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Application of a Classroom Check-in and Naming System

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Abstract

With the rapid development of information technology and Internet of things, the traditional classroom check-in mode is no longer applicable. The current commonly used attendance technology and methods are compared, and a check-in system and device based on face recognition technology and distributed thought are introduced, which provides sufficient guarantee for efficient and accurate classroom check-in.

Keywords

Naming System; Face recognition; Distributed System.

1. Background

In order to ensure the quality of teaching, college teachers will ask students to sign in or call the roll before class to ensure the attendance rate of students. Currently common methods include:

1. A roster of students for this course is provided and signed by the students themselves.

2. According to the roll of students who choose this course, teachers call the class and students answer and confirm.

3. A card-swiping device is provided for students to swipe the campus card before class [1].

4. Based on WeChat or App in smart phone, students scan QR code on site to confirm [2].

5. Face recognition device is provided for students to swipe their faces and sign in before class [3].

6. Face recognition and card swiping device is provided. Students swipe campus card on the device before class, and the device automatically takes on-site photos and compares them with student profile photos

The above methods have the following problems:

In mode 1, 2, 3 and 4, there are questions that other students sign in and answer on behalf of others, which cannot fully confirm the identity of students.

In mode 4 each student are required to carry a smartphone, which is expensive and can be lent to other students for confirmation.

Mode 5 has high accuracy, but the current technical scheme does not dock with the school curriculum in real time. Because of the large number of students and the limited classroom resources, a classroom will arrange courses of different majors, grades and classes in different times. The device needs to match the photos of all the students after taking the students 'live photos. It takes a long time to identify and easily causes the queue to sign in.

Mode 6 has high accuracy and fast matching, but it is impossible for students to forget to carry campus cards.

Ways 5 and 6 ensure the accuracy of check-in, but they cannot avoid the problem of students leaving the classroom without taking class after check-in.

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2. Technical proposal

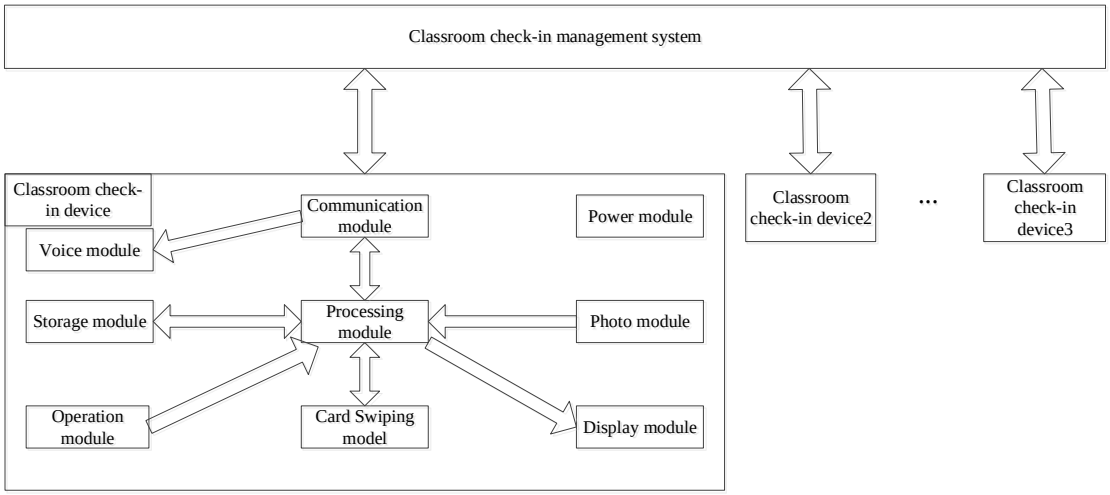

Figure 1 system architecture

In order to solve the above problems, the following technical scheme is designed and implemented. The system architecture is shown in figure 1.

1. A check-in device is designed. The device is installed in each classroom and connected with the class check-in management system on the server side through the network. The class check-in management system calls the data of the course scheduling system and the student information management system, and makes the course information (course name, course teaching) 20 minutes to half an hour before each class. Teacher's name, teacher's photo and all student information (student information refers to campus card number, student number, name, gender, class) and certificate are sent to the device.

2. The device supports the automatic collection of students 'on-site photos and student ID photos for face matching after the students brush the campus card at the time of check-in. It also supports the direct collection of students' on-site photos without swiping the card and the identification matching of all student ID photos issued for the elective course of this lesson.

3. The device supports automatic voice announcement of roll call, and in the process of roll call, students with corresponding names will be shown to sign in photos on the spot, assisting teachers to confirm whether the students are the roll-call students themselves.

4. The device consists of swipe card module, photo module, communication module, voice module, display module, operation module, storage module, power module and processing module.

The card swiping module is an NFC sensor or an RFID sensor, which is used to read the information of swiping students from campus CARDS.

The photo module is a front-facing camera, which is used to take on-site check-in photos of students.

Communication module is a wireless network adapter supporting WIFI protocol. It is used to acquire the course information of the next class, all the students 'information and certificates of the course from the classroom check-in management system, and to upload the check-in confirmation information, including student number, check-in time, classroom location and course name, to the classroom check-in management system.

The voice module is a Chinese voice synthesis chip, which is used to announce the names of students when they call names automatically.

The display module is a TFT-LCD screen supporting touch. It is used for displaying the sign-in course information and sign-in prompt information on the device, and for displaying the student's ID photos and corresponding personal information after taking the student's photo on the spot in the photo module. If there is no matching student information, the prompt information of "you did not take this course" will be displayed.

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The operation module is a virtual button on TFT LCD screen, which supports touch operation, including "modify configuration" button, "course check-in" button, "student identity confirmation" button, "full roll-call" button, "random roll-call" button and "cancel check-in" button, and input box of teacher's work number and password.

The operation module is also used to set configuration information on the device. Click on the "Modify Configuration" button, enter the device's default password, and enter the configuration interface. Configuration are includes: device deployment classroom location, classroom check-in management system server address, the interval time between two students during roll call, configuration information is saved in storage module after setting up.

For the students who do not carry the campus card, click the "course check-in" button, the processing module calls the photo module to take the students 'live photos, and matches all the students' certificate photos sent down to the device. If the matching is successful, the students 'certificate photos and personal information will be displayed on the display module, if there is no matching. Student, show the information of "You are not taking this course".

For the students whose photo matching degree does not reach the system threshold, if the instructor confirms that the student is a student of this course, he enters the teacher's work number and authentication password in the operation module. If the identity authentication is successful, the list of students 'information for the course is displayed in the display module, and the teacher selects the identity pair in the list. The corresponding students click the "student identity confirmation" button, for manual confirmation.

Teachers click on the "full name call" button or the "random name call" button post-processing module will call the voice module to broadcast the names of students automotive at intervals set by the call interval.

In the process of roll call, when the students do not respond or the students do not match the identity of the students, the teacher clicks the "cancel check-in" button to delete the points to the students 'classroom check-in records.

The storage module is SD card, which is used to store the configuration information on the device and the corresponding course information, student information and certificate photos for each class.

Processing module is ARM processor or STM32 processor, which is used to run binary applications, control the operation of other modules, and realize the application logic of this program. Processing module obtains course information from the classroom check-in management system 30 minutes before each class begins, and students 'information and certificates for the course are selected. At the end of each class, all check-in information of the class will be uploaded to the class check-in management system server, and all information of the course will be deleted from the device storage module.

The power module is a large capacity lithium battery and charging circuit, which is used to supply power for the whole device.

3. Workflow

The classroom check-in workflow designed in this paper is as follows:

1. Power on the device, load the application binary code, and complete the initialization of each module.

2. The process system call the display module. If the current time is class time, the course information of this class will be displayed on the screen; otherwise, the course information of the next class will be displayed.

3. The swiping card module detect whether there is any campus card in contact with it. If there is, read the campus card number, and turn to step 4; if so, go to step 7; otherwise, go to step 2

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4. If you fail to read the campus card number or the campus card number is not in the number set of campus card of the list of students who take the next class. Turn to step 2; otherwise, go to step 5.

5. Processing module calls the photo module to take on-site check-in photos of students swiping cards.

6. The processing module matches the card number to the corresponding student's personal information and ID photo. The processing module calls the face matching subroutine to calculate the similarity between the on-site check-in photo and the corresponding student's id photo. If the similarity is greater than the matching threshold set by the system, the identity matching is successful, and the processing module confirms that the student has checked in, go to step 2, otherwise go to step 8.

7. The processing module calls the face matching subroutine and calculates the similarity between the on-site check-in photos and the entire student's ID photos of the elective course in turn. If the maximum similarity is greater than the matching threshold set by the system, the processing module confirms that the student is the student corresponding to the maximum similarity photos, confirms that the student has checked in, and turns to step 2, otherwise. Step 8.

8. For the students whose photo similarity is lower than the threshold, the instructor verifies that they are the students themselves. In the operation module, input the teacher's work number and password. Connect the course sign-in management system to check whether they are the instructors of this course. If so, turn to step 9, or turn to step 2.

9. Teachers click on the button of "Student Identity Confirmation" in the operation module to confirm that the student has signed in. Step 2. If the teacher confirms that the student is not himself, go to step 2 directly.

4. Conclusion

The main features of the classroom check-in device designed in this paper include:

1. Students are supported to sign in by swiping their cards and brushing their faces directly at the same time. In the process of swiping their cards, students ‘photographs are compared with those of corresponding campus cards and those taken on the spot. In the process of direct brushing their faces, students only need to compare the student's photographs of the selected course with those of students' photographs taken on the spot, which greatly shortens the scope of face matching. In addition, the face recognition process is completed by the processing module. This way does not need to communicate with the remote server, and avoids the impact of network delay.

2. The device can automatically call names, and display the corresponding students ‘on-site sign-in photos to help teachers confirm the identity of students. It has strong practicability.

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