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Smart Parking System for Cars

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Abstract: ***This research focusses on an effective method of discovering empty spots and regulating the number of vehicles going in and out of complicated multi parking facilities by recognizing a vehicle with IR sensors and delivering feedback. The completely automated smart parking system for car is simple and does not require expensive equipment. It is a basic circuit designed specifically for its intended purpose. This automated technology is used to locate available parking places and direct the motorist to the desired space utilizing visuals and an efficient approach, hence decreasing hunt time. This smart parking system for car combines four infrared sensors, a 16x2 LCD display, and a cell phone to convey the availability of parking places. The smart parking system efficiently manages vehicle parking by monitoring parking slot availability and regulating gate access as necessary. Based on how the system works, when Parking Slots 1 through 4 are free, the Gate remains open, allowing vehicles to access. When Parking Slots 1 through 4 are full, the gate closes, prohibiting further admission until a slot becomes available. Information about available parking spaces is sent to the mobile device by the system. This system is vital for retail malls and commercial complexes, airports and railway stations, hospitals, corporate offices, universities and colleges, event venues and stadiums.***

Keywords: Automated, smart parking system for car, parking slot, IR sensor, LCD

I. INTRODUCTION

In today's fast-growing urban environments, finding a parking place in today's fast-growing metropolitan surroundings has become a major difficulty, resulting in traffic congestion, fuel waste, and driver irritation. Traditional parking arrangements are frequently inefficient and time demanding.

To address these concerns, a Smart Car Parking System is presented, which automates the monitoring and management of parking space availability. This system uses four Infrared (IR) sensors to identify the presence of automobiles in individual slots. A 16x2 LCD monitor at the parking entry shows real-time slot availability, directing drivers to open spaces. Additionally, the system includes a mobile phone interface allowing for remote access to parking status updates

In the present environment, we see an excess of automobiles and an inability to manage them in the proper sequence. As the population grows, so does the rate of utilization, making it difficult to keep up with the demands. Finding a parking space for your vehicle is a common challenge around the world. This work appears straightforward on side roads and inner lanes, but the real challenge starts when parking in malls, multi-parking structures, IT centers, and parking facilities where hundreds of cars are parked, making it difficult to find a spot.

The basic technique to seeking a parking space is to drive around aimlessly until you find a free space. Finding a parking space can be a simple or difficult chore when dealing with large areas spread across one or more levels. The time and fuel are wasted since the destination is unknown. The easiest method is to enable destination-specific driving within the parking structure. A smart parking system for cars provides a visual output showing an open parking place rather than driving aimlessly. By automating the detection and communication processes, this smart parking system improves convenience, decreases traffic congestion, and contributes to more efficient use of parking resources.

II. LITERATURE SURVEY

Thakare Vivekanand et al. This project aims to automate key procedures in car parking systems, such as using sensor data output to check for parking slot availability. In order to stop crowded and haphazard parking, This research proposes an Internet of Things-based smart parking system. This study presents a four-layered system design. Networking, sensor layer, middleware, and application. The issues that arise when parking a car in commercial parking lots have been addressed in this project. The Parking Reservation System is an automated system that uses a web application or web browser interface to assign an ID-based parking space. Users must arrive at a parking spot within a specified time (such as 10 minutes) after reserving a spot. That time slot will be open to others if they don't arrive at that precise moment.

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An IOT-based smart parking system is presented by Anusha et al. as the best way to address the parking issue in large cities. Finding a parking spot is a challenging chore for users due to the fast increase in vehicle density, particularly during peak hours of the day. This study suggests a mobile application and Arduino-based smart parking solution. The slot module that is deployed on-site as part of the suggested smart parking system is utilised to track and indicate each parking space's availability. Additionally, a smartphone application is offered that enables users to check parking space availability and reserve a spot appropriately. By lowering pollution and fuel consumption in metropolitan areas, smart parking can boost the economy. Our proposed system gives real-time information on parking space availability in a parking lot. Using our smartphone application, users can reserve a parking space for themselves. Thus consumers don't have to waste time looking for parking spaces.

Abdelrahman Osman Elfaki, et al. This research presents an intelligent real-time parking management system. By offering a mechanism for reserving a specific parking space using our Artificial Intelligence (AI)-based application, a mechanism to guarantee that the car is parked in the correct spot, and dynamic allotment of parking places while taking into consideration the entire parking situation., the developed system can address the aforementioned challenges. Two technical options with various costs have been presented for the purpose of cost flexibility. Motion sensors are the basis for the first approach, while range-finder sensors are the basis for the second. Using an Internet of Things device to take a picture, a plate detection and recognition system has been utilized to find the license plate of the car.

S. Hanumanthakari Making the most of the available space, efficiently controlling traffic, and fully utilizing resources are the main objectives of this research project. The smart parking system has been improved in recent years, and research is ongoing to develop a system that is both technologically sophisticated and easy to use. Users can order and locate parking spaces with the help of an Android and web application created for an Internet of Things-based real-time smart parking system. The suggested strategy makes it easier for people to locate parking spots in designated areas when driving their own cars.

Suraj Kumar et al. The goal of this work is to present a thorough examination, comparison, and analysis of smart parking systems with respect to their technological approach, user interface, computational methods, and services offered. In order to address issues like standing in a extensive queue and going about the blocks looking for a parking place, we are putting forward a novel idea in this paper that would allow residents who live close to congested streets to rent their unused parking space. Additionally, by enabling customers to pre-book a parking space, this technology saves them time by minimizing the time they spend looking for a spot.

III. METHODOLOGY

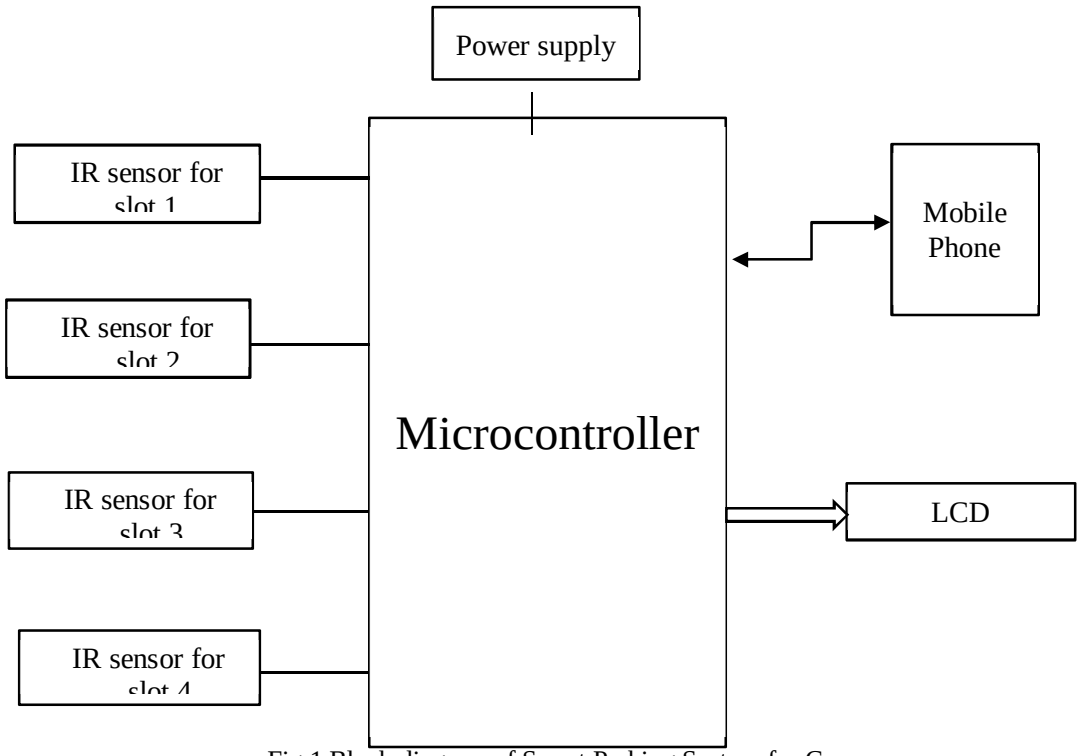


Fig.1 Block diagram of Smart Parking System for Cars

The figure no.1 shows the block diagram of Smart Parking System for Cars.

A. System Design

The smart parking system is designed to monitor and display the availability of parking slots in real-time using IR sensors, a 16x2 LCD display, and a mobile phone for remote communication. The light waves which are emitted cannot be seen in the visible spectrum. Once the emission becomes consistent the IR receiver receives these radiations and converts them into an electrical signal thus creating a potential difference. As the radiations increase, the voltage increases causing more current to flow. To obtain this the distance of reflection of waves must decrease. To as the summarize this the voltage of the circuit increases when any object comes closer. The prototype will be run in, the required conditions and will be tested accordingly.

B. Hardware Components

1) IR sensors
2) Microcontroller
3) LCD (Liquid Crystal Display)
4) Power supply system
5) Mobile Phone

Data Collection and Processing: Collect real-time data from sensors about parking space occupancy and availability of slots. Use data for parking space availability and optimize parking operations. Because IR waves are constantly being emitted, feedback is instant.
Testing and evaluations: Testing and evaluations involve validating system components real world conditions to ensure accuracy, reliability.
Challenges and solutions: Identify challenges, develop solutions, test and refine

IV. RESULT

The effectiveness of the vehicle parking spot and detection system can be assessed as show below is an illustration of how these results may appear.

The figure 2 to 5 shows the following result as:
Total parking slot = 4, slot 1,3 and 4 = Free, Current slot 2= Full, Gate is open

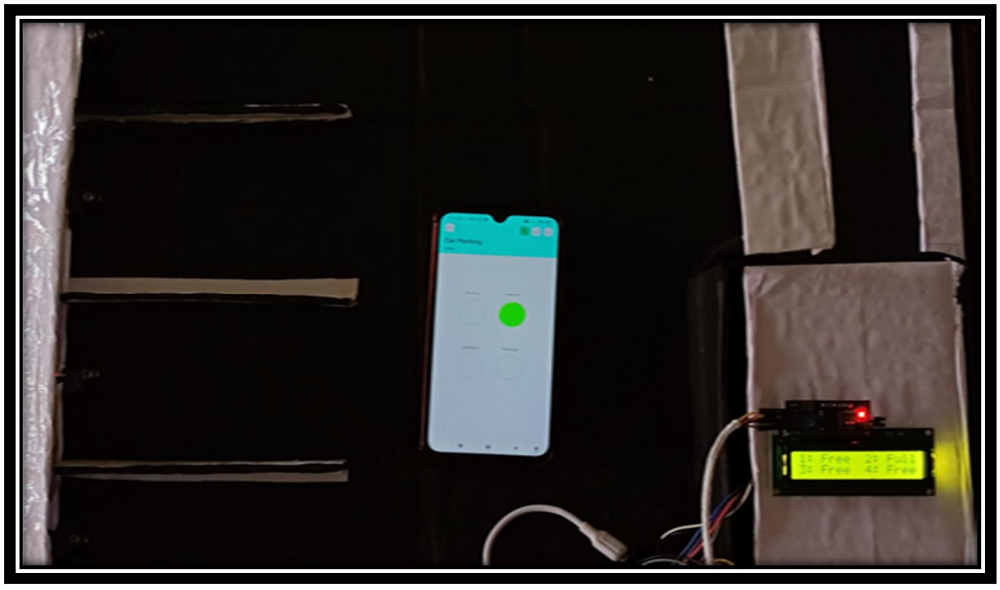


Fig.2 Parking slot 1,3 and 4 = Free, current slot 2=Full and Gate is open

Total parking slot = 4, slot 1 and 3 = Free, Current slots 2 and 4= Full, Gate is open

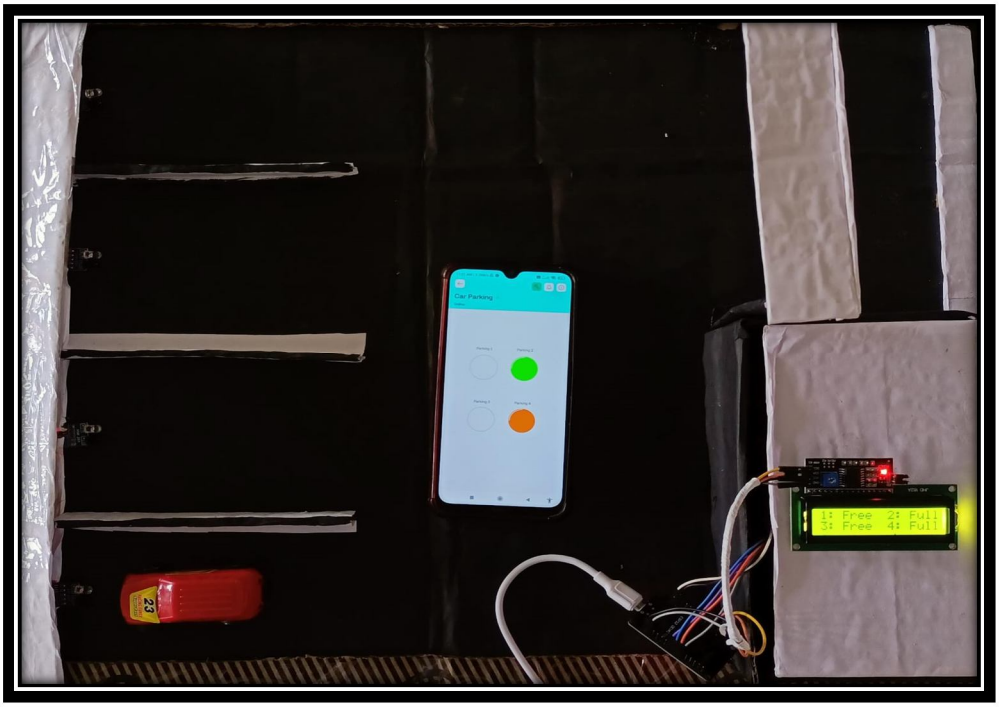


Fig.3. Parking slot 1 and 3 = Free, Current slots 2 and 4= Full and Gate is open

Total parking slot = 4, slot 1 = Free, Current slots 2,3 and 4= Full, Gate is open

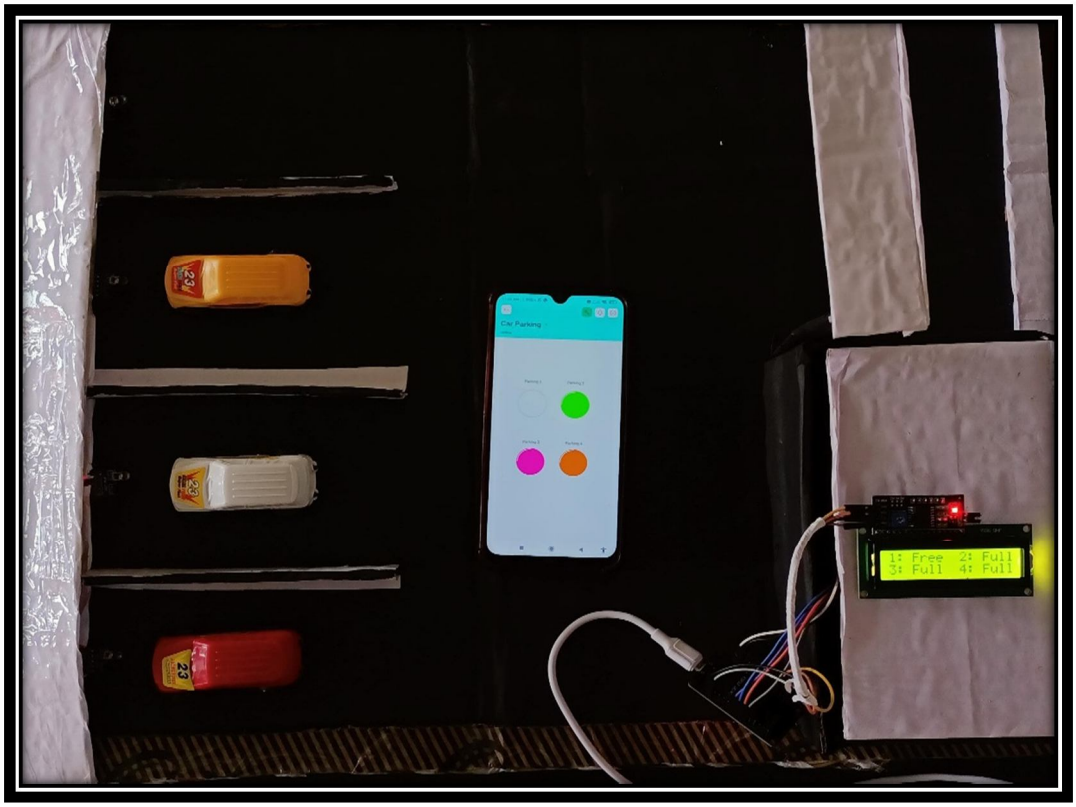


Fig.4. Parking slot 1 = Free, Current slots 2,3 and 4= Full, Gate is open

Total slots =4, Current slots 1,2,3 and 4= Full, Gate is closed

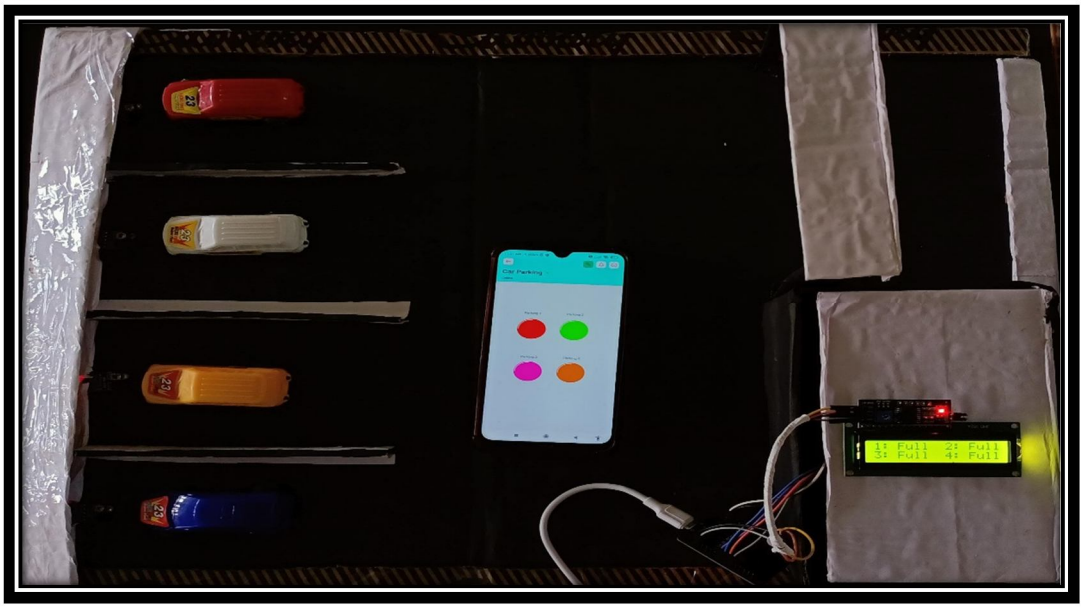


Fig.5 Parking Current slots 1,2,3 and 4= Full and Gate is closed

This is compared to traditional techniques, which would have a much higher amount of accuracy and efficiency improvement. In a Smart Parking System for Cars, typically refer to the visual cues provided to drivers, often through LED lights or displays, indicating the availability of parking spaces. These lines, usually color-coded provide a quick and easy way for drivers to identify available spots and avoid wasting time circling in search of a space. The mobile device receives information about available parking spaces from the system.

V. DISCUSSIONS

A Smart Parking System for Cars uses technology, like sensors and apps, to help drivers find and secure parking spaces quickly and efficiently. It offers real-time parking availability, guidance, and sometimes even reservation options, leading to reduced traffic and frustration. Some of these models can process real time, which makes them suitable for parking management and smart city initiatives but suffers occlusion and changing illumination. Their scalability and efficiency mainly position them for immense utilization in autonomous vehicles and urban infrastructure development undertakings. Moreover, despite some of the chronic challenges, these models are transforming urban planning and transportation into scalable, efficient, and dependable solutions.

VI. CONCLUSION

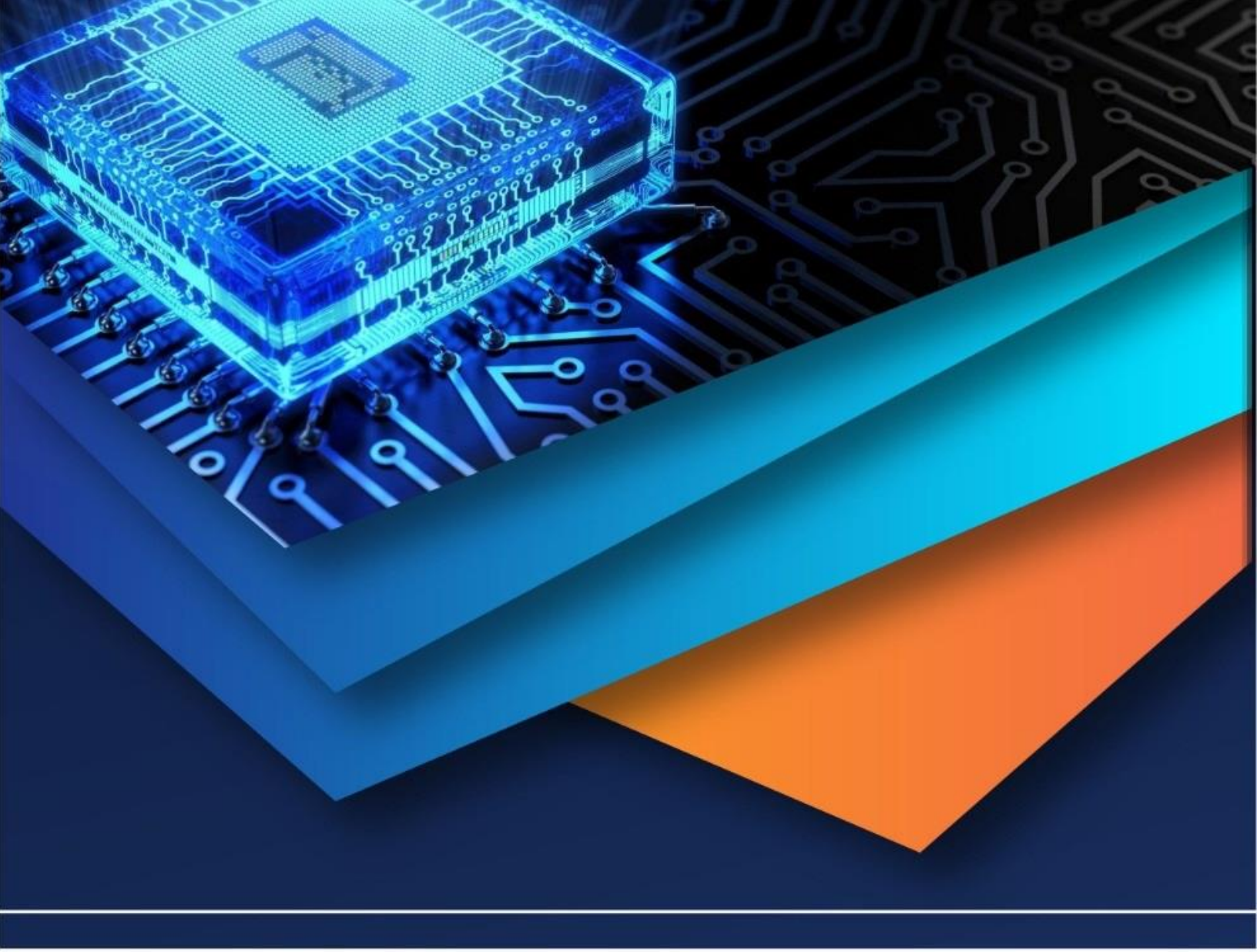
The smart parking system for car efficiently handles the frequent issues of wasted time and traffic congestion caused by improper parking management. The system provides real-time monitoring and quick updates on parking space availability using four infrared sensors, a 16x2 LCD display, and mobile phone connectivity. This not only improves customer convenience, but it also helps to improve traffic flow and minimize fuel use. The design is adaptable and may be varied depending on the area available. Based on free and full slots of parking area the system is displayed indicating the count of parking spaces available. The Smart Parking System efficiently manages vehicle parking by monitoring parking slot availability and controlling gate access as needed. Based on the system's functionality, while Parking Slots 1–4 are free, the Gate remains open, allowing vehicles to access. When Parking Slots 1–4 are full, the gate closes, prohibiting further admission until a slot becomes available. Information about available parking spaces is sent to the mobile device by the system. The concept is scalable, low-cost, and suitable for integration with smart city infrastructure, making it a viable answer to modern urban parking difficulties.

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