

Tracking Availability of Parking Space Using Iot

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ABSTRACT: The problem of parking in big cities, especially mega-cities, has become one of the key causes of traffic congestion, driver frustration & air pollution. Locating parking spaces in central areas, especially during peak hours, is a thoroughly cumbersome process. The issue arises from not knowing where parking spaces may be available at any given point of time. Even if known, many vehicles may be competing for limited parking spaces causing severe traffic congestions. The developed system in this project monitors the availability of idle parking slots and guides the vehicle to the nearest such slot. The feature of pre-preservation of parking slots can also be incorporated in the system. The system's reservation-based parking policy has the potential to smoothen the operations of parking systems, as well as mitigate traffic congestion caused by parking search. As an added advantage it also saves the time required to check-in and get slots to park vehicles. This project deals with an effective way of checking into the parking space and easily finding empty parking slots. This system also helps in managing the number of vehicles moving in and out in complex parking structures such as dedicated parking lots/buildings by detecting a vehicle using IR sensors and providing feedback. The fully automated smart car parking system is rudimentary and does not require heavy lines of code nor expensive equipment. It is a simple circuit built for demonstration and to fulfil the exact need of purpose

Keywords – RFID, Node MCU, Smart Parking, Sensors, Servo Motor.

I. INTRODUCTION

The RFID-based automobile Parking System project introduces an innovative approach to parking management, leveraging Arduino and RFID technology for efficient and seamless

operations. By integrating automated detection at entry and exit points, the system eliminates the need for manual intervention, ensuring swift check-in and check-out procedures for vehicles without disrupting traffic flow.

At the heart of this system lies the capability to automatically detect when a vehicle enters or exits the parking lot through the gate. Utilizing RFID technology, each vehicle is equipped with a unique identifier, allowing the system to accurately track its movements in and out of the parking facility. This real-time monitoring enables the display of the total number of vehicles present in the parking lot, providing valuable information for both administrators and drivers.

One of the key advantages of this system is its high level of automation, which streamlines the parking process for users and minimizes the risk of traffic congestion. With seamless check-in and check-out procedures, drivers can navigate the parking facility with ease, enhancing overall efficiency and convenience. This automated approach is particularly beneficial in urban areas with high volumes of parking demand, including retail centers, hospitals, airports, movie theaters, and residential complexes.

The versatility of this project extends its applicability to various high-traffic locations, catering to the diverse needs of urban environments. Whether managing parking for shoppers, patients, travelers, moviegoers, or residents, the RFID-based automobile Parking System offers a reliable and efficient solution for optimizing parking operations. By leveraging cutting-edge technology and automation, this project sets a new standard for modern parking management, paving the way for enhanced convenience and effectiveness in urban mobility.

II. LITERATURE REVIEW

[1] Abrar Fahim, Mehedi Hasan, Muhtasim Alam Chowdhury

The paper offers a detailed investigation, comparison, and analysis of various smart parking systems (SPS) deployed to address the pressing issue of parking allocation in modern cities. It covers aspects such as technological approaches, sensor types, networking technologies, user interfaces, computational methods, and services provided by these systems. Additionally, it addresses the research gap by evaluating the suitability of SPSs in different environmental conditions and outlining their advantages and disadvantages. The comprehensive comparison provided aids researchers, designers, and policymakers in selecting the most suitable SPS and gaining insights into current trends in this field.

[2] Naman JatinBhai Shah, Sejal Thakkar

In today's urbanized and technologically advanced world, there is a growing need to transition cities into smart environments. Through various measures like data sharing, artificial intelligence, machine learning, analytics, and the integration of RFID technology, cities are evolving into intelligent ecosystems. A primary focus of smart city initiatives is to manage vehicular traffic effectively and ensure sufficient, well-organized parking spaces to alleviate urban congestion. To tackle this challenge, this article introduces a real-time prototype of an Intelligent Parking System (P-System) utilizing the Internet of Things (IoT). This proposed system utilizes electronic devices to detect parking space availability and assists drivers in locating and selecting parking spots from the available options. By promoting efficient utilization of parking spaces, the system aims to significantly reduce traffic congestion and mismanagement in urban areas.

[3] J. Cynthia, C. Bharathi Priya, P. A. Gopinath

In today's thriving economy, the escalating number of vehicles demands more parking space, while the widespread use of smartphones fuels the preference for mobile app solutions. This paper introduces an IoT-based Smart Parking System integrated with a mobile app, offering a comprehensive solution for both users and parking space owners. RFID tags authenticate users reserving parking slots on various time frames, and a scheduling algorithm ensures efficient allocation based on vehicle size. Parking space owners gain insights into slot availability, occupancy rates, and revenue, enabling dynamic fee adjustments. The

mobile app enhances user experience, providing seamless access to parking services.

[4] Mechanical Parking System Feng Yuan Wang, Yi Liu

In response to the escalating congestion stemming from increased transportation options and the affordability of vehicles, cities are grappling with expanding parking infrastructure. Traditional systems have proven inadequate for the growing demand. To address this, we propose a modern parking system integrating advanced automation techniques achieved through modeling, programming, stress analysis, and motor integration. Our solution, a dimensional parking lot, introduces automated features facilitated by sophisticated programming, overcoming space constraints and lack of automation seen in older systems. Through software like Inventor 2017, we ensure reliability via detailed models and stress tests, incorporating hydraulic mechanisms and innovative wheel securing features. In summary, our solution offers a contemporary approach to urban parking, leveraging technology and smart design to enhance the parking experience.

[5] D. Kanteti, D. V. S. Srikar and T. K. Ramesh

The paper presents a Smart Parking System design for urban commercial areas, offering a solution to the challenges of finding parking spots. Using IoT technology and electronic sensors, the system helps users locate nearby parking areas and check availability in real-time. It aims to reduce time spent searching for parking and minimize unnecessary travel through congested lots. The proposed system, called SPSCSC, utilizes different database storage systems to guide vehicles to available parking lots using sensor and image detector data, sending instructions to users' mobile devices for efficient parking.

[6] Robin Grodi, Danda B. Rawat, Fernando Rios- Gutierrez

The escalating number of vehicles on the roads is leading to a pressing issue of inadequate parking space, especially in densely populated urban areas or locations hosting events. Traditional solutions, such as sensor-equipped parking lots, offer limited assistance by tracking overall capacity but fail to provide real-time information on available parking spots. To address this challenge, we propose a prototype for a smart parking system utilizing wireless sensor technology and networks. Through a Wireless Sensor Network (WSN), parking spot statuses (occupied or vacant) are

detected and relayed to a central database. Users can then access this data via a website or mobile application for instant updates on available parking spots. This system offers the advantage of real-time updates and flexibility in sensor placement. By successfully implementing smart parking, we anticipate significant reductions in economic and time costs associated with traffic congestion, wasted fuel, and the frustrating search for parking spaces caused by inefficient parking practices.

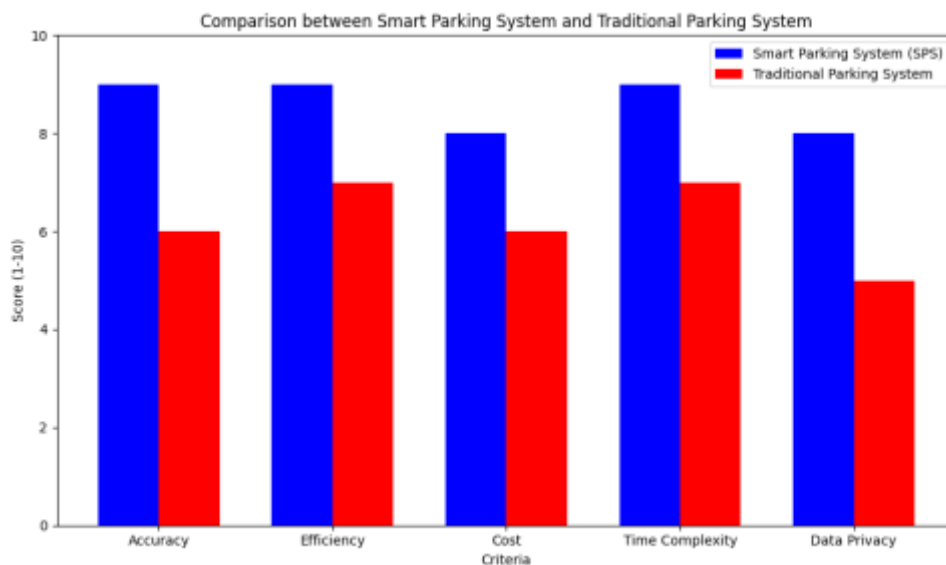
[7] Prof. S.S. Thorat, Ashwini M, Akanksha Kelshikar, Sneha Londhe, Mamta Choudhary

The escalating number of vehicles worldwide and the growing population have made

finding parking spots for bikes increasingly difficult, resulting in traffic issues. This project seeks to develop a dependable system that automates the identification of available parking spaces and maintains organized records of parked vehicles. By employing RFID tags for vehicle identification, IR sensors for detecting vacant slots, and a real-time clock for calculating parking fees based on duration, this system greatly reduces the manual effort required at parking areas. It streamlines the process by eliminating the need for drivers to search for open spots and simplifying payment calculations, thereby enhancing overall parking efficiency.

S.No	Reference Project Name	Pros	Cons
1	Smart Parking Systems	<ul style="list-style-type: none"> Efficient utilization of parking spaces. Real-time monitoring of parking availability. Improved user experience with advanced technologies. Potential reduction in traffic congestion. 	<ul style="list-style-type: none"> High initial setup costs. Potential privacy concerns with data collection. Maintenance requirements for the system.
2	RFID Based Smart Parking System	<ul style="list-style-type: none"> Efficient parking space management with RFID technology. Enhanced user experience with automated entry and exit processes. Improved security with vehicle authentication. Real-time monitoring of parking space availability. 	<ul style="list-style-type: none"> Initial setup costs may be high. Potential RFID interference issues. Privacy concerns regarding data collection. Maintenance requirements for RFID equipment. Compatibility challenges with older vehicles.
3	IoT based Smart Parking Management System	<ul style="list-style-type: none"> Real-time monitoring of parking space availability. Enhanced user experience with IoT integration. Potential reduction in traffic congestion. Systematic record-keeping of parked vehicles. 	<ul style="list-style-type: none"> High initial implementation costs. Potential issues with IoT integration. Privacy concerns related to data collection and storage.
4	Mechanical Parking System	<ul style="list-style-type: none"> Efficient utilization of parking spaces. Real-time monitoring of parking availability. Improved user experience with automated parking processes. Potential reduction in 	<ul style="list-style-type: none"> High initial setup costs. Potential maintenance requirements for mechanical components. Potential mechanical failures leading to downtime.

		traffic congestion.	
5	Smart Parking System for Commercial Stretch in Cities	<ul style="list-style-type: none"> • Efficient parking space management for commercial areas. • Improved user experience with smart parking solutions. • Potential reduction in traffic congestion. • Real-time monitoring of parking availability. 	<ul style="list-style-type: none"> • High implementation costs. • Potential challenges with implementation in commercial areas. • Maintenance requirements for the system.
6	Smart Parking: Parking Occupancy Monitoring and Visualization System for Smart Cities	<ul style="list-style-type: none"> • Real-time monitoring and visualization of parking occupancy. • Improved parking management for smart cities. • Potential reduction in traffic congestion. 	<ul style="list-style-type: none"> • High initial setup costs. • Potential privacy concerns with data collection. • Maintenance requirements for the system.
7	IoT Based Smart Parking System Using RFID	<ul style="list-style-type: none"> • Efficient parking space management with RFID technology. • Enhanced user experience with RFID-based entry and exit processes. • Improved security with vehicle authentication. • Real-time monitoring of parking space availability. 	<ul style="list-style-type: none"> • High initial setup costs. • Potential RFID interference issues. • Privacy concerns regarding data collection. • Maintenance requirements for RFID equipment. • Compatibility challenges with older vehicles.



III.CONCLUSION

This project has basically addressed the problems of efficient streamlined management of parking spaces. This system displays a welcome message and provides information about the

availability of parking space. By using of this system, there would be a significant reduction of the cost incurred to hire personnel in order to control the traffic in the parking lot and traffic congestion problem will be solved by faster check

in and check out. A successful implementation of this project would result in less traffic and chaos in crowded parking spaces like in malls and business buildings where many people share a parking space. As the Smart Car Parking System Requires minimal manpower, there are minimum chances for human error, increased security in addition to a swift and friendly car parking experience for drivers. Developing a smart parking solution in various buildings within a city would also solve the problem of air pollution by vehicles.

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