

Vehicle Parking Monitoring System

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Abstract

The existing parking management system require human efforts, and manual recording in excel sheets and on paper. For huge parking, scenario it is very hectic to keep track of. Use of radio frequency identification known as RFID technology reduces human efforts as well as errors. So, we are proposing on RFID based smart parking system to solve these issues. For huge parking, it will be an effective system. The approach in this project realizes intelligent management of a parking lot. The aim of development of this system is to basically reduce human interference and apply smart technologies which are related to automation field to our day to day application and make human lives more comfortable. Car parking has become a serious problem of everyday occurrence for educational institutions with the decreasing parking supply, increasing enrollments and high percentage of vehicle ownership, in result causing congestion, time and money wastage. This problem is getting worse and more frustrating in Jazan University due to the fact that majority of students, faculty and staff members own cars and drive through them to the University. The most common problem is to find out people (evidence) who are responsible for the damages (hitting, scraping, scratching and dents) to other cars. Moreover, another difficulty that is often faced by the students/faculty is to locate their cars on forgetting their car park location. The existing cameras located at the parking lots are only for video surveillance and cannot help in such situations as there is a lack of proper car parking management and guidance system.

Introduction

RFID is the most fundamental technologies that enables wireless data transmission. Although it has been known for a very standardization among the manufacturing companies. It took a long time for it to be widely utilized.

This technology is older than bar code. For the first time, RFID was used in world war II for airplane identification. In 1994, RFID technology was used by all rail cars in united states for identification. RFID tags are better than barcodes as they have longer life. Nowadays, the situation is changing. RFID systems are being used at very large scale throughout the world 8.9 billion tags were sold in 2015 and 10.4 billion in 2016 and it is forecasted that RFID market will rise to 13.3billion in 2020.

away from that no-man's land the space that borders on the parking and no parking zone. With 8000,000 cars and 15 million two wheelers being added t Indian roads every year, finding a place to park is an everyday battle. One of the most prevalent forms of parking in India is the availability of absolute free parking.

India suffers from chaos associated with too many parked cars. When street parking is free, but there are no vacant spaces, many people drive around hunting from a space. Studies for the past 80 years on four continents show that around 30 percent of cars that comprises traffic are cursing for parking. This wastes valuable time and fuel. It interferes with pedestrians, congests roads and pollutes the air. If you can get the right price for parking and remove these cars from the roads, you'd greatly improve traffic conditions. Our parking management system provides features like accounting, dynamic allotment of slots, security management, statistical reporting along with detecting the count of vehicle inside parking zone.

Our system successfully:

- Keeps track of total cars parked inside.
- Won't allow other cars when the parking capacity if full.
- Stores driver's name.
- Keep all details of the drivers.
- Won't allow unregistered person

The Electronic Device which include parking security system using RFID card. Current scenario highlights an increase in population leading to increasing in a number of vehicles, due to which, it has become very difficult to manage parking system, especially in offices, institutes and various public places. The main objective is to overcome the above

problem so that the systems can work:-

- Faster
- Accurately with less manpower
- User convenience

With less cost of maintenance required

Principle

RFID belongs to a group of technologies referred to as automatic identification and data capture (AIDC). AIDC methods automatically identify objects, collect data about them, and enter those data directly into computer system with little or no Current parking experience in India may range from delayed meetings to deflated tyres, fines in no parking zones, stolen valuables to even vehicles getting towed system consists of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader. The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communication interface to a host computer system. Where the data can be stored in a database and analyzed at a later time.

An RFID tag consists of an integrated circuit and an antenna. The tag is also composed of a protective material that holds the pieces together and shields them from various environmental conditions. The protective material depends on the application. For example, employee ID badges containing RFID tag are typically made from durable plastic, and the tag is embedded between the layers of plastic. RFID tags come in a variety of shapes and sizes and are either passive or active. Passive tags are the most widely used, as they are smaller and less expensive to implement. Passive tags must be “powered up” by the RFID reader before they can transmit data. Unlike passive tags, active RFID tags have an on-board power supply, thereby enabling them to transmit data at all times. We’re proposing a parking system where every car driver has been given a unique RFID card and the RFID card reader is at the door of parking lot. We have made a system with the help of Arduino UNO microcontroller and RFID readers.

Construction Algorithm Prerequisites:

- Arduino UNO
- Servo motor(s)
- M-18 module (RFID cards)
- GSM module(900mhz)
- LCD
- USB cable
- Breadboard
- Connecting wires

to provide information for LED display component and central database.

- RFID Transducer: It reads information from the passive RFID tags used in the system. This input is passed on to the microprocessor which processes the passed-on information and checks validity of the card and then undertake necessary action like recording the corresponding check-in or check-out time with the user id.
- RFID Tag: The RFID tags or tokens used here are type 0 passive tags which are read-only. Each tag represents a unique identity number human intervention. RFID methods utilize radio wave to accomplish this. At a simple level, RFID – Radio-frequency identification (RFID card) uses electromagnetic fields to automatically identify and track tags/bar attached to objects. A radio frequency identification (RFID Scanner) is a device used to gather information from an RFID Tag, which is used to track individual object. Barcode uses the CGI (common gateway interface) form below to generate a printable and scan-able barcode in interleaved. This service can be used to generate individual barcodes or called via URL’s to include inline PNG OR JPEG images directly into your documents.

Maintaining the Integrity of the Specifications:

There have already been many attempts of using RFID in car parking systems. They all have certain variations to suit the local needs and constraints. Based on variations in the constraints these systems have significant differences in their design and engineering standards.

Basically, an RFID system consists of an antenna, a transceiver and a transponder (RF tag). There are many different types of RFID systems in the market categorized on the basis of their frequency ranges viz. low-

frequency (30-500 kHz), mid-frequency (900 kHz-1500MHz) and high-frequency (2.4-2.5GHz). Antennae are available in a variety of shapes and sizes. And tags can be classified as read-only, write-once and full read-write or passive-active. There are other variations in data capacity, form factor, range and cost of tags as well as transducers.

The RFID based automatic parking system is an independent system in itself and does not depend on any service from any external system. All the functions needed is performed by one or other component of the system itself and all the inputs and outputs concerned with our system is handled by various components of the system itself like sensors, display, processor, buzzer, transducer etc. Thus the RFID based automatic parking system is totally self-contained.

Components

- **Microprocessor:** It takes all the inputs it receives from RFID transducer and IR sensors and processes them based on algorithms stored and provide the corresponding output to the LED and display. It also provide necessary input to the central database e.g. check-in time, check-out time and corresponding user that corresponds to a unique user. The central database as well as the microprocessor has the list of all the valid RFID tags issued to various users. Only these tags can be accepted for entry and they are carried with the vehicle itself.
- **LED:** These bidirectional LEDs act as display unit. They give the status about validity of the RFID tag swiped at the transducer viz. green for valid tag and red for invalid tag. They also show the real time status of the parking slots based on the input received from IR sensors placed at each slot viz. green for empty and red for filled. Their arrangement is similar to that of the parking slots inside the parking area to give an easy to understand graphical representation. This is useful in guiding the vehicles to empty spots in an optimal manner.
- **Central Database:** The central database keeps the list of valid RFID tags and their corresponding users. It stores their personal information as well. Second function of central database is to store a list of corresponding check-in time, check-out time and user id for data analysis. Thirdly it maintains a real time status of parking slots.

The principal external interface used here are the Arduino software platform. Any normal computer with minimum 256 MB RAM and Windows 7 equipped with USB to serial driver will be sufficient to manage the system.

Goal of the RFID based Automatic Parking system is to provide an efficient parking and resolve the existing problems related to parking systems. It should reduce the personnel costs using unmanned, secure, automated parking-lots functioning with RFID technology. Vehicle owners should not have to make any payments at each check-ins and check-outs as they will be handled automatically in a fast manner without having to stop the cars. This will reduce traffic jam and thus a faster traffic flow will be possible. Another goalsto monitor the parking slots at any point of time and develop a central database to keep track of vehicles and analyze for any patterns be used to find any patterns in parking demand.

Advantages of system Economic:

The system should not exceed cost of Rs. 4000 for a prototype module handling 4 car slots. Each additional slot should not exceed the cost of Rs. 200.

Environmental:

identity. All the inputs, processing and output happen in real time.

- **IR Sensor:** It is placed at every parking slot to monitor its status in real time i.e. if it is empty or filled. It passes on this input to the microprocessor which then processes it

Technical Specification:

Operating specifications for computing device are as follows:

- Processor: 1GHz
- Memory: 1GB RAM

Performance specifications for microprocessor ATmega328 are as follows:

- Operating Voltage: 5V
- Input Voltage (Recommended): 7-12V
- Input Voltage (Limit): 6-20V
- Flash Memory: 32 KB
- Memory: SRAM of 2KB and EEPROM of 1KB

Operating specifications for RFID are as follows:

- Operating Temp: -20°C to 60°C, Storage Temp: -40°C to 85°C
- Humidity: 98% Non-condensing Dust & Water IP68, works in outdoor environment
- Frequency: 125KHz
- Range : 10 cm

Working

The designing of the system was divided into sub parts so that building will be easy:

RFID Scanning:

In the RFID based Automatic Parking System the EM-18 RFID reader which operates at 125 KHz is installed at the entry gate. The vehicles are fitted with the RFID tag also operating at 125KHz. When the vehicles approach the entry gate their RFID tag is scanned by the RFID reader and transmitted to central database. Based on validity of the tag scanned, the user may be allowed or denied entry by signaling a green or red light respectively.

Status Display System:

Based on the information available from Infrared sensors placed at each parking slot, the status display system will show which parking slots are vacant and which are occupied. For this purpose it uses LED lights. A glowing LED depicts that the corresponding slot is occupied.

Central Database:

The system should not cause pollution or damage environment by releasing harmful solid, liquid and gaseous waste. Also the radio frequency used must not cause harmful radiation or disturb animals, birds, insects etc.

Ethical:

The system should maintain privacy of the individual and follow codes of ethical sharing of collected data. The data collected regarding check-in and check-out timing of individuals as well as their personal details should not be shared with unauthorized parties. They should only be shared with law enforcement agencies and courts on their demand and following legal and standard procedure.

Health and Safety:

The system should not cause any health related problems especially related to electromagnetic radiation, or pollution of immediate environment by solid, liquid or gaseous waste. It should also be safe to handle and should not cause electric shocks, cuts from sharp edges, burns from heated components etc.

Cost versus Range of Sensors:

High power active sensors using better class of RFID tags and higher frequency transducers can function at a very large range but they are costlier than low frequency passive RFID tags which function in a smaller physical range. Due to focus on making the system cost effective and only a slight increase in inconvenience due to decrease in range, we are using passive RFID tags. Information Storage in Tags versus Information Storage in Central Database: Using "read-write" tags the user information and account balance can be stored in the tag itself but these tags are costlier and there is risk to data privacy as any transducer working on the same frequency can read it.

Using "read-only" tags that only contain a unique ID which has corresponding user information and account balance in central database helps maintain privacy and security.

Conclusion

Prerequisites:

- Arduino
- Servo motor
- RFID cards
- GSM module
- A laptop
- USB cable
- Breadboard

For availing the facilities of the parking system each user must have an account in the system and receive a RFID based card. This account information is stored in the central database in form of a table with each entry representing one account and various columns containing different data items belonging to that account. The corresponding RFID card will be used to operate the account and its services like getting in and out of the parking and will be used to monitor all the activities related to that specific account such as taking check-in and check-out time and billing. It can also

- **Connecting wires**
- **LEDs**

In this study, the various types of smart parking system and has been presented. From the various examples of the implementation of the smart parking system being presented, its efficiency in alleviating the traffic congestion and the insufficient parking spaces are undeniable. It does so by directing patrons and optimizing the use of parking spaces.

With the study on all the sensor technologies used in detecting vehicles, which are one of the most crucial parts of the smart parking system, the pros and cons of each sensor technologies can be analyzed. Although, there are certain disadvantages in the implementation of visual based system in vehicle detection as described earlier, the advantages far outweighs its disadvantages.

Results / Applications

Educational campuses, offices, Multiplexes, flats etc. can employ this system. The same type of system can be modified to be used in toll booth management as well as security access application also.

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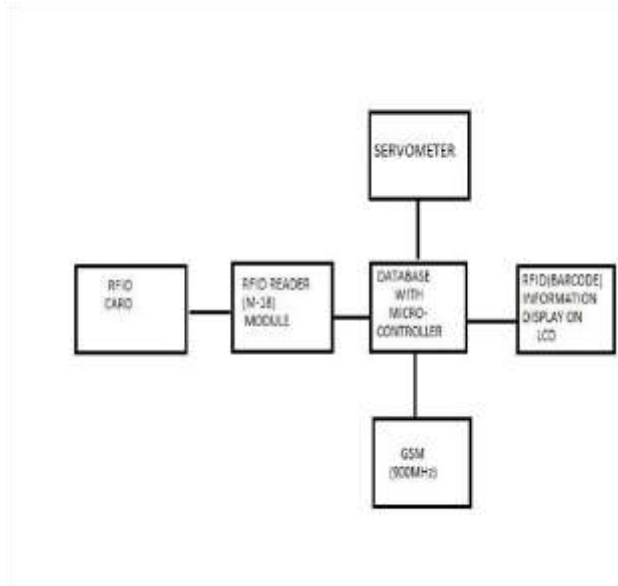
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