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Automated Vehicle Parking System

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Abstract -The purpose of this IoT-based project was to design and build an example of an automated parking system that would provide a solution to the problems encountered in modern parking management systems.
The main components are RFID technology, RFID labels, RFID reader, barriers. All these hardware are connected using the Arduino Mega board. The software handles transactions, control, management, control, reporting of parking operations. Space availability can be viewed remotely using the Internet and a web browser. Entering and exit parking spaces are monitored and controlled by RFID students, labels and barriers, and parking costs are heavily deducted using this technology. Drivers will not wait for the identification of their vehicles as this will be automatically deducted from the tags provided. This will not only save her time and car fuel but also ensure safety as only registered markers (users) are allowed access.

Key Words: IoT, RFID, Arduino, Reader, IR Module, Tags

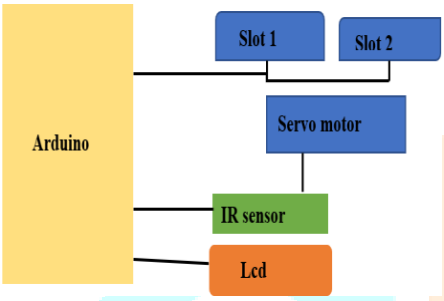
INTRODUCTION

This "Automatic Car Parking" project demonstrates the concept of an automatic car parking system. Automatic parking can be defined as the use of advanced technology within an urban travel strategy to operate, monitor, and manage to park effectively. It is difficult to find an unoccupied parking lot in today's hands-on system in a large parking lot. The proposed automated parking system helps to find empty spaces even before parking. Ifthere are no empty spaces, the gate will not be opened by the servo motor and the message "Space is not available" will be displayed on the monitor in front of the parking gate. This can be done using many hardware and software. On the hardware side, the core of the project is the Arduino Mega Board, which is an easy-to-use device and this device can be easily connected to almost any sensors or module in today's market.While on the software side, Arduino core is usedto use Arduino board, MySQL is used to store andtrack all records in its database, and PHP is usedto retrieve all such data. The main components of the system are RFID tags, antenna, reader, barriers, IR sensor, servo motor, and the above-mentioned software. Part of the software is equally important not only to use the Arduino's spine but also to display all the online parking information that helps to determine the parking space even before you arrive at the parking lot. Therefore, the purpose and objective of the software are to perform various operational tasks, to keep records, and to access those

records in the backend. In other words, thesoftware works as a default tool.

Methodology

It is difficult, if not impossible, to quickly find a vacant lot in a multi-level car park, especially onweekends or holidays. About 66 percent of visitors can take more than 10 minutes to find accommodations on weekends or holidays.
Stadiums, shopping malls, hospitals, etc., are crowded with peak hours, which is a big problem for customers to find vacant spaces inthese areas.



Project Objective

The main objective of the project is to replace the current system of managing parking spaceseffectively. Here is a list of the project objectives:
. Reduce human effort and parking time.
. Building an affordable parking system.
. Default payment system.
. Remote access to the parking availabilityinformation.
. To make the parking lot safe, secure andrealistic.

Features and Motivation to use Smartparking

To get rid of and move on to the proposed system of parking management, one must be confident and satisfied to use this latest technology. Some ingenuity has no reason and motivation to move from the old system to thenew. Some of these project features and motivation to use smart parking are listed below:

1- Customized parking: The car owner will find available parking, time-saving, fuel, and effort. The parking space perfectly complements what business and corporate objects can use the upgraded space efficiently.
2- Reduced pollution: Searching for parking places burns unanswered fuel per day. So this good parking solution will save a lot of fuel andreduce driving time, thus reducing the daily carcrash.
3- Reduced traffic: Traffic flow will increase as they search for open parking requires driving around.
4- New Income Distribution: With this proposed technology, a lot of revenue stream is possible. The owner of the parking lot, for example, may allow a selection of horizontal installments depending on the location of the parking space.To empower rehash clients, a reward system can also be incorporated into existing models.
5- Improved safety: Sticks operating in the parking lot have real-time data that can help prevent parking violations and any suspicious activity. Lower search routes can also help toreduce the risk of disruption in search of parking lots.

Scope

This advanced technology can be used in any urban area where parking is common.

Some of the heavy areas where this projectcan be installed and implemented are listedhere:

* Supermarkets
* Hospitals
* Airports
* Cinema hall

RFID Based Management System

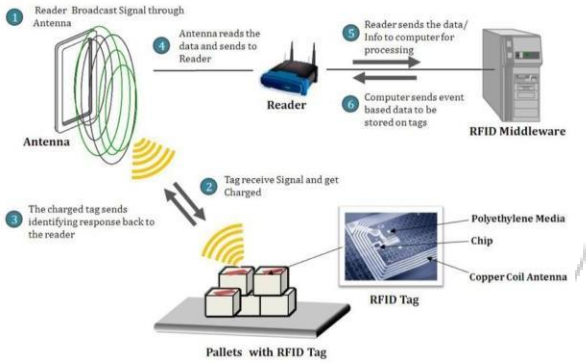
Different ways of making independent or smart parking systems are common. Since theproject is based on RFID, the literature used to implement the project is based on an article published in the Indian Journal of Science and Technology entitled “A Prototype for Io based Car Parking Management System for Smart Cities.

Design of the System

The design of the automotive parking system is divided into two parts: Hardware (electronic components) and Software. RFID tags, students, barriers, Arduino mega board, Arduino Ethernet shield, IR Module, Servo Motor, LCD screen are the main electronic components used as hardware components. On the other hand, software such as HTML, CSS, JavaScript, MySQL, PHP, Apache is used to have one fully functional project...

RFID and It’s Working

RFID stands for Radio Frequency Identification. RFID belongs to the family of Automatic Identification and Data Capture (AIDC) which is a fast and reliable way to identify objects. There are two main components: the RFID Reade, which transmits and receives the signal, and theTransponder connected to the object. An RFID tag is a device that uses radio waves to identify and track items such as a person, animal, or product. A few meters away, beyond the student's visible line, some markers can be read. RFID tags come in a variety of sizes and shapes that can be customized or customized. Wireless communication between RFID readers and tags usually does not require a visible path between devices. An RFID reader can read almost anything other than materials, for example, water and metal, but even this can be overcome by modification and placement.



RFID tags are available in a wide variety of typesas well as a variety of pre-passive, multi- frequency, dynamic, and tag-talks-first. There may also be different types of RFID sticks. In addition, not all RFID systems use standard EM waves. Only reading tags and tags are available at read-write tags. Up to 2K tags contain product data and tags contain only one productID. Tags can also be used for more than product IDs; can be applied to safety features, environmental monitoring, and product integrity measures

* UHF 400-1200 MHz
* Microwave 2.45 and 5.8 GHz

Types of Tag

- Passive Tag

Empty labels are usually smaller, simpler, and less expensive than flexible labels that can be attached to hard objects are not maintained, and will last longer. Transponders are simply configured within a reader's response range. A low-frequency radio field is issued by an RFID reader that gives the marker the ability to transmit any chip information.

- Active Tag

Active tags do not match when they combine their given capabilities, while the tag can be a substitute for a standard signal indicator that allows for a wide variety of options such as read / write and edited power.

Arduino Ethernet Shield

RFID Frequencies

Carriers of data between tags and radio reader. The RFID communication method is usually accepted to distribute the waves depending on the application. Used frequencies cover the extended range.

The bands mentioned are:

* High frequency 9 - 135 kHz
* Short wave 13.56MHz

Arduino Mega Board

Arduino is an open-source, hardware, and software-based prototyping platform. Arduino boards can perform automated automation with other electronic devices such as reading light input sensors, LED switching, working with different types of engines, and accessing the Internet through network protection. A small controller on the board follows a set of commands written in the programming language where your board can do many amazing things. It's like the brain of any project.Arduino can connect to many other electronic devices such as pc, other Arduino, or other smaller controllers.

Arduino Specification

Microcontroller	AtMega2560
Operating Voltage	5V Input Voltage (recommended) (7-12) V Input Voltage (limit) (6-20) V
Digital I/O Pins:	54 (of which 14 provide PWM output)
Analog I/O Pins:	16
DC Current per I/O Pin:	40mA
DC Current for 3.3V Pin:	50mA
Flash Memory	256 KB of which 8 KB used by boot loader
SRAM	8KB
EEPROM	4KB
Clock Speed	16MHz

The Arduino Ethernet Shield R3 integrated withthe Arduino Mega Board can provide an internet connection to the Arduino board. This shield is based on the details of the Wiznet W5100 ethernet chip. The Wiznet W5100 provides a network stack capable of TCP and UDP (IP). Four connections can be made simultaneously in that socket

IR Sensor

An infrared sensor is an electronic detector or sensor that detects infrared ray (IR) light in

objects in its field. This project monitors the presence of vehicles in the parking lot and sends information accordingly. The ADC is used here to perform the calculations described below:

* 1023 == 5V (taken)

* 0 == 0V (nobody)

The Arduino ADC has a 10-bit converter which means 1024 (0-1023) as a decimal number thatis also mapped with a power supply of (0-5) V.

5V means busy because the IR sensor will hear avale in the parking lot and the 0V means unoccupied because the IR sensor will not hear anything.

LCD Screen

LCD (Liquid crystal display) is used for our mobile phones and various other Nanotechnologies. Similar to the light-emitting diode (LED) and gas plasma, LCDs allow the indicators to be much smaller than the technology used for the cathode ray tube (CRT)which is usually much larger. LCDs use much less power than LEDs and gas displays as they work differently than transmitting them to a light-blocking guide. The connection of the LCDscreen to the small controller is made with a PIN.

Software Required

A programming language and interface are required to achieve the desired results to design a concept that will allow the Arduino Mega board to understand its needs. Many Arduino libraries have been used to integrate hardware and software. To create a fully functional web page that can be accessed online, using the required languages and software.

HTML, CSS and JavaScript

HTML

An HTML file contains a page layout. It's like abuilding.

CSS

Page style customization is done with CSS thatallows color, location, and much more to change the look of a web page itself. It is like abuilding design.

JavaScript

Flexible and active items on the page are determined by a JavaScript file. It focuses onthe interactive part of a web page such as clicking, scrolling, or typing within certain
features of a web page.

Result.

The project platform contains 6 parking spaces, an entry gate, exit gate, and LCD to display information. 150 Nrs per hour parking costs andthe same amount should be deducted on an hourly basis. This information is in the web browser. The LCD always indicates the availability of 6 free parking spaces for this.
Now to make sure the project went smoothly, 4test cases were done.

Test Case 1: Invalid Mark

The first test is performed on an unregistered marker. LCD 6 available parking space. In this test case, as the vehicle with the wrong sign is approaching the entrance gate, the system did not allow the vehicle to enter the parking lot and the gate remained closed. The LCD is marked "Invalid Marker" and parking is available at 6 which means the invalid mark has been tested and

operated successfully.

Test Case 2: Valid mark but low balance

The second test is for a registered marker but with a lower balance. LCD 6 available parking space. In this test mode, as the car approachesthe entrance gate, the LCD has shown "low balance" and the free parking space is still 6.
With this result, it is guaranteed that the lowbalance marker has worked successfully.

Test Case 3: Valid Mark

The third test is for a registered marker with enough balance to park his car in the parking lot. LCD 6 available parking space. As the car approached the front door, the gate opened. The car was allowed to go to the parking lot. Now, as the car enters the parking lot, the LCDs5 available parking spaces as one sits in a newlyparked car.

Now after some time, the parked car has to move, the LCD still shows the 5 available parking spaces. As the car approached the exit gate, the gate opened. The owner was allowed to leave the parking lot and as he was leaving, the LCD showed 6 available parking spaces as one residential area was free. Now to check thebalance in the web browser, the browser is reloaded and shows that Nrs 150 has been deducted from the user's balance. With this result, it is confirmed that the valid tag has been successfully used.

Conclusion

This project aims to solve the problems of managing parking spaces in the busiest areas. The project model needs to be analyzed while developing a life-size model. The machine model is built. The project was mainly divided into electronic, Arduino program, and part of web applications. In the electronic part, all the required circuits are successfully built. The challenging planning part took a long time but was successfully integrated with all the hardware each member assigned to the Arduino board. Later each program was mergedand one program was developed. The same process is used to improve a web application.
Also, software compliant with the control region has been used successfully. The project is made with intensive research and learning fromdifferent resources and tools.

One of the aims of the project was to provide remote information about the availability of parking space, the project could not achieve the desired result. This unattainable result, however, taught an important lesson: One has to be very careful about choosing the electronicpart and getting the direct effect on it.

In this project, it has been proven that by using RFID tags with a student with a database, safe and well-managed parking can be accessed. Thisproject not only provides automatic parking but can manage records better. By using a central data system, easy management and accessibility are possible. The manager can easily keep a check on incoming and outgoing vehicles depending on the day and time. By using this program, personnel costs will be eliminated and the congestion problem will be solved by going in and out immediately.

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