



“Drive Thru” Attendance System using Radio Frequency Identification (RFID): A Review

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ABSTRACT

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Radio Frequency Identification (RFID) play a big role in people daily lives. Various applications of RFID including transportation and logistics, manufacturing and processing, security, animal tagging, waste management, time and attendance, road toll management and etc. The aim of this research is to improve old attendance system that capable to eliminate time waste during manual collected attendance by create “Drive-Thru” attendance system. This model can be given an access badge with radio frequency identification (RFID) chip in it as its use technique of electromagnetic fields to exchange data from a tag (like a smart tag) to an object (a reader) at the post guard for the purpose of identification or tracking. Development in RFID technology widely increasing in adopting new and many features.

Keywords:

RFID, attendance system, drive thru

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1. Introduction

Today's, lots of colleges, schools, and universities have a problem to handle large number of students and staffs especially to get their attendances. Manually, the attendance are given whenever the lecturer comes to class and pass it around for the students to tick. This manual process shows a flaws since the students can cheat and lecturer had to enter the attendance into database for record. Zatin [17], describes the conventional method of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. Krenare [11] tells that counting students' absence, teachers lose couple of minutes of their classes to fill in the attendance sheet manually by calling the students for signing the documents and the worst just come after classes where there should be spent extra time for inserting the attendance data in a computer to generate the statistics and send them per email to each student and of course to the administrator and lecturer in total. Meanwhile, the staff has to queue up for a long time to punch card and put it in the slot provided according to their name which shows that both system are slow in performance and not efficient express Tushar *et al.*, [15]. This would cause a big problem. In this study we implement the Radio Frequency Identification (RFID) technology as one of figures development focuses on staffs of

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Universiti Pendidikan Sultan Idris (UPSI) as this university have two main campus which is Kampus Sultan Azlan Shah (KSAS) and Kampus Sultan Abdul Jalil Shah (KSAJS) a niche in educational leadership Tourism in rural areas plays an important role that lead to the global change. The main purpose of this research is to develop a “drive-thru” attendance system for staff UPSI by using Radio Frequency Identification (RFID). The staffs are having difficulties to punch their card as a sign of attendances due to the long distance between two main campuses which is 7.5km from each others as the staffs might have a lecture at one of the campus.

Besides that, the flow of the traffics affect the time of the staffs to arrive punctually for the attendances due to the amount of vehicles on the road such as cars, buses and lorries' been using the same routes to their respective journey during peak hour for 8am lecture. The using of RFID in attendance system for staffs UPSI can improve the existing system that capable to eliminate time waste. This statement is supported by Fakolujo [6] that RFID is an automated identification and data collection technology, that ensure more accurate and timely data entry and quickly gained more attentions due to current low cost and advances that open up more application area. On the other hands, Ankita [7] mentions that RFID systems have been widely used in many different application areas such as; product tracking through manufacturing and assembly, control of inventory, parking lot access and control, container tracking, ID badges and access control, equipment tracking in hospital and etc. which researcher find it is suitable to be use for taking attendances of staffs UPSI. It is one way to improve efficiency as researcher found out the parking problem on Kampus Sultan Abdul Jalil Shah (KSAJS) that is limited for the staffs. If there are any program being held on E-learning building the staffs found out the difficulties to find the parking lots and it's stressing them to punch card for the attendances. Thus, manual attendance system are very time consuming supported by Priyanka [13].

2. Literature Review

2.1 Introduction

In this section, it will focus on literature review based on the research of the current system that will be developed. The purpose of a literature review is to convey the reader about the knowledge that also establish the idea based on the topic and strengthens and weakness. Construction of development the “drive-thru” attendances system by using Radio Frequency Identification (RFID) has been made and the motive for the purpose of this study was conducted. In additional, this study also looks at the suitability of using this development as an aids among the staffs. There are several views of number of studies regarding the RFID as attendance system.

2.2 RFID Technology

According to Zakiamani [8] Radio Frequency Identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data by using devices called RFID tags. It's parallel with Barid Baran Nayak [4] research by stating that RFID is a technology which wirelessly identifies the chip or tag of interest and capture the data. The RFID idea is not new as it's began to be use for manufacturing to improve economic growth in 1800. Basically RFID use electromagnetic or electrostatic incorporate with radio frequency portion of electromagnetic spectrum to identify an object, animal or person. It can be used in many application such as in health care industry to reduce counting, looking and auditing item.

Typically, RFID system contains two main components; the reader and the tags. The tag or transponder (derive from terms transmitter and responder) normally attached to the objects to be monitored and carries information in microchip that contain radio transmitter that emits a coded

identification number when carried out by the reader device. RFID technology are implement in many field such as client server based attendance system that allow the company to monitor the employees' attendance from their branch, smart card attendance system that using MyKad to record employee attendance in one shortage and fingerprint attendance system that considered as the oldest method and most popular used for verification and identification in the field of biometric technology.

2.3 Type of RFID System

Research supported by Olanipekun [1], tag can be passive, semi-passive or active which also can be categorized based on memory type on transmission. Figure 1 is illustration of passive RFID system. In passive RFID systems it use tags with no internal power sources and powered by electromagnetic energy transmitted from RFID reader. It's supported by Andrew [9], the transmitted signal from the reader power's the tag's integrated circuit (IC) reaches a tag, and the tag reflects the signal in form of backscatter. This may affect the range are limited by the power of tags which less than 10m but they are cheaper, smaller and easier to manufacture compare active tag. Passive RFID tags can be used for application in field of file tracking, race timing, supply change management, and smart label.

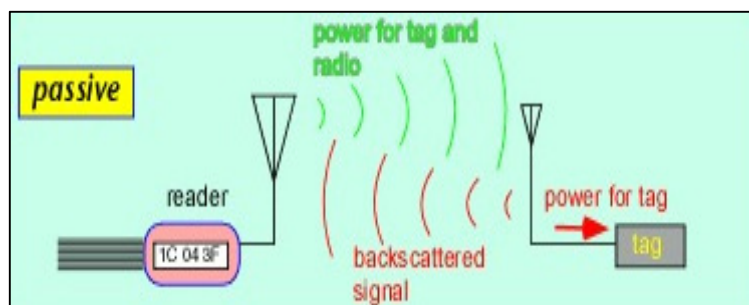


Fig. 1. Passive RFID system

Semi-passive tag kind of similar to passive tag except it has additional of small power sources to power on the chip as it can captured energy from the reader to use as backscatter. According to Andrew [9], the battery provided the power to transmit the signal back to the reader that increase the range. Figure 2 is illustration of semi-passive RFID system.

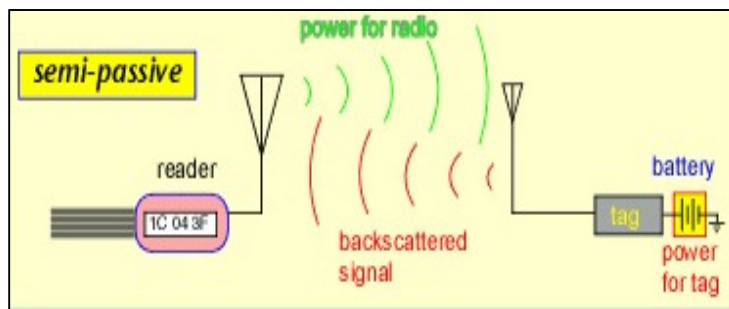


Fig. 2. Semi-passive RFID system

The active RFID system use battery-powered RFID tags that broadcast own signal to transfer information stored on the microchip. Olanipekun and Boyinbode [1] state that due to reliability to

conduct with reader, its can transmit at a higher power level than passive allowing to be more effective in challenge environment such as water, metal and longer distance. Besides the battery ability to store up to 32,000 bytes it's also can live up to 10 years. Active tag are being used on large objects such as rail cars, big reusable container and others. Figure 3 shows the active RFID system.

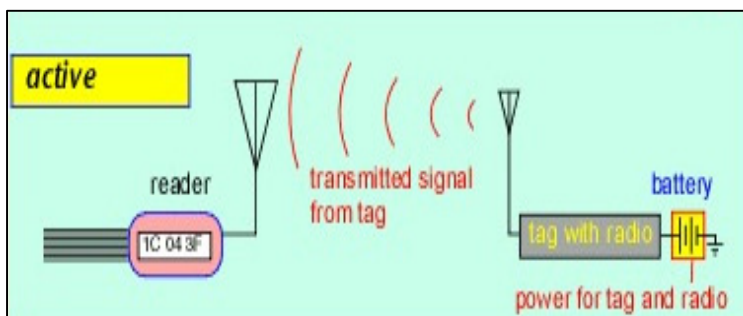


Fig. 3. Active RFID system

2.4 Type of Frequency

Radio Frequency Identification (RFID) system uses radio frequency wave to detect and track the objects by using tag as the tag contain information related to the object that stored electronically. As we know, RFID system consists with tag and reader and type of RFID tag are passive, active and semi-passive. The RFID system communicate with specific frequency band when they operate that highlight the important role of radio wave in signaling between RFID. There are three types of frequency bands uses which are Low frequency, High frequency, and Ultra-High frequency. Each frequency behave differently. Figure 4 shows the different wave length of the frequency.

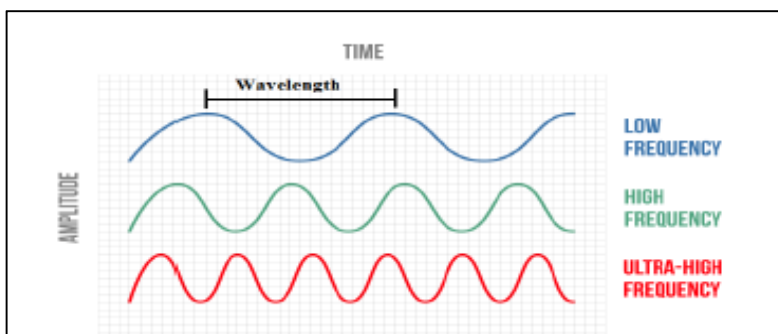


Fig. 4. different wave length of the frequency

From Figure 4 also, researcher can see the different. For Low frequency the wavelength is greater compared to the High frequency and the Ultra-High frequency, but amplitude of Ultra-High frequency is greater than the High and Low frequency. Table 1 shows the frequency range of the difference type of frequencies with the distance travel, regulations and data speed. It reveal that Low frequency have range of 10cm but it is unregulated with 120-15KHz that have low data speed.

Table 1
 Frequency Type and Specifications

| Type of Frequency | Range of Frequency | regulations | Range | Data Speed | Benefits |
|----------------------------|--------------------|--------------------|---------|------------------|--|
| Low Frequency (LF) | 120-150KHz | Unregulated | 10cm | Low | Work well round water and metal product |
| High Frequency (HF) | 3-30 MKz | ISM band worldwide | 10cm-1m | Moderate | Low cost of tag |
| Ultra-High Frequency (UHF) | 300MKz-3GHz | Short range device | 1m-100m | Moderate to High | EPC standard built around this frequency |

2.5 Related Work

Through the studies, currently the existing system was not user friendly where employees record their attendance by using punch card. With a large number of workers/ employees in institutions/ university, it is difficult to manage the attendance record. Besides, everything was done manually that may cause errors and repetition work that was time consuming for a recheck. On the other hands, certain institutions still using paper-based attendance which every details such as name and matric number were written down manually on paper. It may cause loss of record and take a long time to generate the form in computer. Thus, some research have been done on the existing record to find out the method being used and problem behind the existing to develop more effective than this.

There are many types of attendance system nowadays and RFID based attendance system uses technology that eliminate the problem faced in manual attendance that may prove to be more reliable and accurate. Krenare *et al.*, [11] have underwent the project that track the attendance of our students in an automatic manner by using this technology in an education institution environment. The output presented in web based platform that implement using HTML, JavaScript and CSS as front-end while MySQL and PHP 5.1.x scripting language as back-end. Java is the primary way to produce code that deployed as java bytecode and MYSQL database is highly recommended database for web application which is open source. It's also supported with web server Apache and IIS to make the system more user friendly. His study demand that this helps the lectures be more concentrating of motivating the students' attendance and save their time. Author of Tushar *et al.*, [15], propose research monitoring of students using RFID reader and passive where reader located in fixed area that send signal to passive RFID chip detected in range of reader. Research reviewed that every tag have own unique ID besides using Graphical User Interface (GUI) to provide efficient way review the attendance. The Graphical User Interface is created with visual basic 2010 consisting database system use to store all the student details, date and time. According to research, monitoring system can replace manual system that transform the information and convenient to be used for college/ university level.

On the other hands, Arulogun *et al.*, [3], have developed an RFID based Attendance System that are commonly used nowadays to keep track of attendance for community organizations such as educational institutions, business organizations etc. the program was written in Microsoft Visual C#

programming language for the front end and backend of Microsoft SQL. It's supported with the advantages using passive tag with low cost and flexibility as RFID capability implementing the attendance system. Similar project was undertaken by Nurbek and Selim [18] to create system that makes easier to check students' attendance system implemented in Suleyman Demirel University, Kazakhtan.

Besides that, Elima *et al.*, [12] propose an attendance system implement the RFID by using Open Source Software in a multi-user environment. Its use python as back up for reading tags as user can view the attendance by accessing the web portal. Its happen when Java based desktop application is being used for authenticate lecturer that then run the python code and record the tag in XML which later it is uploaded in a server for processing to interpret the data. The project occur agree that Open Source based RFID attendance system can increase the performance and efficiency make the user friendly attendance system.

According to Zatin *et al.*, [17], Sidi *et al.*, [14] proposed a system that was capable to record student's " attendance using interactive input, generating reports, viewing students" and lecturer" profiles, and providing students timetable. The system records attendance using barcode scanner. RFID technology has a lot of advantages such as simultaneous collection of large quantities of data with high accuracy, contactless, etc. RFID technology has an increasing influence to our lives and gradually replaces barcode in supermarket and logistics management.

2.6 Comparison between Punch Card and RFID

According to Nur Halim [10], a punched card of punch card attendance system is an old traditional system to manage the attendance of the worker by using a piece of paper that contains time of the worker/ employee enter in or exit the place by punch the exact time and date. Later, the information received from the punch card will be collected a week before the salary payment. This is because they need to calculate the exact time for each of the worker to manage give out the salary fairly. Punch card attendance system actually widely being use at office, industry section, institution, school and others because it is easily to manage the salary to be given to the worker by calculate the time on the punch card.

The difference between punch card attendance system and attendance system by using RFID is that the RFID us use tag on the worker card which can be store information easily while punch card attendance system uses paper that wasted the time where employee had to calculate the salary on it before being throw out to the dustbin. ID number is being used on the worker card in RFID system that provide employee access to enter place and manage the attendance by give permission to access through RFID scanner. The tag will be scanned immediately when worker touch the card that improve the security level.

3. Conclusion

In this section, various type of RFID system and frequency have been presented. Based on various example of from related work of RFID attendance system, it is efficient in alleviating the attendance system problem that arise in the institutions/ university and school due to the insufficient parking spaces that undeniable in Universiti Pendidikan Sultan Idris at both main campus.

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