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Procedia Computer Science 45 (2015) 524 – 527

Procedia Computer Science

International Conference on Advanced Computing Technologies and Applications (ICACTA-2015)

Bluetooth Smart based Attendance Management System

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Abstract

Bluetooth Smart is a wireless technology aimed at innovative applications in the healthcare, fitness, beacons, security, and home entertainment industries. The technology makes use of electronic tags to facilitate automatic wireless identification, with a Bluetooth Smart enabled device. We are attempting to solve the problem of attendance monitoring using a Bluetooth Smart based system in this paper. This application of Bluetooth Smart to student attendance improves the time taken during manual attendance and human errors and provides administrators the statistics of attendance scores for use in further managerial decisions.

Peer-review under responsibility of scientific committee of International Conference on Advanced Computing Technologies and Applications (ICACTA-2015).

Keywords: Bluetooth Smart; Lecture; Attendance; Tag; Student; Database

1. Introduction

Valuable lecture time is dedicated to attendance taking and sometimes it is inaccurate. It is time-consuming and laborious. Besides, the process being manual, it is very prone to personal errors. Making this problem automated through the use of Bluetooth Smart technology makes it more efficient and effective. Bluetooth Smart technology can be used since it is an automated identification and data collection technology. It is accurate and ensures timely entry of data. It come into existence only recently, but has tremendous future scope due to its low cost and compatibility with a large number of mobile phones, tablets and computers.

Bluetooth Smart combines microchip technologies and radio frequency to create a secure system which can be used for identification, monitoring and for maintenance of object inventories. Bluetooth Smart systems use tiny chips

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Peer-review under responsibility of scientific committee of International Conference on Advanced Computing Technologies and Applications (ICACTA-2015).
doi:10.1016/j.procs.2015.03.094

called tags. The tags themselves contain and then transmit some piece of identifiable information to a Bluetooth Smart enabled device.

Bluetooth Smart systems can deliver accurate and precise data about tagged items that improves efficiency and this ability will bring many other benefits to the business community and to consumers alike in the near future. In this paper, we present a smart Bluetooth Smart based lecture attendance management and control system tailored around the Mumbai University (MU) policy of ensuring a 75% course attendance by students for a course before likelihood of writing a semester examination for any course.

The application of Bluetooth Smart Technology to student lectures attendance monitoring problem in our proposal will lead to the creation of a student database management system that is not manipulated by anyone and not prone to errors, it will eliminate/reduce the wastage of quality time during manual collection of attendance, and most importantly it helps in better management of the classroom statistics for allocation of attendance scores, in a particular course, in the final grading of student performance.

2. Review of Related Work

An automated attendance management system using both a stationary RFID reader with four circulatory antennae and a handheld RFID reader was implemented in mobile and electronic platform respectively[1]. A system comprising of an antenna placed at the entrance of the classroom and a student database is depicted by the attendance management system in the electronic platform. As students enter their class, their names are shown on the screen in order to ascertain that their attendance has been marked in the professor's database. However, one major drawback of this system is that as the distance between the RFID tags and electronic device decreases the RFID tag read rates tremendously. A different type of automatic attendance system was proposed that uses fingerprint verification technique[2]. The technique of extraction of abnormal point on the ridge of user's fingerprint or minutiae made the fingerprint technique verification achievable. This verification is used to confirm the authenticity of a user who is authorized by comparing the captured fingerprint template with the stored templates in the database. Another system is based on true or false value of previous verification of person's authenticity[3]. Authors also reviewed and proposed biometric system for attendance automation of employees in an organization using fingerprint identification[4].

In [5], a RFID based system detects and identifies tags and is used to mark students' attendance. A computer has been used as the medium to perform this task. The RFID reader detects the presence of a tag and the system processes this information on the computer according to the programmed instructions. The tractability, availability and receptiveness of the technology highly affect the ease with which RFID system can be integrated into current operations. The system provides an effective solution to lecture attendance problem by organizing the design of software and hardware along with efficient exchange of data between the RFID tag and reader which is interfaced with the computer.

3. Proposed Model and Working

For RFID based systems, in case of scanning the tag, the tag must be close or in contact with the RFID reader to send the information to an established database, which interprets the data stored on that tag. This process needs monitoring as to who is scanning the tag to avoid proxies. The scanning time is approximately same as the time it takes to manually count the students in the class.

The development of industrial wireless sensors has led to important demands for the wireless technologies like low energy consumption and a resource saving simple protocol stack. Bluetooth Smart is a rather new wireless standard which will completely fulfil these fundamental requirements.

The proposed Bluetooth Smart system offers many advantages because electronic tags can be embedded into the student identification cards (student ID card); has low power consumption; the electronic tag can be read during motion as well and no line of sight is required for wireless communication between the tag and the reader. Tags can be read even if submerged or covered with dirt, are almost indestructible, and have unalterable permanent serial

code that prevents tampering.

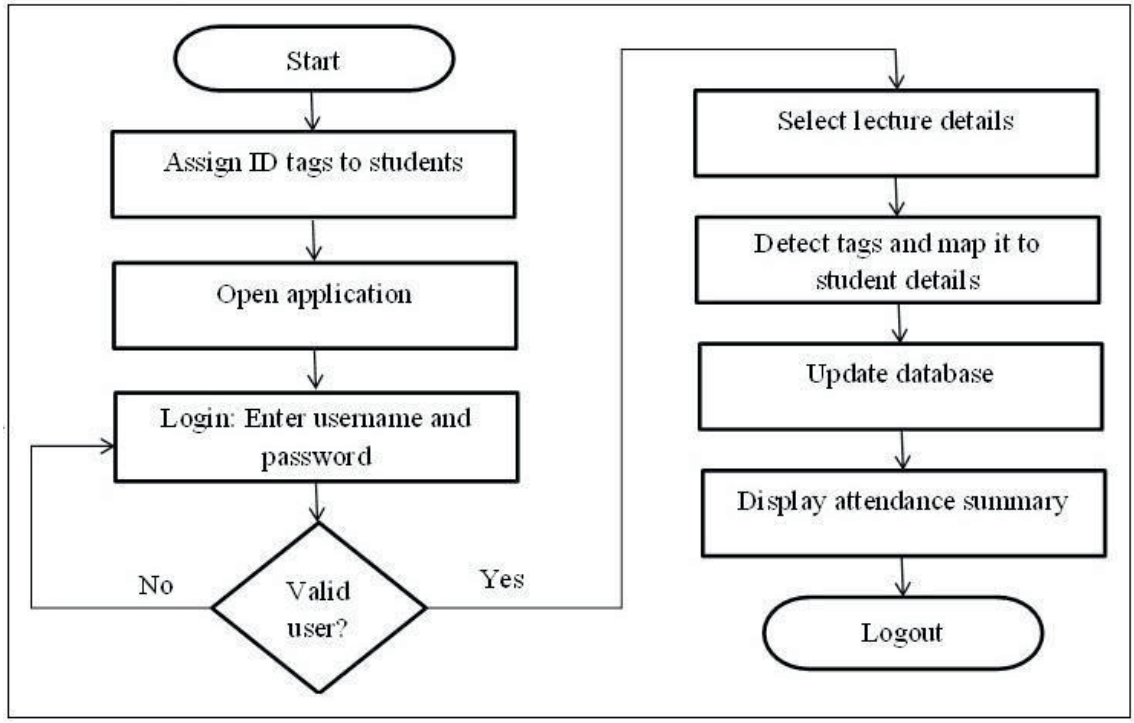

Fig.1. Flowchart showing the mode of operation of the student attendance management system

A Bluetooth Smart chip is programmed and configured such that it works in connection with the Android application via Bluetooth. Every student is given a specific tag, which can then be detected by the application via Bluetooth Low Energy. When he/she attends the lecture, a serial number (related to each student's SAP number) of the tag is associated with the student database entry. Therefore, every time a student carries his/her card and is attending the lecture the entries will be entered into the database with the time stamp as the lecturer moves around the class and the application detects the tags. Also, the application is configured to detect tags only within a particular range in order to avoid detection of tags that are outside the class.

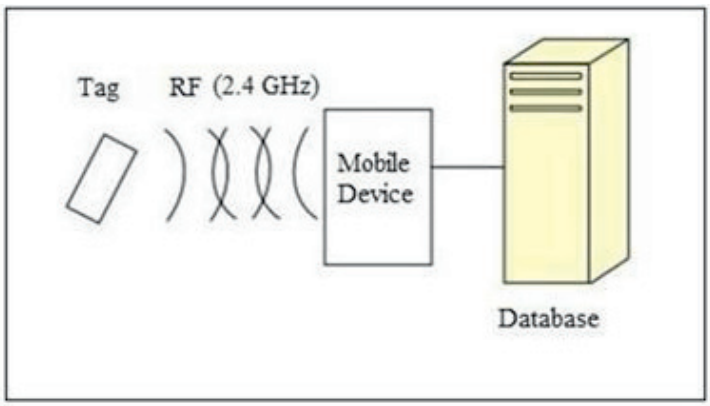

Fig.2. Depiction of Bluetooth Smart system operation

Bluetooth Smart technology operates in the same spectrum range (the 2.400 GHz-2.4835 GHz ISM band) as Classic Bluetooth technology. Bluetooth connects the tag with the mobile device. The application checks for the validity of the tag. If the tag is valid, it continues to the database program and then registers the student's attendance for the particular course. If the tag is found to be invalid, the application provides a notification that the tag has not been registered to any student and the user is required to supply a valid tag.

The professor can use queries provided by the application to obtain more information about the attendance of a particular student or the entire class. The professor can grade students based upon their attendance for a particular course by entering the specific parameters in the application as specified by the university and can also generate reports weekly, monthly or for an entire semester. Additionally, the system can be used to notify the parents of defaulting students. The administrator assigns tags to the students and can not only designate new tags but also assign an existing tag linked with a particular student to another student.

4. Conclusion

In this paper, we have discussed an automated attendance recording system that utilizes the capabilities of Bluetooth Smart technology. The major advantages of a Bluetooth Smart based system are:

- Low power consumption
- High data transfer rate
- Small size of chips and low cost
- Simple implementation of Bluetooth Smart based wireless sensors

As Bluetooth Smart technology evolves, sophisticated applications in a variety of fields like healthcare, inventory management and sports can make use of this technology to design simpler, cheaper and more efficient solutions.

Acknowledgements

We would like to thank Prof. Harish Narula for guiding us with the research. We are also grateful to the principal of D. J. Sanghvi College of Engineering, Dr. Hari Vasudevan, and Head of Department of Computer Engineering, Dr. Narendra Shekokar, for giving us the facilities and providing us with a propitious environment for working in college. We would also like to thank S.V.K.M. for encouraging us in such co-curricular activities.

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