OTP and Facial Recognition based Attendance System

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Abstract— Today in most colleges and universities attendance is done manually or by biometric means which takes a considerable amount of time or require a large number of resources. The pen and paper based attendance system requires a large amount of human effort and hence resulting in manual errors. Whereas the biometric system requires a large amount of capital cost and the considerable amount of operational cost. We propose a fully software based approach using android application which uses OTP and facial recognition base authentication methods to reduce the nuisance of pen and paper based attendance system, proxies, and the high maintenance cost of the biometrics.

Keyword—User Authentication, Portable Attendance System, Android Platform, Mobile Application, Facial Recognition, OTP (One Time Password), MAC (Media Access Control), Database.

I. INTRODUCTION

The generic way of taking attendance has always been the pen and paper method, where either the teacher calls out the name of the student to mark their attendance or pass an attendance sheet around for the student to mark their attendance. The job of the teacher is not done here then he goes back and updates this data to his database. This process is not only time taking but is highly error prone.

On the other hand, the biometric system involves a great amount of capital and operational investment. In this system the students have to authenticate them self at the single device which is in place for the whole class, this creates a bottleneck as for an average class of sixty students will take ten minutes of the teaching.

The system proposed here provide full software based and distributed approach for attendance registering system [1]. This system uses android applications, which are part and parcel of our everyday life and can be easily installed independently on mobile devices. The system uses a fully software based approach for authentication which involves OTP, facial recognition using the android device and the MAC addresses of the physical device placed in the department.

II. RELATED WORK

There has been a significant amount work already done in this area, but none of it provide a cost efficient and fast way.
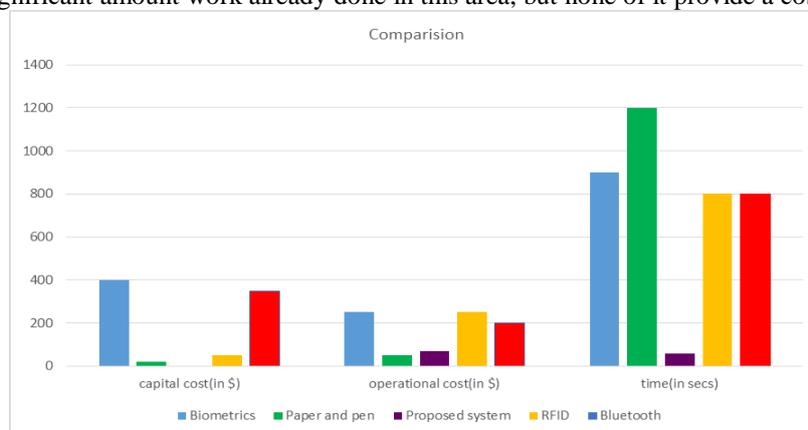

Figure 1 Comparison of the related system.

The graph shows the comparison between the various types of the system currently in use or proposed, the data was collected on a class of sixty students over a period of thirty days. The graph shows the capital cost involved in installing the system, the operational cost involved in maintaining the system for thirty days and the time (in second) needed to register the attendance. The graph clearly depicts the inefficiency of these systems.

A. Pen-Paper System
Pen paper method is monotonous for teachers. The teacher has to calculate attendance after the end every month. There are even more chances of proxies' and it is very tedious for class teachers to maintain paper-based attendance of a whole

class of sixty students. It is also not natured friendly as on an average a university consumes near about 0.20 million paper on attendance. Using Android application helps in checking proxies and also in saving paper.

B. Biometric System

Biometric system has its prime focus in fingerprints based attendance system. Biometric technologies used to measure and analyze personal characteristics for attendance verification [4]. A biometric system is quite costly and difficult to maintain.

The iris recognition system is another useful system, but it is very intrusive and expansive [10]. Comparisons of templates record can take upwards of 10 seconds, hence, for a whole class to mark their attendance would take near about 15-20 min. However, the 2D facial recognition is not intrusive and it's easier to implement with the Android application.

C. Bluetooth system

The Bluetooth has high usability and proxy removal techniques that can be included in making the system perfect. But the major limitation is that only 10-12 student can connect through Bluetooth at a time [2]. The other problem associated with Bluetooth is data where we going to save such a large data.

D. RIFD System

Colleges utilizing RFID innovation helps in keeping up the programmed consistency of understudy participation and making a move against latecomers and non-actively present students. RIFD system is the costliest system of all available systems [3]. Storing data in RIFD is kind of tedious task. Installing such a system in University needs a large amount of Capital cost and Operational cost.

III.   PROPOSED SYSTEM

There are two android applications one for the students and one for the teachers. At first, students and teachers are required to register with the department for their username and password. Almost every department has its own database containing the information related to student's name, unique registration number, etc. This data can be further utilized during the authentication process. The student's username is their unique University registration number and the password will be provided by the department and the process for teacher's registration is very similar. The MAC address of the Wi-Fi routers is also stored as the server. During the first time login, students and teachers have the privilege to change their password as per their convenience.

The pre-requisite of this system is that the student and the teacher device needs to be connected with the college or department Wi-Fi routers. When the teacher enters the class, he logs in to the android application using the credentials created during the sign-up process. After the teacher is log in he enters the details of the lecture such lecture time, the topic covered etc. After he has entered this data, he gets a six digit OTP on his screen. This OTP needs to be physically shared with students. By this time, the students are logged into their application. As soon as they log in they get a time interval of 20s to fill in the OTP provided to them. As soon as they enter the OTP, the front camera of their phone clicks a picture of them and use the face detection API to see if it's a match. The Wi-Fi routers MAC address, OTP and facial detection provide the basis for authentication.

A. Three-way authentication

1) MAC address: During the first authentication process the MAC address (Physical address) of the Wi-Fi router through which the student is connected is matched with the MAC addresses already stored at the server. If the MAC addresses matches, then the application will perform further authentication steps.

2) OTP: This can be called as the zest of the whole attendance management system. Teacher's application will generate a 6 digit unique OTP. The teacher will write that OTP on the board and that OTP will be only valid for 20 seconds only. Giving such, a short time will help in checking proxies. For example, a student A is standing outside the class and waiting for his friend B, who is inside the class to tell him the OTP written on the board. The time limit of 20 seconds will make impossible for student A to register himself/herself first and then forward the OTP to his friend.

3) Face Recognition system: The third part of authentication is most important. When the OTP is successfully checked and confirmed by the server, after that it is time for facial recognition. The student's application will click a picture using smartphone's front camera. This picture will then automatically check the pre-stored student's picture.

If the database picture matches with the student have clicked the picture, then the attendance will be registered.

B. Network Architecture

It is a client-server model. The student and teacher's applications are the client here and the department system acts as a server. Client-server model provides high processing and large disk storage. Client does not share information, but rather request that information from the server. Client-server architecture also provides central security to the whole system. The client and server communicate with each other using messages.

C. Database Platform

The database can be defined as the organized collection of data. Database management system (DBMS) is used for managing and organizing the data. The database platform used is Oracle 10g enterprise edition. Oracle 10g enterprise edition provides high availability, end-to-end reliability and high scalability [9].

D. Software requirements
The student and teacher's application is design to have compatibility with the APIs. Android holds the 85% market share of the smartphones. Android has revolutionized the way of creating and consuming information [7] [8].

- Android 6.0
- Android 5.0,5.1
- Android 4.0, 4.1, 4.2, 4.3, 4.4

E. Hardware requirements
The minimum requirements are -

- Processor – 300MHz
- RAM – 128 MB
- Internal storage – MB
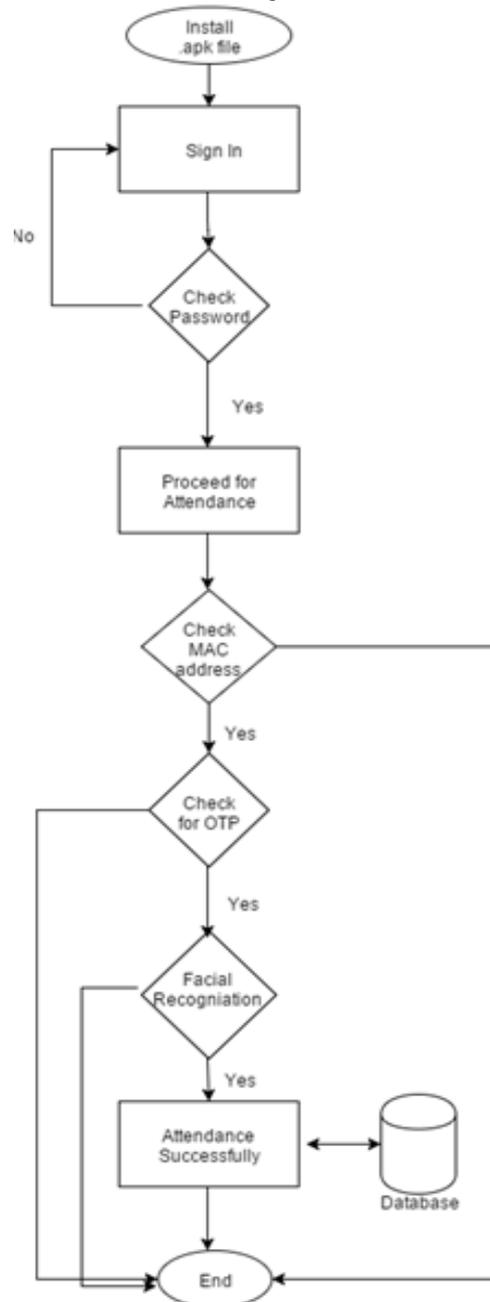- Smartphones must have a front camera for face recognition.

Figure 2 Proposed system.

IV. CONCLUSION
The system is portable and can be easily installed and used on any mobile phone running Android OS. The authentication model proposed in the system eliminates the nuisance of proxies completely by following a pure software approach, which reduces the cost involved with system considerably. The complete process of attendance registration takes place in just a few seconds, which saves precious lecture time.

The system is fast, cost efficient, reliable and saves lots of resources, which are involved at both ends like paper etc. As Android OS based devices hold the majority of the market the system is a good fit for colleges and can easily implement without needing additional architecture or devices. The implementation of the system is also not time-consuming like other systems, the system requires installing of two android applications, which takes a couple of minutes. Most of all the system automates the whole process of attendance and reduces human effort and that is what technology is meant to do.

V.   FUTURE SCOPE

The system can be further improved by developing applications that can run on various mobile OS, such as iOS and windows and interact with the system. With improvements in the facial detection API, we can add dynamic facial detection to the applications which will further improve the performance of the system. The significant increase in biometric integrated mobile devices (such as apple's touch ID), we can further improve the authentication process to completely eliminate the trouble of proxies.

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