

SMART CAR PARKING SYSTEM

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ABSTRACT

Nowadays, finding an available parking space can be considered as time and fuel consuming in metropolitan cities. This paper explains the architecture and design of Smart car parking based on Arduino. Our system design is used to eliminate unnecessary time conception to find an empty park space depending on the number of unoccupied slots in the parking area and if it does not find an empty slots in parking area the barrier will not open and display the message that parking is full. Using this system, we also save more than 20-30% of fuel wastage in search of car parking.

Keywords: - Smart Car Park, Parking Problem, Arduino Uno, IR sensor, Servo Motor, Display

1. INTRODUCTION

There a lot of instances today where people park their vehicles in places where parking is not allowed or have a lot of problems finding the right places to park. Parking these days in cities is one of the most difficult conundrums for the people. People waste a lot of their time finding the right parking slots, as a result many park their vehicles in congested areas and places where actually parking is prohibited .This leads to a lot of confusion , especially during the rush hours when there is a lot of traffic wasting lots and lots of times. This paper deals with this problem in a very efficient manner as it allows folks to book parking slots prior to their visit to a particular place. The person who needs to book a slot first has to register himself on the website after which he gets to know the available or vacant parking spots nearest to place he wishes to visit. This helps in optimizing usage of parking space and saves time as well as prevents congestion. This sheds light on the way in which this difficult problem can be solved. The prototype basically looks for the available parking slots and helps the driver or the person to book them. After the booking process a receipt is generated which is evaluated for validity at the place of parking through a unique ID, as this is an insight to an automated system, if the ID is valid then the vehicle is allowed entry into the parking premises. After the driver parks his vehicle, a message is sent to him giving him the confirmation that his vehicle has been parked successfully. People who don't have access to internet can refer to an LCD which shows the available parking slots at the current time.

1.1 Literature Review

Smart car parking systems offer a range of benefits that have garnered significant attention in recent years. One of the primary advantages is the improved parking efficiency they provide. By utilizing advanced technologies such as IoT, sensors, and data analytics, these systems offer real-time information on parking space availability, allowing drivers to quickly locate and secure a spot. This reduces the time spent searching for parking and minimizes traffic congestion, resulting in a more efficient use of parking spaces.

In addition to enhanced parking efficiency, smart car parking systems also contribute to an enhanced user experience. Mobile applications integrated with these systems enable drivers to easily find and reserve parking spaces in advance, eliminating the stress of searching for parking upon arrival. Moreover, smart parking solutions often incorporate cashless payment options, eliminating the need for physical transactions and making

the process more convenient for users. Automated entry and exit systems further streamline the parking experience, providing a seamless transition in and out of parking areas.

Furthermore, smart car parking systems can have significant environmental benefits. By reducing the time spent searching for parking, they help decrease fuel consumption and vehicle emissions. This contributes to a cleaner and greener environment, aligning with sustainability goals in urban areas. Despite these benefits, several challenges exist in implementing smart car parking systems. The integration of various technologies, such as sensors and IoT infrastructure, requires significant investment and infrastructure development. Moreover, ensuring the security and privacy of user data is crucial to maintaining public trust in these systems. Looking ahead, the potential applications of smart car parking systems are vast. They can be integrated into smart city initiatives to improve overall urban mobility and reduce congestion. Additionally, the data collected from these systems can be leveraged to gain insights into parking patterns, enabling better urban planning and resource allocation.

In conclusion, smart car parking systems offer numerous benefits, including improved parking efficiency, enhanced user experience, and environmental sustainability. While challenges exist, the potential applications and long-term advantages make them a promising solution for addressing parking congestion in urban areas. Continued research and development in this field will further advance the capabilities and impact of smart car parking systems.

2. WORKING PRINCIPLE

The basic working principle of LCD is passing the light from layer to layer through modules. These modules will vibrate & line up their position on 90 degree that permits the polarized sheet to allow the light to pass through it. These molecules are accountable for viewing the data on every pixel. Every pixel utilizes the method of absorbing light to illustrate the digit. To display the value, the position of molecules must be changed to the angle of light. So this light deflection will make the human eye notice the data that will be the ingredient wherever the light gets absorbed. Here, this data will supply to the molecules & will be there till they get changed at present, LCDs are used frequently in CD/DVD players, digital watches, computers, etc. In screen industries, LCDs have replaced the CRTs (Cathode Ray Tubes) because these displays use more power as compared to LCD, heavier & larger. The displays of LCDs are thinner as compared to CRTs. As compared to LED screens, LCD has less power consumption because it functions on the fundamental principle of blocking light instead of dissipating.

Registers of LCD-

The registers used in LCD are two types like data register & command register. The register can be changed by using the RS pinout. If we set '0' then it is command register and if it is '1' then it is data register.

Command Register-

The main function of the command register is to save instructions illustrated on LCD. That assists in data clearing & changes the cursor location & controls the display.

Data Register-

The data register is used to save the data to exhibit on the LCD. Once we transmit data to LCD, then it shifts to the data register to process the data. If we fix the register value at one that the data register will start working.

2.1 Software

1) Arduino IDE:-

The Arduino Integrated Development Environment is a crossplatform IDE designed for Arduino microcontrollers. The IDE uses a combination of the C standard library and C++.[4] It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.[5] The source code for the IDE is released under the GNU General Public License, version 2.[6] The Arduino IDE supports the languages C and C++ using special rules of code structuring.[7] The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution.[8] The Arduino IDE employs the

program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.[9] By default, avrdude is used as the uploading tool to flash the user code onto official Arduino boards.[10] Arduino IDE is a derivative of the Processing IDE,[11] however as of version 2.0, the Processing IDE will be replaced with the Visual Studio Code-based Eclipse Their IDE framework.[2] With the rising popularity of Arduino as a software platform, other vendors started to implement custom open source compilers and tools (cores) that can build and upload sketches to other microcontrollers that are not supported by Arduino's official line of microcontrollers. In October 2019, the Arduino organization began providing early access to a new Arduino Pro IDE with debugging [12] and other advanced features.[13]

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. • This environment supports both C and C++ languages.
- You need to select the baud rate of the Arduino Board you are using right now. For my Arduino Uno Baud Rate is 9600, as you write the following code and click the Serial Monitor.

3. PROJECT DEFINATION

For the traditional parking, the available number of slots are displayed at the entrance of the parking area using the LCD display. In case of availability the drivers can go to the parking. They are then directed to a specific slot where they can park the vehicle and the count on the display decreases. This count is updated through the signals sent by IR sensor to arduino whenever it detects the presence of a vehicle in front of it. The sensitivity of IR sensor can be adjusted manually. The basic working model consists of two slots in total. The IR sensors are present in the offline slots which on detecting the presence of a vehicle sends signals to the Arduino Uno which in turn updates the count on the LCD display.

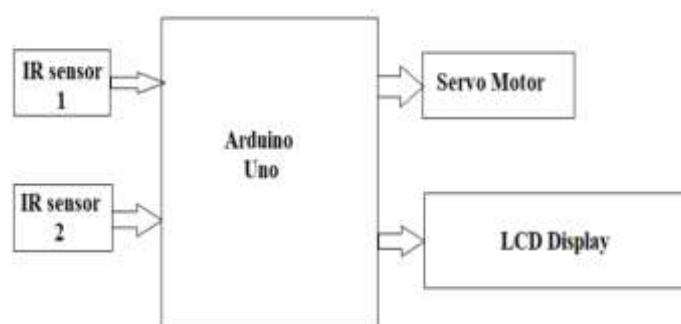


Chart -1: Block Diagram

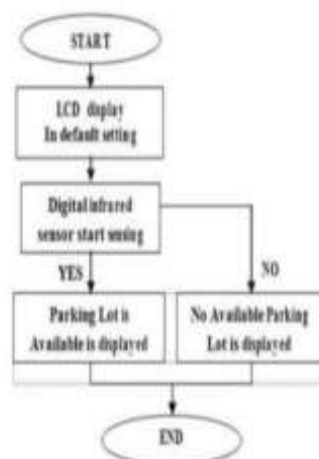


Chart -2: Flow Chart

3.1 Result and Analysis

We have tested the design system with a dummy car. There are usually two possibilities.

- Entry: While entering, the car is noticed by the IR Sensor. Firstly the outer IR sensor and then the inner IR sensor. The count increases and result is shown in display.
- Exit: In this case, Firstly the inner IR sensor notices and then the outer IR sensor. The count decreases and result is shown in display.

We have experimented the system to gather some statistical results. After the experience, we have found the inner and outer sonar works perfectly. As the result shows, the system is almost 100% correct. The whole experiment was done couple of times by us. Dummy cars were used. The prototype was not always correct due to the limitations of the use of low quality sensors. But the performance was satisfactory enough.

4. FUTURE EXPANSION AND CONCLUSION

In future works, this framework can be enhanced by including different applications, For Example, and internet booking by utilizing. The driver or client book their parking area at home or while in transit to the shopping center. This can diminish the season of the client to seeking the empty parking area. As a further review, distinctive sensor frameworks can be added to enhance this framework to distinguish the question and guide the driver or clients speediest. We will to decrease the mechanical structure and attempt to make it ecofriendly. The future of smart parking is optimistic. It will permit us all to make efficient use of available space while vastly enhancing parking management efficiency for drivers & agencies that manage this vital city resource. Smart Parking solutions play a huge role in the smart city ecosystem, betterment in convenience, congestion, lower costs, urban mobility, and practical information & intelligence delivery. Digital smart cities change the consumer's experience and set expectations that shape the demand for parking services. The progress of all-inclusive information services has led Smart Parking to extend our technology and services to meet smart city solution needs. Smart parking applications have a positive impact on all investors. Bikers will be equipped to reserve parking spaces in advance. Officials will better be able to manage traffic and catch parking breaches. Managers and parking facility owners can better use the space and resources within their parking lot. Smart parking will be a great move for urbanization. We can hereby conclude that this system provides a very efficient and comfortable way of dealing with parking problems that people are facing in their day to day life and tackles the conundrum of systematic parking and congestion saving both time and money. Using this methodology and strategy we can help alleviate the stress and confusion that a driver has to face in order to an easy enough task as parking his vehicle.

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