Automated Vehicle Parking System using RFID

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Abstract - **Radio Frequency Identification (RFID) technology is very useful technology in automation of vehicle parking system in mall/building. One of the challenging problems for many vehicle owners in big cities is where to park their vehicles. If the parking slot is known in advance one can save precious time and fuel wastage. In our proposed system the user is informed about the parking slot availability at a particular parking location .The slot availability details are collected using an RFID system and are updated periodically into the database [1].**

Entry-point and exit-point of the parking-lots will be under control with RFID readers, labels and barriers. Personnel costs will be reduced considerably using this technology. Entry-point and exit-point will be handled in a fast manner without having to stop the cars so that traffic jam problem will be avoided during these processes. Drivers will not have to stop at the circulation points and parking tickets will be out of usage during Entry-point and exit-point. Because we have added recharge module therefore user has to register into the system and he will get message of balance on his mobile.

It will be avoided ticket-jamming problems for the ticket processing machines as well. Vehicle owners will not have to make any payments at each Entry-point thus a faster traffic flow will be possible. Since there won't be any waiting during Entry-point and exit-points the pollution problem will be avoided. Automated parking system certainly reduce the total cost of RFID parking system infrastructure without re-modifying the existed hardware.

It also gives functioning for video surveillance which will captures objects which are in front of camera [2].

Keywords - **RFID, Parking-lot, Automation**

I. INTRODUCTION

RFID today is the popular wireless induction system . Each RFID tag in RFID system is given a unique ID (UID). When an independent RFID tag approaches the RFID reader, the induction between tag and reader happens. The information and content recorded in the tag is transmitted to the RFID reader and translated into the computational data. Following up the data translation, the tag recognition can be completed and related applications are provided.

The RFID card is used to identify that a user is legal or not. According to the short- distance wireless signal, the RFID tag users can be monitored within the specific area. However, most of these applications are based on the indoor environments or be a tiny area service and independent of the existed system.

In opposition to creating new execution or service environment, there were many existed systems or applications deployed [3].
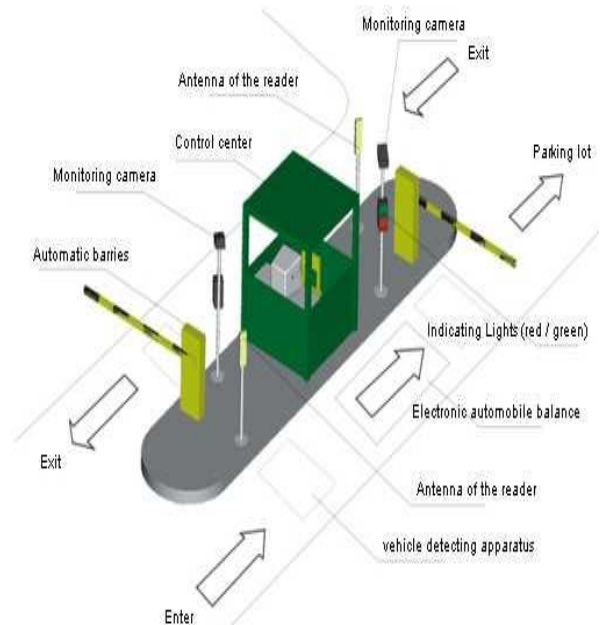

Fig. 1 : Parking system

This project aims at implementing an automated vehicle management system using radio

frequency identification (RFID) technology. This automated vehicle management system will enhance stage consists of embedding the code into a tag and assigning the same to car. The second stage is reading the data from the RFID tag to the RFID reader. In the third stage, the data is updated from RFID reader to the Database. The final stage is to keep a track of vacancies of the parking spaces [4].

In this paper, a realistic application *Automated RFID Parking Management System*, is proposed. Via using the proposed system, the main contributions are:

The project is implemented in four stages:

Step 1:

Writing into the tag: By making use of the write capability of the RFID reader, RFID tag is embedded with unique identification code and is assigned to a car.

This is similar to embedding information on a magnetic strip and the process is called writing. The tag contains distinct information about the car, like employee ID number or name or any other distinct data. This step accomplishes the data feed to the tag.

Step 2 :

Reading from the tag: The information from the tag needs to be read during the car parking. In this step, the data is read from the tag with the help of an RFID reader.

Step 3 :

Data feed to the System: The data from the RFID reader has to be transferred to the system for the actual comparison of data and further processes. During this phase the data from the RFID reader is fed to the system using RS232.

Step 4 :

Tracking the count: To properly utilize the parking lot, the number of the cars presented in the parking lot needs to be tracked. In this the number of cars in the parking lot is incremented for every car entering the lot and is decremented for every car leaving the lot [5].

II. RFID SYSTEM

The RFID System consists of a reader, and RFID tags. Each RFID tag records a unique ID and finite information. The tag is triggered when it approaches the RFID reader. The information recorded in the tag is transmitted to the RFID reader.

A RFID reader will pass the signal into the digital and computing content. In the proposed *RFID* Parking system the RFID reader is deployed at the gate. In addition ,the RFID tags are placed in the car. Considering the practicability, the *RFID System* should overcome the accuracy affection of weather and sunshade-paster of car, and the RFID tag type.

When an RFID Parking Management System user's car approaches the gate, the induction and communication between RFID tag inside the car and antenna of *RFID System* is automatically established. Then the reader of *RFID System* translates the signal information to the digital content. Fig.2 presents the work flowchart of the *RFID System*.

The same procedure will be followed whenever the vehicle leaves from a parking slot. The user again have to swipe the card while coming out of the parking [6].
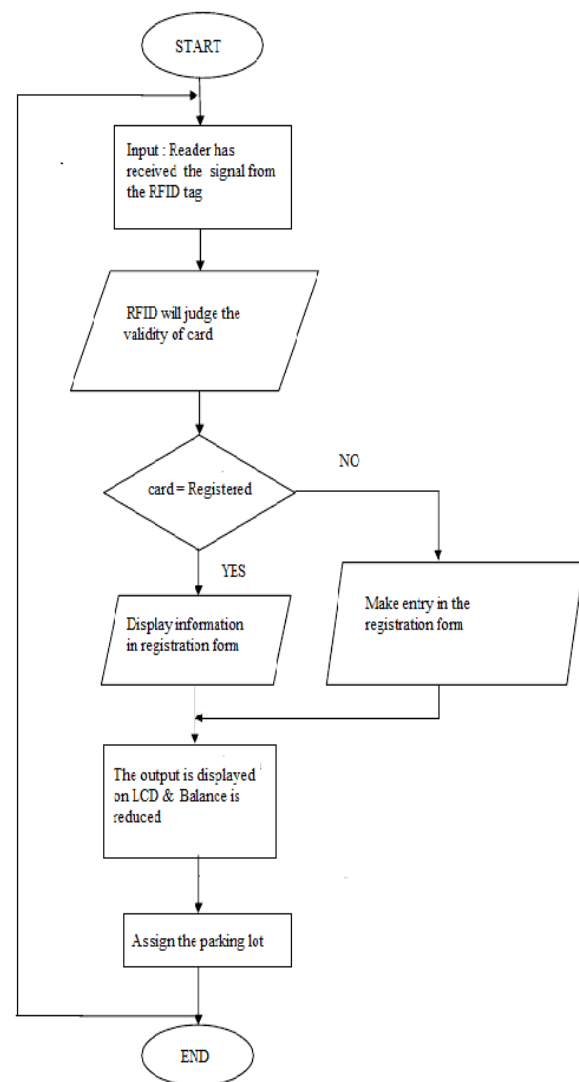

Fig. 2 : The work flowchart of RFID System

III. MATHEMATICAL MODEL

Slotted Parking with RFID :

Tags can transmit data at any time with the Pure Aloha protocol. But with the Slotted Aloha Protocol, tags are not permitted to transmit data at any time. With the Slotted Aloha protocol, tags should be transmitted at the beginning of the slot, otherwise there is a high probability that the tags will collide.

Each tag that needs to be read should have a unique identification number. The RFID reader in the wait mode will send a REQUEST command, and the tags in the reader range will recognize the REQUEST command and respond to the reader by randomly selecting a slot in order to send the tag identification number to the reader.

Collision occurs when more than one tag responds to the same slot. Collided tags need to be read again. If none of the tags responds to the REQUEST command, then the REQUEST command will be repeated at cyclical intervals. If the reader identifies the tag identification number without errors (collisions), then that detected tag can be selected using the SELECT command to perform the read/write operation without colliding with other tags.

Using the READ_DATA command, the selected tag will send stored data to the reader .

Throughput of the Slotted Aloha protocol is increased by having the tags begin transmitting data at predefined synchronous time slots. The collision interval of the Slotted Aloha protocol is half that of the Pure Aloha protocol .

Throughput of the Slotted Aloha protocol is defined as :

$$S = G \cdot e^{(-G)}$$

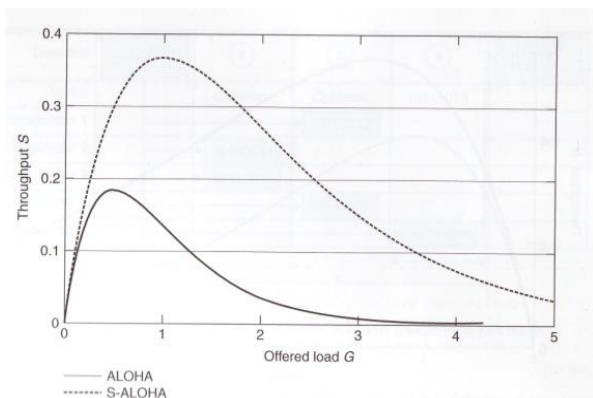where S is throughput, and G is the offered load.

Fig 3 : Throughput vs. Offered Load

Figure 3 indicates how the throughput of the Slotted Aloha protocol changes when the offered load G changes.

IV. SYSTEM OBJECTIVES

This project aims at implementing a Automated vehicle management system using radio frequency identification (RFID) technology. This digital vehicle management system will enhance the utilization of parking space and help user check the availability of the parking space.

The RFID technology has been used to maximize parking utilization. The RFID kit includes RFID windshield tags and RFID readers.

The applications of RFID are ubiquitous. It can be used for inventory tracking, animal tracking, transportation payments, and employee identification, newly born infant identification, and industrial automation and access control. RFID technology solutions are receiving much attention in the research and development of many large corporations [7].

V. SCOPE

One application of the system can be installed at the Parking Lots of Offices, Malls or Toll plazas.

In our project, we would have all the vehicles with a unique RFID (Radio Frequency Identification) tags attached to it.

1. Video surveillance can be implemented.

2. It can be implemented for two wheelers as well as four wheelers.

3. Count of no. of vehicles coming in a month will be kept.

• When the vehicle passes from the RFID Reader, the Reader reads the RFID Tag.

• After the RFID Reader reads the RFID Tag, it sends the RFID tag information to the Database.

• The Database has all the vehicle information stored in it such as: Vehicle type, model etc.

• The screen present in the Parking Lot shows the space availability.

• This system also provides additional facilities like video surveillance [8].

VI. OBSERVATIONAL RESULTS:

The Observational results of Automated Vehicle Parking System are :

- The efficiency of management can be improved.

- The RFID parking management System is modular and can be embedded in other similar parking system and hardware without additional Re-modification.

- The costs of real construction for the RFID parking management System can be decreased and estimated [9].

VII. CONCLUSIONS

The verification shows that the *Automated RFID Parking Management System* is realistic and can control the parking automatically. The response time delay is within 1 second. The total cost of *Automated RFID Parking Management System* infrastructure can be reduced.

This parking lot management system enables user to operate an unattended parking barrier with controlled parking access privileges. The system is ideal for apartments and condos, gated communities, business parking lots and garages, university parking areas.

Automated RFID Parking Management System offers utmost efficiency, convenience, safety & reliability.

It is An ideal solution for todays car parking and traffic problem in cities [10].

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