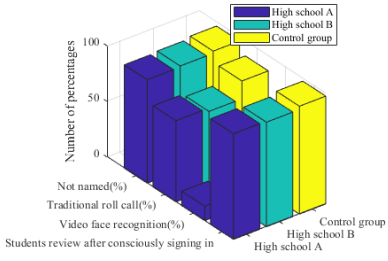

FIGURE 5. Statistics chart for checking student attendance

D. FACE RECOGNITION ATTENDANCE SYSTEM INTERFACE SETTINGS

From the amount of change in Table 4 and Figure 6, it can be seen that by recognizing the student's face as the attendance interface, the successful attendance and time information of the confirmed student is displayed on the screen. By selecting face detection and recognition, the video images of the attendance students can be described by the face recognition attendance system multi-person video. Compared with the traditional punch card signing, this method greatly improves the efficiency, and can prevent early leave and skip class. By regularly extracting images, seeing that the students 'handling of the case is transparent, the inspection method is an imperceptible process to a process where the user perceives no signs, it is a sign of an automated way. After repeated testing, the test results of the system under different test sample numbers are as follows: when the input student is 10 ~ 20, the recognition and sign-in correct rate is 85%; when the input student is 20 ~ 50, the correct rate is 80%. There is an error rate of about 20% in the test results. Most students face information errors that will change, such as changes in facial features, accessories, cosmetics and lighting caused by medical plastics, making it impossible to extract the correct logo from the picture; Another main reason is the accuracy of identification code comparison. The system fails to correctly judge that the two identifiers are very similar. Under various perfect conditions, make sure to adapt to various situations

.

TABLE 4
TEST NUMBER AND ACCURACY RATE TABLE

Test number	Correct rate
10～20	85%
20～25	80%
25～30	78%
30～35	75%

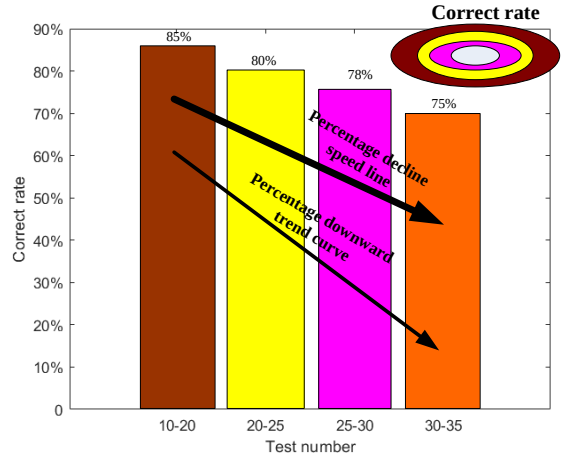

FIGURE 6. Test number and accuracy rate chart

V. CONCLUSIONS

(1) College attendance management for students has become one of the hot issues in the society, so the management of college students should be strengthened. However, most college students still use traditional manual attendance for daily attendance, using paper signatures or teacher orders, but now with the gradual rise of technology, some new methods point out that gradually, a few colleges and universities will use punch card fingerprints and smart attendance methods. Although there are some ways to stimulate attendance, the effect is not so effective. Attendance and these methods have a common shortcoming, fraud will occur, thereby increasing the rate of absenteeism. This repeated phenomenon not only has a negative impact on students' psychology and physiology, but also maintains the normal order of university teaching and hinders the quality of teaching. At the same time it will have a very unfavorable situation training and the formation of university spirit and discipline.

(2) In this paper, a face recognition attendance system based on real-time video processing is designed, and two

colleges in a province are selected for real-time check-in and inspection of student attendance. This article mainly sets four directions to consider the problems: the accuracy rate of the face recognition system in the actual check-in, the stability of the face recognition attendance system with real-time video processing, and the truancy rate of the face recognition attendance system with real-time video processing It is difficult to analyze the interface settings of the face recognition attendance system using real-time video processing. By analyzing the situation of these problems, the concept of attendance system based on face recognition technology is proposed, and the research on face recognition attendance system based on real-time video processing is carried out. Research data shows that the accuracy of the video face recognition system is about 82%. The face recognition time attendance system and manual fingerprint punching are more stable and correctly identify check-ins, and the rate of skipping classes is significantly reduced compared with the control group, only about 13%. Compared with the control group, the efficiency is greatly improved, which can prevent students from leaving early and skipping classes.

(3) The attendance system realizes the expected attendance results through face recognition technology with the help of a computer, which fully reflects the feasibility design of the overall algorithm. The students who completed the attendance sign-in system quickly completed the tasks, got rid of the complicated sign of roll call, and soon realized the sign of operation and function. The future system time and the form of attendance system conversion have made tremendous innovations, greatly improving the attendance rate and the reliability of face recognition technology. It is worthy of further exploration and realization by our scientists.

REFERENCES

[1] Solanki, K., Pittalia, P. "Review of face recognition techniques", *International Journal of Computer Applications.*, vol. 133, no. 12, pp. 20-24, 2016.

[2] Stoll Chloé, Richard, P. G., Roberto, C., Junpeng, L., Dye, M. W. G., & Florent, A. "Face recognition is shaped by the use of sign language", *Journal of Deaf Studies & Deaf Education*., vol. 23, no. 1, pp. 1-9, 2018.

[3] Deng, W., Hu, J., Guo, J. "Face recognition via collaborative representation: its discriminant nature and superposed representation", *IEEE Transactions on Pattern Analysis and Machine Intelligence*., vol. 40, no. 10, pp. 1-1, 2017.

[4] Pei, T., Zhang, L., Wang, B., Li, F., & Zhang, Z. "Decision pyramid classifier for face recognition under complex variations using single sample per person", *Pattern Recognition*., vol. 64, no. C, pp. 305-313, 2016.

[5] Shi, H., Wang, X., Yi, D., Lei, Z., Zhu, X., & Li, S. Z. "Cross-modality face recognition via heterogeneous joint bayesian", *IEEE Signal Processing Letters*., vol. 24, no. 1, pp. 81-85, 2017.

[6] Ding, C., Tao, D. "Trunk-branch ensemble convolutional neural networks for video-based face recognition", *IEEE Transactions on Pattern Analysis & Machine Intelligence*., vol. PP, no. 99, pp. 1-1, 2016.

[7] Nemirovskiy, V., B., Stoyanov, A. K., Goremykina, D., S. "Face recognition based on the proximity measure clustering", *Institute of Cybernetics of Tomsk Polytechnic University*., vol. 40, no. 5, pp. 740–745, 2016.

[8] Taniya, K., Nidhi, M., Nandini, T. "Automated human resource and attendance management system based on real time face recognition", *IJSRSET*., vol. 16, no. 4, pp. 847-853, 2016.

[9] Wu, D., Tang, Y., Q., Lin, G., H., & Hu, H. "Roboust face recognition based on significance local directional pattern and deep learning", *Guangdianzi Jiguang/Journal of Optoelectronics Laser*., vol. 27, no. 6, pp. 655-661, 2016.

[10] Sun, Y., Zhao, J., Hu, Y. "Supervised sparsity preserving projections for face recognition", *Proceedings of Spie*., vol. 8009, no. 4, pp. 357-366, 2017.

[11] Best-Rowden, L., & Jain, A., K. "Longitudinal study of automatic face recognition", *IEEE Transactions on Pattern Analysis & Machine Intelligence*., vol. PP, no. 99, pp. 1-1, 2018.

[12] Valentine, T., Lewis, M., B., & Hills, P., J. "Face-space: A unifying concept in face recognition research", *Quarterly Journal of Experimental Psychology*., vol. 69, no. 10, pp. 1996-2019, 2016.

[13] Duan, Y., Lu, J., Feng, J., & Zhou, J. "Context-aware local binary feature learning for face recognition", *IEEE Transactions on Pattern Analysis & Machine Intelligence*., vol. PP, no. 99, pp. 1-1, 2017.

[14] Nemirovskiy, V., B., Stoyanov, A., K., Goremykina, D., S. "Face recognition based on the proximity measure clustering", *Institute of Cybernetics of Tomsk Polytechnic University*., vol. 40, no. 5, pp. 740–745, 2016.

[15] Chakraborty, S., Singh, S., K., & Chakraborty, P. "Local gradient hexa pattern: a descriptor for face recognition and retrieval", *IEEE Transactions on Circuits & Systems for Video Technology*., vol. PP, no. 99, pp. 1-1, 2016.

[16] Best-Rowden, L., & Jain, A., K. "Longitudinal study of automatic face recognition", *IEEE Transactions on Pattern Analysis & Machine Intelligence*., 2017, vol. 40, no. 1, pp. 148-162, 2018.

[17] Feng, Q., Yuan, C., Pan, J., S., Yang, J., F., Chou, Y., T., & Zhou, Y. "Superimposed sparse parameter classifiers for face recognition", *IEEE Transactions on Cybernetics*., vol. 47, no. 2, pp. 378-390, 2017.

[18] Valentine, T., Lewis, M., B., & Hills, P., J. "Face-space: A unifying concept in face recognition research", *Quarterly Journal of Experimental Psychology*., vol. 69, no. 10, pp. 1996-2019, 2016.

[19] Mudunuri, S., P., & Biswas, S. "Low resolution face recognition across variations in pose and illumination", *IEEE Transactions on Pattern Analysis & Machine Intelligence*., vol. 38, no. 5, pp. 1034-1040, 2016.

[20] Li, Y., Song, W., Cheng, C. "Attendance system of face recognition based on raspberry pi%", *Microcontrollers and Embedded System Applications*., vol. 16, no. 11, pp. 28-30, 34, 2016.

[21] Bharadwaj, S., Bhatt, H., S., Vatsa, M., & Singh, R. "Domain specific learning for newborn face recognition", *IEEE Transactions on Information Forensics & Security*., vol. 11, no. 7, pp. 1-1, 2016.

[22] Zhu, X., Liu, H., Lei, Z., Shi, H., Yang, F., & Yi, D. "Large-scale bisample learning on id versus spot face recognition", *International Journal of Computer Vision*., vol. 127, no. 6-7, pp. 684-700, 2019.

[23] Nguyen, H., Yang, W., Sheng, B. "Discriminative low-rank dictionary learning for face recognition", *Neurocomputing*., vol. 173, no. P3, pp. 541-551, 2016.

[24] Ji, H., K., Sun, Q., S., Ji, Z., X., Yuan, Y., H., & Zhang, G., Q. "Collaborative probabilistic labels for face recognition from single sample per person", *Pattern Recognition*., vol. 62, no. C, pp. 125-134, 2017.

[25] Wang, L., Chen, S. "Joint representation classification for collective face recognition", *Pattern Recognition*., vol. 63, no. Complete, pp. 182-192, 2017.

HAO YANG was born in Yongkang，Zhejiang,P.R. China, in 1986. He received the Doctor degree from University of Chinese Academy of Sciences, P.R. China. Now, he works in College of Media Engineering, Communication University of Zhejiang. His research interest include formal method and face recognition.
E-mail: 415360889@qq.com

XIAOFENG HAN was born in Taian, Shandong, P.R. China, in 1982. He received the master‘s degree from Shandong University of Science and Technology, P.R. China. Now, he work in College of Mathematics and Systems Science, Shandong University of Science and Technology. His research interest include image processing, information and computing science.
E-mail: hs56923@.163.com