

Implementation of a Wireless Network for Class Attendance System Using Face Recognition and GSM

Sulakshna Sarkar, Pradnyali Gaikwad, Sneha Agrawal, Seema Arote

Abstract— *this paper describes a Class attendance system. It uses Face Recognition and Rfid as the two parameters for marking the Attendance of students. The attendance of the students is also updated to the Head of department. Classroom and Head of department is connected through a Zigbee network. If the student is present an SMS is sent to the parent. Authentication is a significant issue in system control in computer based communication. Human face recognition is an important branch of biometric verification and has been widely used in many applications, such as video monitor system, human-computer interaction, and door control system and network security. This paper describes a method for Student's Attendance System which will integrate with the face recognition technology using Principal Component Analysis (PCA) algorithm. ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. Zigbee has been proposed as the wireless network in this system because it is low cost and easy.*

Index Terms—Face Recognition, Attendance, PCA, Zigbee, Rfid.

I. INTRODUCTION

In many institutions and organization the attendance is a very important factor for various purposes and its one of the important criteria that is to follow for students and organization Employees. The previous approach in which manually taking and maintains the attendance records was very inconvenient task. Traditionally, student's attendances are taken manually by using attendance sheet given by the faculty members in class, which is a time consuming event. Moreover, it is very difficult to verify one by one student in a large classroom environment with distributed branches whether the authenticated students are actually responding or not. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. If an automatic attendance system is developed for attendance, it eliminates the need for stationary materials and personnel for the keeping of records. The results showed improved performance over manual attendance management system. Attendance is marked after student identification, a minimum percentage of class attendance is required in most institutions and this policy has not been adhered to, because of the various challenges the present method of taking attendance presents. This traditional method involves the use of sheets of paper or books in taking student attendance.

This method could easily allow for impersonation and the attendance sheet could be stolen or lost. Taking of attendance is time consuming and it is difficult to ascertain the number of students that have made the minimum percentage and thus eligible for exam. Thus, there is a need for a system that would eliminate all of these trouble spots. An automatic attendance management system using biometrics would provide the needed solution. An attendance management system is software developed for daily student attendance in schools and institutions. It facilitates access to the attendance of a particular student in a particular class. This system will also help in generating reports and evaluating the attendance eligibility of a student.

A. Background and Related Work

Development of automated face recognition started in the 1960s, the first semi-automated system for face recognition required the user to locate features (such as eyes, ears, nose and mouth) on the photographs before it calculated distances and ratios to a common reference point, which were then compared to reference data. In the 1970s, Goldstein, Harmon and Lesk used 21 specific subjective markers such as hair colour and lip thickness to automate the recognition. The problem with both of these early solutions was that the measurements and locations were manually computed. In 1988, Kirby and Sirovich applied principle component analysis, a standard linear algebra technique, to the face recognition problem. This was considered somewhat of a milestone as it showed that less than one hundred values were required to accurately code a suitably aligned and normalized face image. In eigenfaces techniques, the residual error could be used to detect faces in images- a discovery that enabled reliable real-time automated face recognition systems.

II. CONCEPT

Attendance is the most basic job in every institution or organization. Manual methods have been used since a long time. Integrating Face Recognition for attendance system is an innovative technique.

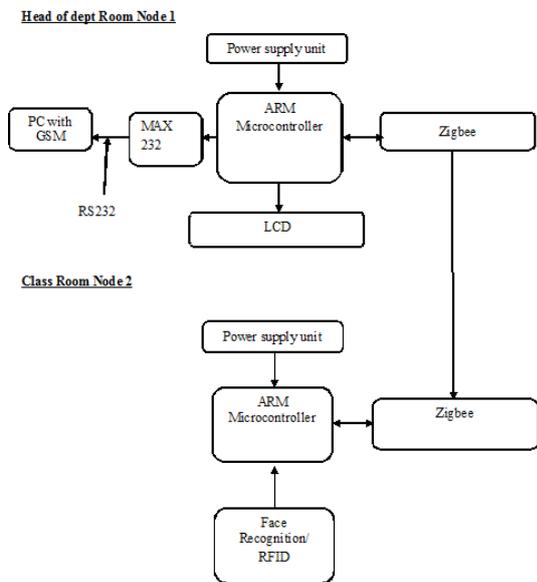


Fig. 1 Architecture of the System

As shown in fig. 1 classroom and the Head of Department (HOD) cabin are connected through Zigbee. At the classroom entrance the student's attendance will be marked after face recognition and identity card .i.e. Rfid. The record of the attendance will be available to the HOD. If the student is present then a sms will be sent to their parents automatically from the HOD cabin. An extra person is not required to take the attendance from the classroom to the HOD cabin. The aspect that sets us apart from the existing approaches of Class attendance system is that instead of just keeping a record of attendance of students, parents are also informed about the doings of their children.

III. FACE RECOGNITION

It is necessary in our working the proper Recognition of face. Matlab software is used for face recognition. One of Matlab's goals is to provide a simple-to-use computer vision infrastructure that helps people build fairly sophisticated vision applications quickly. Matlab library contains many functions that span over many areas of vision. The user stands in front of the camera keeping a minimum distance of 50 cm and his image is taken as an input. The frontal face is extracted from the image then converted to gray scale and stored. The Principal component Analysis (PCA) algorithm is performed on the images and the Eigen values are stored in a file. When a user requests for recognition the frontal face is extracted from the captured video frame through the camera. The Eigen value is re-calculated for the test face and it is matched with

the stored data for the closest neighbour. Uigetfile command is used for adding an image in the database. Dialog box is used to write messages as required. If the person is a student of the class, message displayed in the dialog box is "Authenticated", if the person is not a student of the class message displayed is "Not Authenticated".

B. Principal Component Analysis

PCA commonly referred to as the use of eigenfaces, is the technique pioneered by Kirby and Sirovich in 1988. With PCA, the probe and gallery images must be the same size and must first be normalized to line up the eyes and mouth of the subjects within the images. The PCA approach is then used to reduce the dimension of the data by means of data compression basics and patterns. This reduction in dimension removes information that is not useful. The following steps summarize the PCA process.

IV. ZIGBEE

ZigBee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive range. Because ZigBee nodes can go from sleep to active mode in 30ms or less, the latency can be low and devices can be responsive, particularly compared to Bluetooth wake-up delays, which are typically around three seconds. Because ZigBee nodes can sleep most of the time, average power consumption can be low, resulting in long battery life. Due to the above reasons Zigbee has been proposed as the wireless network for this implementation.

V. RFID

Radio frequency identification, or RFID, is a generic term for technologies that use radio waves to automatically identify people or objects. Rfid cards are used as the identity cards for students and the second parameter for marking the attendance

VI. GSM

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. Computers use 'at' commands to control modems both GSM modems and dial-up modems support a common set of standard 'at' commands. GSM modem is used to send SMS to the parents from the institute in this proposed approach.

I. SYSTEM IMPLEMENTATION

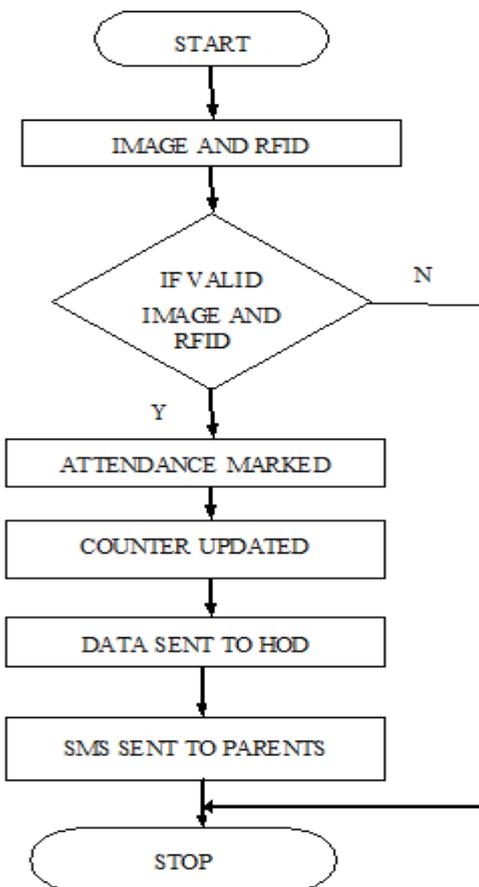


Fig. 1

VII. EXPERIMENTAL RESULTS



Fig. 3

Fig. 3 shows a set of training images. We performed a set of experiments to demonstrate the efficiency of the proposed method. Images of different persons are used in training set. Experiments showed that with the increasing face angle with respect to camera face recognition rate decreases.

VIII. FUTURE SCOPE

- We can use other methods too for face recognition. In our project we have used principal component analysis; other methods can also be used for the same.
- The Wireless network used in this project is Zigbee so there is a limitation for range. Better Wireless Networks can also be used.
- We can use thumb impression also in this same project, So that the Attendance system becomes better. The speed at which the Face recognition is done remains a problem.

IX. CONCLUSIONS

Thus we propose a Wireless Network connecting the HOD and Classroom which will use the innovative technique of Face Recognition for attendance of students that will be very useful as compared to the existing techniques involving manual work which are prone to errors.

X. ACKNOWLEDGMENT

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