

# **Smart Parking System**

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# **ABSTRACT**

Smart parking system is a technology-based solution to address the parking problems faced in urban areas. The objective of this project is to develop an efficient, user-friendly, and automated system that allows drivers to quickly find an available parking spot in a crowded area. The system uses sensors, cameras, and other devices to monitor parking spaces and provide real-time information to users about available parking spots.

The smart parking system utilizes IoT (Internet of Things) technology and cloud computing to process the data collected by sensors and cameras. The collected data is then analysed to predict parking space availability and enable efficient parking management. Additionally, the system offers mobile applications and websites for users to easily access parking information, make reservations, and pay for parking.

The system benefits both the drivers and parking facility owners. Drivers can save time and reduce frustration by finding parking spots easily, while parking facility owners can optimize their parking space utilization and increase revenue by providing a seamless parking experience. Moreover, smart parking systems contribute to reducing traffic congestion and air pollution, enhancing urban mobility and sustainability.

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# INTRODUCTION

Smart parking system using IoT has sensors added into an interconnected system to determine parking space or level and provide real-time feedback. It is accomplished by using cameras, counters on the doors or gates of parking lots, sensors embedded in the paved area of individual parking lots, among other locations, depending on the deployment.

Each parking space has an IoT gadget, which includes sensors and microcontrollers. The user gets real-time updates on the availability of all parking spaces and, therefore, an option to choose the best one. This solution alone initiates a chain-reaction of benefits, from lesser traffic congestion to reduced fuel efficiency, in urban areas where parking is often painstaking.

A simple and easy task such as parking is thought as a tedious and time-consuming process due to mismanagement of parking system. Current parking systems involve huge manpower for management and requires user to search for parking space floor by floor. Such conventional systems utilize more power, along with user's valuable time. This paper presents a Smart Parking Energy Management solution for a structured environment such as a multi-storied office parking area.

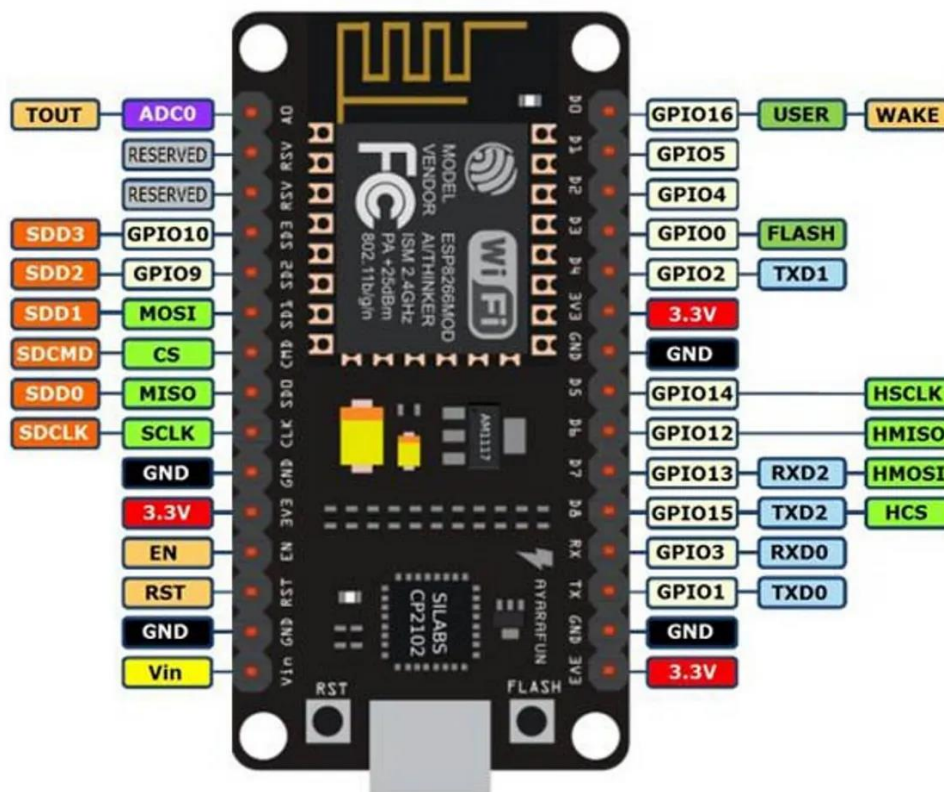
The system proposes implementation of state-of-the-art Internet of Things (IoT) technology to mold with advanced Honeywell sensors and controllers to obtain a systematic parking system for users. Unoccupied vehicle parking spaces are indicated using lamps and users are guided to an empty parking space, thus eliminating need for searching for a parking space.

The occupied parking spaces are virtually stored to the cloud to be accessed by central system and direct the upcoming cars to empty spaces. The automatically controlled light illuminance helps reduce energy usage, along with lighting up the parking space to the user whilst in the parking space. The entire system being fully automatic leads to reduced manpower involved and improves illuminance aesthetics of the parking area. This paper aims at improving user's time value and convenience in a parking system.

# TECHNOLOGY USED

## Node MCU

NodeMCU is an open-source, low-cost, and user-friendly development board designed for the Internet of Things (IoT) applications. It is based on the ESP8266 Wi-Fi module and features an integrated Wi-Fi chip, which allows it to connect to the internet and communicate with other devices. The NodeMCU board is compatible with the Arduino IDE, and it can be programmed using the Lua scripting language or C++ programming language. It is an excellent platform for building smart home devices, IoT sensors, and other internet-connected projects. With its low cost and ease of use, the NodeMCU board has become popular among hobbyists, students, and professionals alike.



# HARDWARE & SOFTWARE REQUIREMENTS

## SPECIFICATIONS

### Hardware Requirements

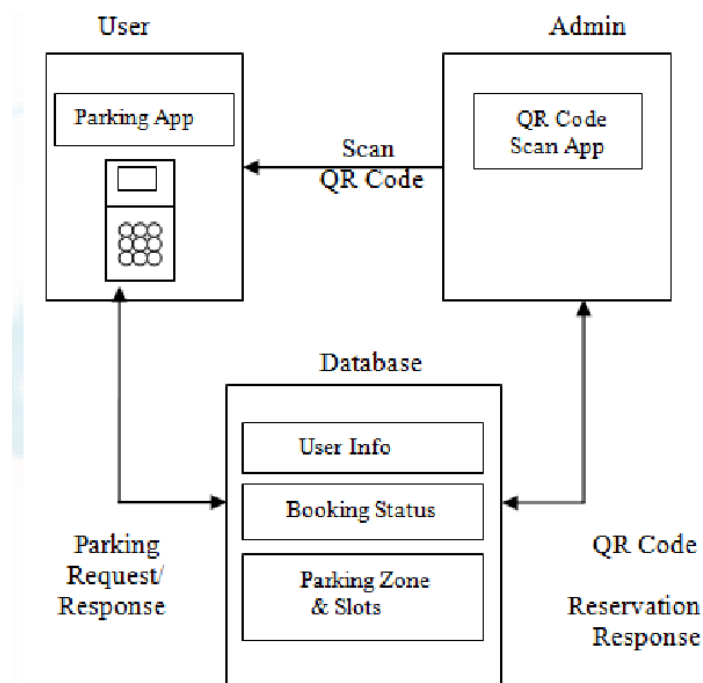
Number	Description
1	Node MCU
2	IR Sensors
3	Servo Motors
4	LED Lights
5	LED Display

### Software Requirements

Number	Description	Type
1	Arduino IDE	Windows
2	Cayenne	JavaScript

## MODULES

- 1. Admin Panel:** An admin panel enables administrators of an application to manage its configurations, settings, content, and features and carry out oversight functions critical to the business. It allows them to view the state of the platform and take any action in the performance of their duties.
- 2. User Panel:** A user panel helps user to look into his/her information registered with the website for service, carers and communities which uses the lived experience of group members to help influence and improve services. Panels succeed through regular two-way communication and feedback between service providers and panel members.



## Future Scope

The future scope for smart parking systems is vast and promising, as technology advances and urbanization continues to increase. Some of the potential future developments in smart parking systems are:

- 1. Integration with autonomous vehicles:** As self-driving cars become more prevalent, smart parking systems can integrate with them to provide a fully automated and seamless parking experience.

2. Predictive parking analytics: By analyzing historical parking data, smart parking systems can provide predictive analytics that accurately forecast parking demand, optimize parking space utilization, and reduce congestion.

3. Environmental sustainability: Smart parking systems can integrate with renewable energy sources, such as solar panels or wind turbines, to power the parking facility, reducing its carbon footprint.

4. Enhanced user experience: Future smart parking systems can utilize augmented reality, mobile apps, and other innovative technologies to provide an immersive and engaging parking experience for drivers.

5. Smart city integration: Smart parking systems can integrate with other smart city technologies, such as traffic management systems, to create a more integrated and efficient urban environment.

Overall, the future scope for smart parking systems is vast, and there is immense potential for innovation and development in this field.

## **Conclusion**

In conclusion, smart parking systems offer an innovative and efficient solution to the parking problems faced in urban areas. By utilizing IoT technology, cloud computing, and real-time data analysis, smart parking systems enable drivers to quickly find available parking spots, while parking facility owners can optimize their space utilization and increase revenue. Moreover, smart parking systems contribute to reducing traffic congestion, improving air quality, and promoting sustainable urban development. With the potential for future developments and integration with other smart city technologies, smart parking systems hold



immense promise in creating a seamless and convenient parking experience for drivers while enhancing the overall urban mobility and sustainability.

## 4-Tier Architecture Implemented

