

Fusion of Radio Frequency Identification (RFID) and Fingerprint in Boarding School Facilities Management System (FAMs)

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Abstract — Boarding School (BS) may offer variety of extracurricular activities where conducive learning environment with good facilities such as computer room, gymnasium and entertainment room contribute to good way of mind relaxing and boost up brains development . By enhancing security in BS facilities, help the school management to provide visibility of assets and effective users tracking. By using RFID technology, it is easier and faster to detect students handling at that time and reduce assets losses. In this system the fingerprint recognition is adopted to enable the process of identifying of BS student more reliable and secure. The application of FAMs as a Boarding School facilities management system will improve school management procedure, monitor the interest group movements automatically and increase assets security. This research work offers an important implication for monitoring the BS assets and eases the workload of the school management and save time for various student activities. In order to analyze and design the system, those who want to implement this application must have their metric cards embedded with RFID tag and fingerprint registered to the access system .When the metric card passes through the RFID reader and fingerprint image authentication system verified ; the system will trigger the data from the RFID tag to the database where the access data can be view online by BS management for monitoring purposes. Thus present an easy access to BS facilities and reduce unattended assets loses.

INTRODUCTION

Effort to monitor the BS facilities [1], provided for active leisure and passive leisure activities such as playing games, watching television and internet surfing can be unforced if auto-id technologies is used to reduce the time and main power to make sure only authorize individual accessing the facilities. In this paper, we present Radio Frequency Identification (RFID) integrating with biometric recognition to help securing BS facilities; where RFID is a technology which uses radio waves that automatically detect an object, it is transmitted through an antenna; the use of RFID system can reduce operating costs and simplify the data storage and retrieval [2]. In a security perspective, we used biometric recognition, and more specific fingerprint was chosen to provide correct identity of the card holder due to its low cost for data authentication [3].

RFID technology is composed of three main components; a RFID tag, which contains the identification number, a RFID reader, which activates the tag to broadcast its identification number, and a RFID Middleware, which integrates the information from the reader to the backend database system. Nowadays, RFID is used in any areas and every where if possible. However at present, the popularity of RFID technology opens several issues within the security umbrella.

Even though the combination RFID and fingerprint is not an answer to unauthorized access but a key to reduce forgery and counterfeiting of passive RFID tags [4] and solve the problems in the traditional system thus increase the efficiency of management process [5]. Literatures show that fusion of RFID and biometric has been applied in arious fields, such as Blood Information Management [5], control access [6], [7] and parking system [3].

In this project, the RFID tags enable the school management to track the student and staff movements in and out of the facilities rooms. An individual without the RFID card or without the correct fingerprint image disable the entry .The system will also trigger the security signal and this will notify the school management upon the unauthorized access using an online monitoring system. This system used the main component of passive RFID system and fingerprint sensor, database management system and networking i.e. wireless. When the RFID tag pass through the RFID reader in a range zone and match ingerprint image for the scan tag, the system will record the data from the RFID tag to the database system. Then the data will be sent online to the management for record and supervision of rooms' access. This could ease the management to observe access of selected facilities rooms.

This paper is organized as follows; next section discussed the FAMs design. System implementation is discussed on section 3 and concludes in section 4.

FAMs DESIGN

This section explains the initial design of the system. In overall concept, RFID will be detected when someone with an RFID tag passes through the RFID reader and verify by matching fingerprint image. Upon verification with database is success, the system will enable the room to be access. Thus, the management people may also view the evidence of room entry via internet. Fig 1 shows the operation of the FAMs.

Various researches were done before the projects criteria were chosen. Aspects like range, frequency, and environments for this project situation have been identified. Table 1 shows the project's criteria.

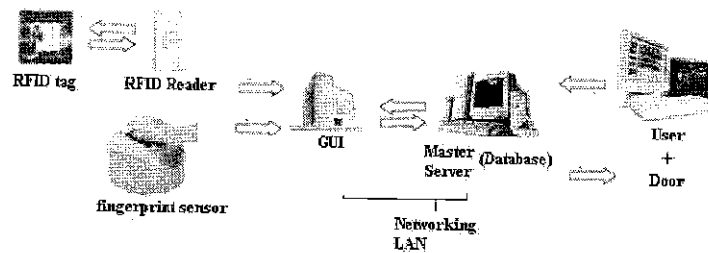


Figure 1: FAMs Architecture

Table 1: The Project's Criteria

Criteria	Solution
Type of device	a) Passive RFID -13.56MHz (High Frequency) b) Fingerprint sensor
Type of software	- Microsoft Visual Basic 6.0 - Microsoft Access - Dream weaver
Others typical application	Access control
Networking	Local Area Network

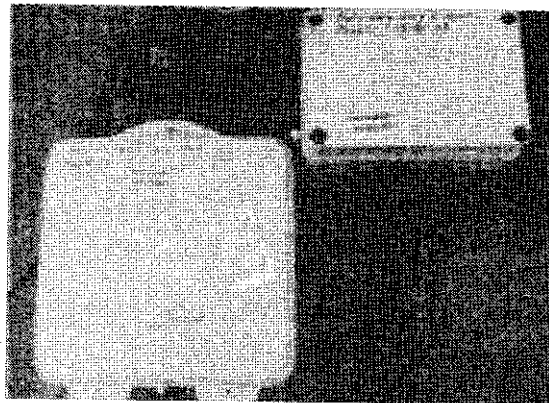


Figure 2: The Antenna and the Reader of Passive RFID

SYSTEM IMPLEMENTATION

An experiment has been conducted in order to evaluate RFID functionality and performances of the FAMs in term of reader conversion power and tags distance; conditions such as indoor/outdoor with low and high noise with normal moisture levels. The RFID tag is placed near to the antenna and the distance will be increased to look the conversion of power in every meter until 8 meter (passive RFID condition). The RFID reader is supplied 12V battery and 13.56 MHz frequency with the output signal of the RFID reader is jumped to the spectrum analyzer probe. The RFID tags have been tested to make sure how it functioned. The results show that the signal detected in different distance of RFID tag to the RFID reader.

Disturbances occurred in the data analysis due to the present of noises in the environments carrier; such as absorption, reflecting /nulling, electrical and skip interference. Although the passive tags depends on the surrounding conditions to provide power to the tag, there is nothing about them which makes them safe against a variant of this power-analysis attack due to environment changes especially by electrical appliances ; such as mobile phone that can attack and kill UHF tags although with different frequencies and antennas. With the capability of attacking HF tags and this situation is very crucial due to it can contribute to the lost and conflict of data. Some snapshots of FAMs are provided in Figure 4.

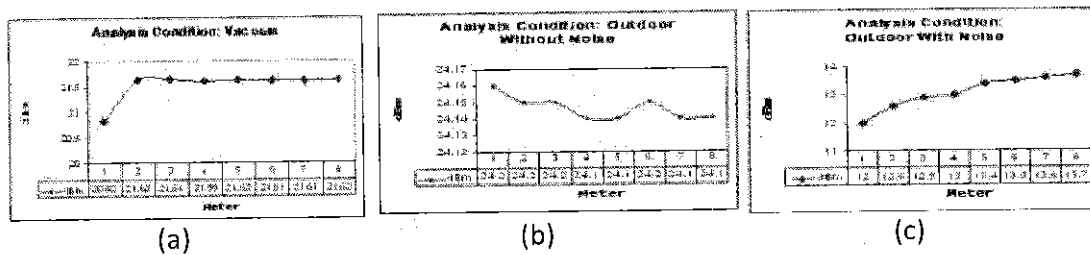


Figure 3: The Effect of the Distance v/s Conversion of Power

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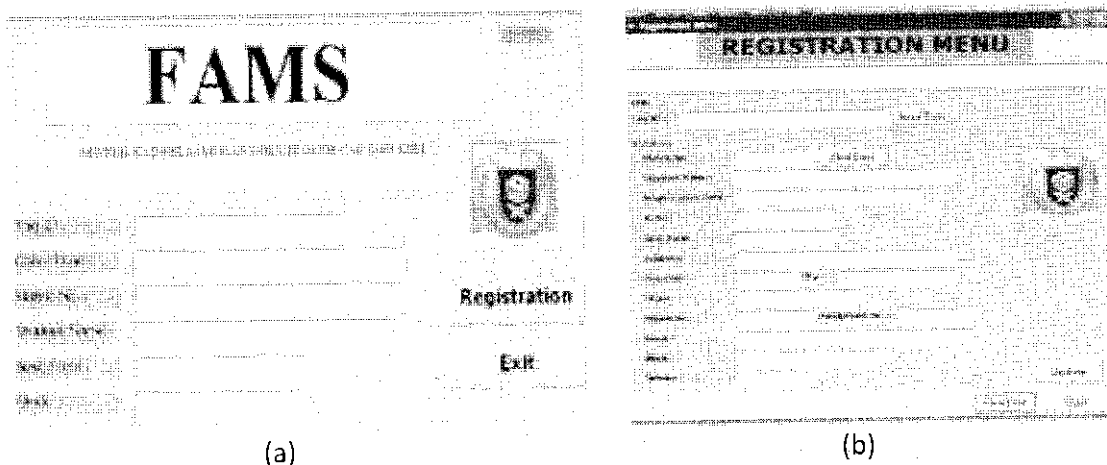


Figure 4: Visual Basic Interface Development System

The web based application was developed to ease the management system to monitor the access of students' movement in preferred places. The function of the web application is to register the students' information (except Tag ID) and monitor the students' attendance lists using networking; i.e. Local Area Network (LAN) or Wireless. The user interface were design using Macromedia Dreamweaver MX software and overall process of

the system illustrated at the flow chart of the online system is shown in Figure 5 and Figure 6 shows the relationships of the overall system.

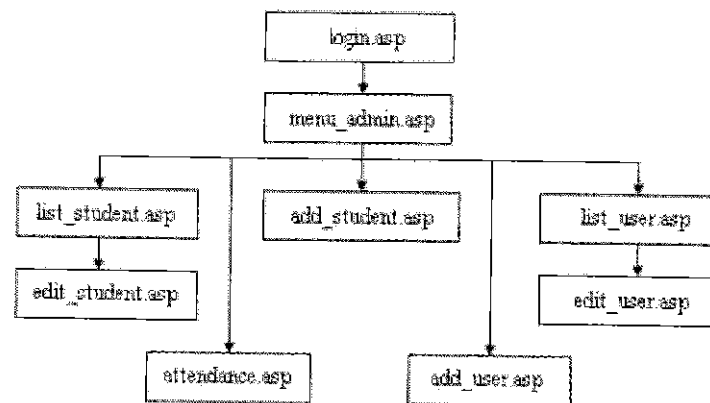


Figure 5: Flowchart of the Online System

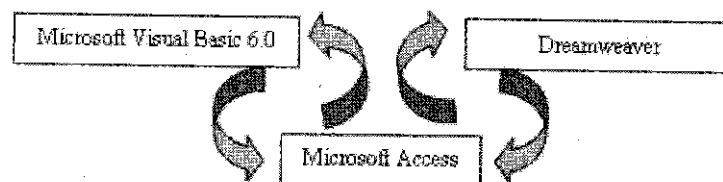


Figure 6: Relationship among the Microsoft Visual Basic 6.0, Microsoft Access, and Dreamweaver

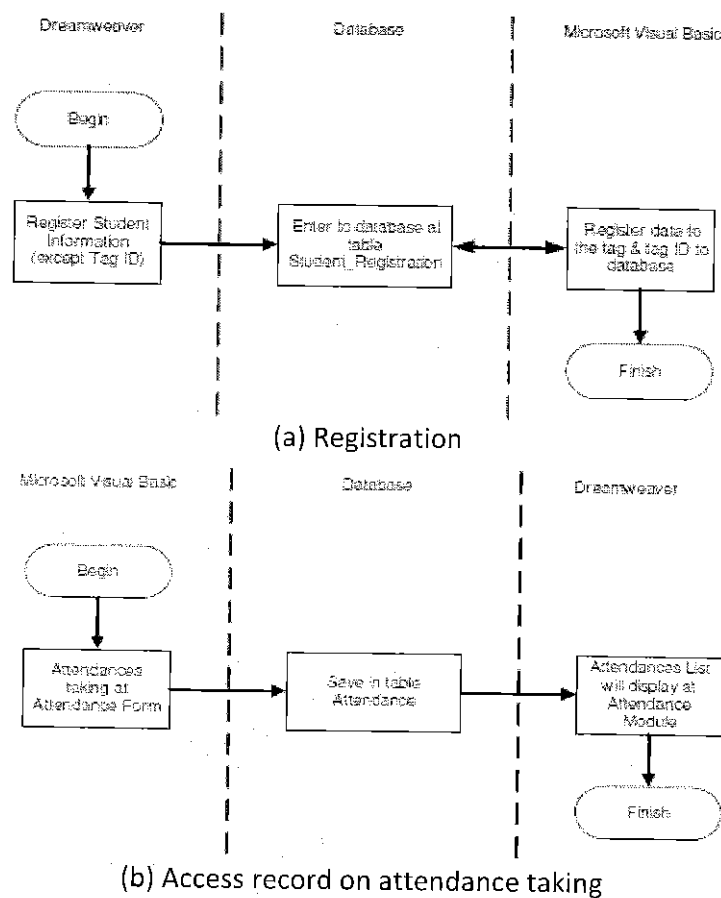


Figure 7: Flowchart of the Relationships of the Overall System

CONCLUSION

RFID has been one of the important elements or components in many access control application. By combining RFID systems with biometric technology, directly interference of communication, either by interrupting, fabricating or modifying communicated messages can be eased. It also provides an automatic means to identify physical objects without the need for line-of-sight communication thus enhancing security issue of thievery and false card holder accessing secured area. As for future research expansion, some system defensive mechanism should be added to enable the system to be immune outside knock such as manipulation, sniffing of radio signal for replicate/ modify signals and viruses.

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