CAR MANAGEMENT SYSTEM USING RADIO FREQUENCY IDENTIFICATION (RFID)

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ABSTRACT

Radio Frequency Identification (RFID) is a wireless communication technology that uses radio-frequency waves to transfer information between tagged objects and readers without line of sight. Radio frequency identification (RFID) has been identified as one of the ten greatest contributory technologies of the 21st Century. This technology has found a rapidly growing market, and an increasing variety of enterprises are employing RFID to improve the efficiency of their operations and to gain competitive advantage. In many country RFID have been used to check n record the cars flow. RFID tags were found to be better than the car sticker and their performance was also measured to be well above that of car stickers. The RFID system is built from three basic components which are the reader also known as the detector that may be used as to read or write device, the transponder also known as tag which is located on the object to be identified and antenna. This paper presents the implementation of RFID technology to manage the car flow in the company. This is accomplished by integrating RFID technology together with linking of database.

ABSTRAK

Radio Frequency Identification (RFID) adalah teknologi komunikasi wayarles yang menggunakan jalur frekuensi radio untuk memindahkan maklumat antara objek tag dan pembaca tanpa saling berhadapan. Pengenalan frekuensi radio (RFID) telah dikenalpasti sebagai salah satu teknologi sepuluh penyumbang terbesar abad ke-21. Teknologi ini telah menemui pasaran yang berkembang pesat, dan berbagai peningkatan usaha yang menggaji RFID untuk meningkatkan kecekapan operasi mereka dan untuk mendapatkan keunggulan kompetitif. Banyak negara telah mengguna RFID teknologi untuk menyemak aliran kereta. RFID tag dijumpai untuk menjadi lebih baik daripada pelekat kereta dan prestasi mereka juga lebih baik daripada pelekat kereta. Sistem RFID dibina dari tiga komponen asas iaitu pembaca juga dikenali sebagai pengesan yang boleh digunakan sebagai untuk membaca atau menulis peranti, transponder juga dikenali sebagai tag yang terletak pada objek yang akan dikenalpasti dan antena. Makalah ini menyajikan pelaksanaan teknologi RFID untuk menguruskan aliran kereta di syarikat. Hal ini dicapai dengan mengintegrasikan teknologi RFID bersama-sama dengan menghubungkan database.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The system that will be developed is Car Management System using Radio Frequency Identification (RFID). It is the system that used to check and record the time the car going in or out of the company area. Every car in the company is assign to the staff. The staffs will use the company's car go to the site. The car must be going in and back to the company in the time interval that has been set. Every car will be register in the system with all the information such as car plate number, brand of car and etc. Each car will be given an RFID tag with the unique ID. When the car passed by the guard house the reader will read the RFID tag and identify it. After identify the tag, the time when the car passing by will be recorded and saved. If the car is passing by within the time

interval, the status of the car will be recorded either in or out. Else the status of the car will be late.

At present, there is no system that manages the flow of car in the company. The guard needs to record the flow of car in documentation. The guard need to stop by every car and recorded the time they in and out. Furthermore, all the information of the car is only recorded in hardcopy. So when the guard needs to check the information he has to browse for all the hardcopy.

By developing this Car Management System by using RFID, every car around in the company will be tagged with the RFID tag and will be used to go in and out from the company area. This system not only let the guard works as the admin to manage the system but also can help save the guard job by stopping the car and recorded for the time. When the car passes by, the RFID tag will able to send the radio frequency that will detect by the detector. The status of the car either in, out or late will be know. Subsequently, all the data will be transmitted into the database to be updated.

1.2 Problem Statement

Currently, the car flows are only recorded in hardcopy. Every day the car in the company need to go out from the company and back to the company but do not have a proper way to manage the car flow. There is no system for the company to record the number of cars that the company have. The company

only will have the information of the car that is register in the JPJ and it is in hardcopy. They do not have the proper way to record which car have been assign to which staff. Time of that the cars go in or out from the company are recorded in hardcopy by the guard. The guard need to stop by the car and recorded the time of the car passed through following the time in the office of his watch. Sometime if the guard is away, he will not able to stop by the car to record it. The guard needs to search for all the document if he wish to find the information of certain car. This will consume a lot energy and time.

1.3 Objective

The objectives for Car Management System using Radio Frequency Identification (RFID) are:

i. To develop a car mangement system that manages the cars (in and out) in the company within the time interval that has been set by using Radio Frequency Identification (RFID) in a better and easy way.

ii. To ensure that the time and status of every car going out and in the company will be recorded.

iii. To ensure that the information can be keep safely in database so can be easily update and help save time.

1.4 Scope

The scopes for car management system using RFID are as below:

i. The staff in the company that uses the car to go to the site.
ii. The guard as the admin that is responsible to the whole system.

1.4.1 User

i. The system is used by the admin to manage the cars that are in and out from the company area every day.
ii. The admin can update, add and delete the information about the car and staff that drive the car.
iii. This system can be used to store all the information about the car and staff that drive the car.

1.4.2 System

i. The RFID reader should be able to detect and read the tag.
ii. The information that has been updated must be same with the database.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Radio Frequency Identification (RFID) is a wireless communication technology that uses radio-frequency waves to transfer information between tagged objects and readers without line of sight. This creates tremendous opportunities for linking various objects from real world. These objects are numbered, identified, catalogued, and tracked [6].

RFID is only one of numerous technologies grouped under the term Automatic Identification (Auto ID), such as bar code, magnetic inks, optical character recognition, voice recognition, touch memory, smart cards, biometrics etc. Auto ID technologies are a new way of controlling

information and material flow, especially suitable for large production networks [9].

In simplest form, RFID is a similar concept to bar coding. It is seen as a means of enhancing data processes and is complementary to existing technologies. It is a proven technology that has been in use since the 1970s [18]. A more complex description is an electromagnetic proximity identification and data transaction system. Using ''RFID tags'' on objects or assets, and ''readers'' to gather the tag information, RFID represents an improvement over bar codes in terms of non-optical proximity communication, information density, and two-way communication ability [3]. The RFID technology is a means of gathering data about a certain item without the need of touching or seeing the data carrier, through the use of inductive coupling or electromagnetic waves. The data carrier is a microchip attached to an antenna (together called transponder or tag), the latter enabling the chip to transmit information to a reader (or transceiver) within a given range, which can forward the information to a host computer. The middleware (software for reading and writing tags) and the tag can be enhanced by data encryption for security-critical application at an extra cost, and anti-collision algorithms may be implemented for the tags if several of them are to be read simultaneously[9].

RFID systems fundamentally consist of three elements:

i. The RFID tags (transponder) themselves
ii. The RFID readers(transceiver)
iii. The antennas and choice of radio characteristics[2]

Although RFID has been around for more than half a century, it is only in recent years that this technology has begun to attract a lot of attention, due to the convergence of lower cost and increased capabilities of RFID tags [6].

Currently, RFID is used for a wide variety of applications ranging from the familiar building access control proximity cards to supply chain tracking, toll collection, vehicle parking access control, retail stock management, ski lift access, tracking library books, theft prevention, vehicle immobilizer systems and railway rolling stock identification and movement tracking [3].

Each RFID system has different components and customizations so that it can support a particular business process for an enterprise. Depending on the application in an industry and the enterprise within an industry, A RFID system can be very complex, and its implementations may vary greatly [4].

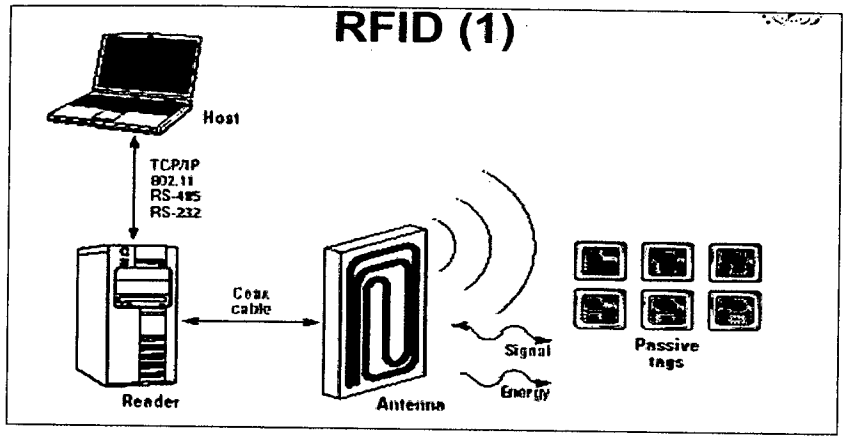

Figure 2.1: The elements of the RFID [1]

2.2 RFID Elements

RFID systems fundamentally consist of three elements tag, reader and antenna.

2.2.1 RFID Tag

Tag is the basic building block of RFID. Each tag consists of an antenna and a small silicon chip. The chip is a tiny computer that contains a radio receiver while the antenna enables the chip to receive power and communicate, enabling the RFID tag to exchange data with the reader. There are three types of tags:

i. Active tag
ii. Passive tag
iii. Semi passive tag

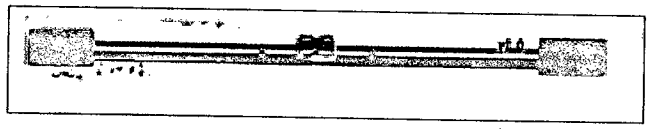

Figure 2.2: The look of a RFID tag [1]

2.2.1.1 Active Tag

Active tags have an internal battery as their own power source that powers their communication. Active tags can actively and intensively transmit and processing data, and over considerable physical distances [7]. Since active tags have an internal power supply, they can respond to lower power signals than passive tags. Active tags are more reliable because they do not need a continuous radio signal to power their electronics. Active tags have greater communication distance and faster

response time. Besides that, active tags are more versatile and usually have larger memory capacity [5].

Active tags need much less signal from the RFID reader than passive tags require, and so can contain sensors and data loggers, for instance, as they are continually powered [7].

Active tags are also suited as data loggers because they can support a clock (for time-stamping data) and can contain significant amounts of memory [7]. Active tags have a finite battery life and are generally larger and more expensive.

2.2.1.2 Passive Tag

Passive tags have no internal power source and use external power to operate. These tags are powered by the electromagnetic signal received from a reader. The received electromagnetic signal charges an internal capacitor on the tags, which in turn, acts as a power source and supplies the power to the chip [5].

Passive tags communicate when they are in the close presence of a reader. Passive tags are less complex than active tags, because the reader provides them with their operating power.

A passive tag uses the electromagnetic energy it receives from a reader's transmission to reply to the reader. The reply signal from a passive tag, which is also known as the backscattered signal, has only a fraction of the power of the reader's signal. This limited power significantly restricts the operating range of the tag. It also means that passive tags can only support data processing of limited complexity. The range of transmission is relatively short.

Passive tags have an unlimited life, are lighter, smaller and cheaper [8]. The trade-off is limited data storage capability, shorter read range and they require a higher-power reader. Performance is reduced in electromagnetically ''noisy'' environments [3].

2.2.1.3 Semi Passive Tag

A semi-passive tag is a passive tag that uses a battery to power on-board circuitry, but not to produce return signals. When the battery is used to power a sensor, they are often called sensor tags. They typically are smaller and cheaper than active tags, but have greater functionality than passive tags because more power is available for other purposes [10].

Semi-passive tags use the reader's power to transmit a message back to the RFID reader using a technique known as

backscatter. These tags thus have the read reliability of an active tag but the read range of a passive tag. They also have a longer shelf life than a tag that is fully active.

RFID tags can be promiscuous, in which case they will communicate with any reader. Alternatively, they can be secure, requiring that the reader provide a password or other kind of authentication credential before the tags respond. The vast majority of RFID tags that have been deployed are promiscuous. Not only are these tags cheaper, but the systems also are much easier to manage. Systems that employ passwords or encryption codes require that the codes be distributed in advance and properly controlled. This is an exceedingly difficult management problem [2].

Tags come in all shapes and sizes. The smallest tag that has ever been produced is the Hitachi mu-chip, which is less than 0.4mm on a side [2]. RFID tags can also be quite large like size of a paperback book.