RFID-Based Automated Car Parking System By Empty Parking Slot Detection

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Abstract-*Present industry is increasingly shifting towards automation. In order to aid for the tedious work and to serve the mankind, today there is a need to develop an intelligent operation. Parking problems are a common problem in most major cities. The limited availability of parking space results in traffic congestion, air pollution, time consuming as well as economy of the nation. The price for parking expansion is usually prohibitively or extremely high. All above various problems are faced by many peoples in day to day life. Thus we are trying to resolve above stated problems by RFID based automatic parking. Each parking slot will have an IR sensor to monitor whether it is empty or filled and will update constructing a parking area that is with easy to park vehicle. This paper has shown the concept of a smart car parking system, which can automatically sense the entry and exit of the cars, number of cars displayed on the LCD. Radio Frequency Identification (RFID) technology is very useful technology in automation of vehicle parking system in mall/building.*

I. INTRODUCTION

The automatic car parking system could be used for residential buildings, hotels, offices, shopping center and show rooms, universities, government buildings, airports, hospitals, and stadium. The advantages of automated car parking are efficient usage of spaces; decreasing the land space and increasing the number of parked vehicles, saving time by taking and delivering car in a few seconds; providing security and safety for the car from theft and damages while parking.The automatic car parking system could be used for residential buildings, hotels, offices, shopping center and show rooms, universities, government buildings, airports, hospitals, and stadium. The main objective of this report is to build a prototype of the automated car parking system to park and retrieve cars automatically in an easy and sufficient way. To easily find an unoccupied parking space in the large car park is a problem for drivers. It is because the car on the road increases every year especially in town. On the other hand, it is more difficult to find the parking space during peak time and holidays because this is the time people want to release their stress and to spend time with family. There are not many existing solutions attempting to address the problem. Thus, it is useful to have some technical solutions that can provide information on parking space occupanc. The limited availability of parking space results in traffic congestion, air pollution, time consuming as well as economy of the nation. The efficient parking monitoring system must be designed to overcome the problem. When the driver has parked their car at car parking space, there are another problem will occur. The problem is about how to make sure the car is safe and these kinds of problem involve the security systems. All drivers want to have a comfortable parking place with security when park their car. Thus, we have to design a system that can help driver to find a parking space easily and at the same time the car that has been park is also safe.

The objectives of proposed work are as follows:

1) Improve on the current parking management systems.
2) Enable drivers to locate and reserve empty parking slot at the entrance and remotely.

As multinational cities is suffering from the lack of available parking spots and expensive land prices, especially in vital areas. To easily find an unoccupied parking space in the large car park is a problem for drivers. On the other hand, it is more difficult to find the parking space during peak time and holidays because this is the time people want to release their stress and to spend time with family. There are not many existing solutions attempting to address the problem. Thus, it is useful to have some technical solutions that can provide information on parking space occupancy. The aim of this proposed system is to develop and implement an automatic andsecured parking system that will increase convenience for the public to park as well as collecting parking fees without human by using RFID technology and microcontrollers.

RFID Technology has the following advantages

- An RFID system has readers and tags that communicate with each other by radio.
- RFID tags are small and require less power (even a battery isn't required to store information and exchange data with readers).
- This makes it easier and economical to apply tags to all commodities that people would like to identify or track.

II. BACKGROUND

Users of automobiles spend a lot of time in the parking slot trying to locate where to park. In today's ever busy working environment, drivers hardly have time to spend in parking bays looking for where to park. This project aims at saving the parking space required for parking the vehicles. Using this system any number of cars can be parked according space is available in empty slot. Whenever the car gets into parking area only the energy of that IR Sensor will be consumed on which the car is getting park and rest of the IR Sensor will be in the halt state. Hence, its energy will get conserve. Finding the lot for parking the car is done by calculating distance from the entry point of parking to the nearest parking lot in the parking area. The traditional method of finding parking by the naked eye has a number of irritating situations. In situations where a driver is walking towards a car or is in the car, the other drivers waiting to find parking often make signs, or whistle or try to do something intending to ask the other whether they are pulling out.

III. SYSTEM ARCHITECTURE

An authorized person's tag information is stored in a tag whose ID is provided to the users, through which all the information can be accessed by the system. When the vehicle checks in, the customer swipes the tag and RFID reader reads the data of the tag. If there is no tag for the customer then the barrier will remain closed. Thereafter reading all the information of the tag, transfers it to the software. The software then starts comparing the information of the tag with the database. If the ID matches, the barrier opens.

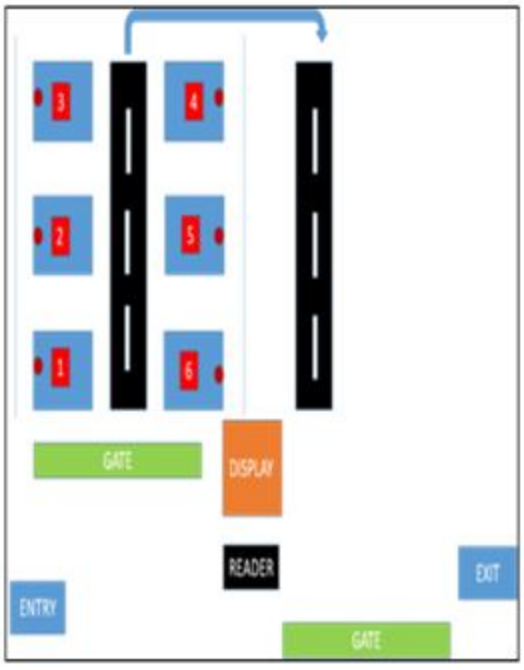

Fig. 1: System Architecture

The reader will take a note of the entry time and exit time from the parking area and calculate the parking fee accordingly as shown in fig.1. IR sensors are placed at each parking slot in order to detect the vehicle's presence in the slot. Program is written in such a way that the LCD should display the vacant slot according to the specified priority. If the slots are filled, then it should display "parking is full".

IV. SOFTWARE IMPLEMENTATION

The complete software implementation of the system is carried out as shown in the below flowchart.

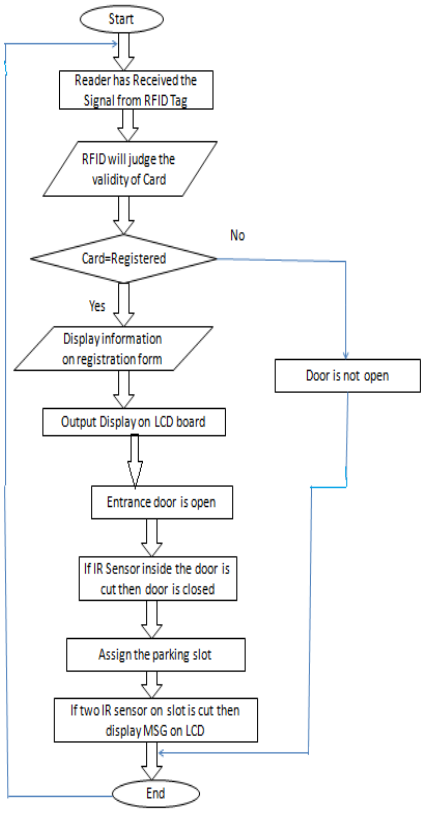

Fig.2:Flow Chart

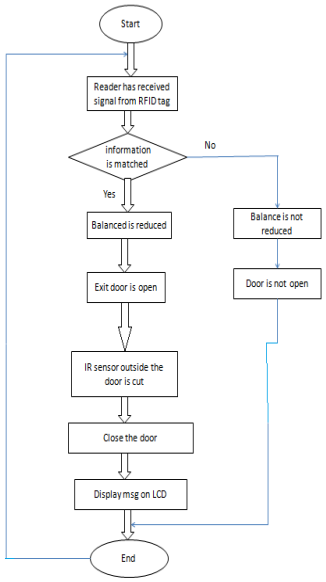

Fig. 3: Flow Chart

In this process, design and implementation of ''Automated Car Parking In Empty Slot Detection" is done with modules of identifying the empty slot in prioritizing method.

Only an authorized person who will possess a unique RFID tag can enter the parking lot. Billing happens without human intervention. Sensors are used to identify whether the slot is empty or not. The gate will open for an authorized person with the help of microcontroller the time of usage of parking facility will be recorded and the corresponding proportionate amount to be paid is deducted through the authenticated gateway.

V. HARDWARE IMPLEMENTATION

The block diagram of the system is shown in Fig.2. The operation of the system is as follows:

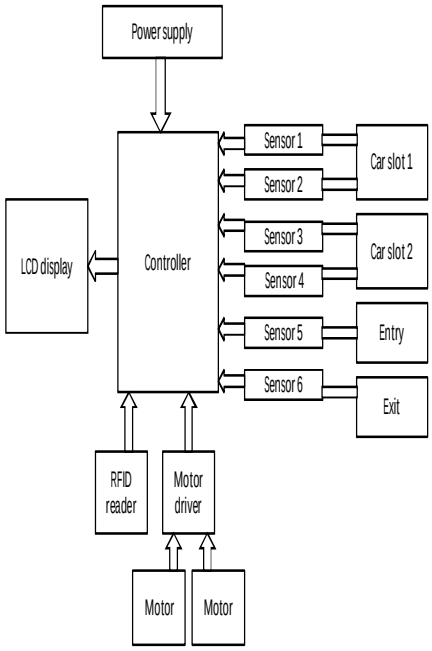

Fig. 4: Hardware implementation

A user enters the parking facility. The driver swaps his RFID, there will be a LED panel and a display.LCD displays whether there is empty slot for parking or not. The gate will open automatically and user can go to the empty parking slot. In the project Car Parking System we have shown the concept of an automatic car parking system. As in nowadays world everything is going automatic we have built a system which will automatically sense the entry and exit of cars through the gate and then display the number of empty slots in the parking lot. When a car arrives at the gate the microcontroller receives the signal from the IR sensors and then checks whether there is a capacity of cars to be accommodated. It will display the number of empty spaces present in the parking lot on a LCD screen. Then user park car and after exit he swap the RFID card the time will be measured that exit time minus entry time according to that balance is reduced.

In this paper, "Detection and display empty slot of car parking", we have built a system which will automatically sense the entry of cars through the gate and then display the number of empty slots on the LCD. In this paper we have taken a model of car parking system. The basic concept is, when a car enters the car park through the entry point, if there is an empty parking slot, the message will display on LCD. One big display is situated after entry which shows the remaining parking slots. If there are no slots available for parking, it shows the message that all slots are full and drivers have to wait for some time. How many slots are empty? Those are displayed on LCD.

a) Motor Driver:

To drive a motor we need some drivers which can amplify the 5v voltage to 12v. These days many IC manufacturers have H□bridge motor driver available in the market like L293D is most used H□ Bridge driver IC. H□bridge can also be made with the help of transistors and MOSFETs etc. This IC is used to control the motor in forward, backward, left and right direction

b) DC motor:

DC motor is used to open and close the gate. Two DC motor is used, one is for entry and other for exit the cars.

c) IR sensors:

IR sensors are used to sense the cars. One is transmitter and the other is receiver .

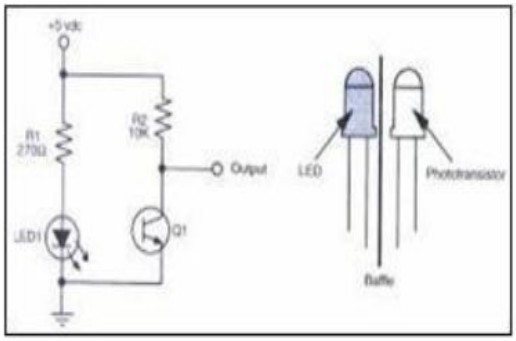

Fig. 5: IR Sensor

d) Power Supply:

In this paper we use 5 volt regulated power supply. For this purpose we use one step down transformer with full wave rectifier circuit. In the rectifier circuit we use two diode as a full wave rectifier. One 1000 microfarad capacitor as a filter capacitor to convert pulsating dc into smooth dc. Output of the rectifier is not regulated. So for regulated power supply we use IC7805 as a regulator. Output of the 7805

e) Microcontroller:

The microcontroller used in the paper is 89S52. This part is the heart of the car parking system . It checks for the entry and exit of car. It continuously polls the pins from where we receive the signal from the sensor. When it detects the car from the entry gate then it checks whether there is any vacant space in the parking lot or not [4]. If there is vacant space then it opens the door and the motor is rotated clockwise after some time it rotates anticlockwise the gate is closed.

f) Display Unit LCD:

LCD makes this instrument user interface friendly by displaying everything on the display. It is an intelligent LCD module, as it has inbuilt controller which convert the alphabet and digit into its ASCII code and then display, this LCD will display the total number of cars, empty space and no vacant space.

Fig. 6: Display unit LCD

VI. SCOPE

This system will also have lots of utilizations in industries.
1. It can be used in shopping mart, jeweler mart.
2. It can be used in Crowded Areas, In metro Politian cities.
3. This system also provides additional facilities like video surveillance.

VII. CONCLUSION

The verification shows that the “Automated car parking with empty slot detection” is realistic and can control the parking automatically. Automated RFID Parking Management System offers utmost efficiency, convenience, safety & reliability. It is an ideal solution for today car parking and traffic problem in cities. This Automated car parking system enables the parking of vehicles and thus reduces the time taken to check the space to be used by displaying the slots where the space for parking is available on an LCD display by using IR sensors at the entrance. Smart parking systems employ advanced technologies to permit efficient use of parking slots. Smart parking ranges from simple systems that show the number of available spaces to complex ones that can guide customers to a free slots.

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