

Parking Management Using IOT

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ABSTRACTs

Parking is one of the most left out sectors which have never been digitized with proper infrastructural tools. Majority of the parking issues in case of huge residential apartments, malls, and corporate parks can be easily tackled through simple yet unique technology. ParkCtrl offers solutions to all the parking problems faced by anyone currently using the parking systems. Through using a hash patterned method with IR blasters and exact measurement of spaces ParkCtrl uses a mechanism of engineering through multiple servers implementing a system that works with the environment and manages every resource in real-time application is the target with this project and research. Every type of data collected is used for some application or analysis of how the system is responding. From making a booking for your parking space to watching your own parking space to check for intrusion of unknown vehicles.

ParkCtrl offers security, features of visiting with the booking and real-time watch over your space.

KEYWORDS: Parking, Management, IoT, Developer, Odd-Even Parking, Real-time data, Android Application, Showcase your work, Achievement.

1. INTRODUCTION

Welcome to the ParkCtrl solution to major parking related problems. This digital space has been crafted to provide a visual and interactive supplement to the comprehensive project report that we've prepared. As, we are excited to share the practical and creative aspects of our work in the Parking management field through this online platform.[1]

In recent years, the integration of Internet of Things (IoT) technology with various sectors has revolutionized how businesses and industries operate. One such application is in parking management systems, where IoT and sensors play a crucial role in optimizing parking spaces.[2]

Traditional parking management systems often face challenges such as inefficient space utilization, difficulty in finding available parking spots, and lack of real-time data for decision-making. However, with the advent of IoT and sensor technologies, these challenges can be effectively addressed to create smarter and more sustainable parking solutions.[3]

IoT-enabled parking management systems leverage a network of interconnected devices and sensors to monitor and manage parking spaces in real time. These systems utilize various sensors such as ultrasonic sensors, magnetic sensors, and cameras to detect the presence or absence of vehicles in parking lots or garages. The data collected from these sensors is then transmitted wirelessly to a centralized platform where it is processed and analyzed to provide valuable insights and actionable information.[4]

2. LITERATURE SURVEY

A literature survey on parking management using IoT and sensors would involve exploring various research studies, articles, and papers that have investigated the application of IoT technologies and sensors in optimizing parking systems. Below is a summarized literature survey highlighting key findings and insights from relevant studies in this field: *Internet of Things in Intelligent Transportation Systems: A Review*" by A. Elhenawy, et al. (2021): This comprehensive review discusses the role of IoT in various intelligent transportation systems, including parking management. It covers topics such as IoT architecture, communication protocols, and applications in real-time data.[1]

Another Research on Smart Parking Systems: A Review of the State of the Art by J. Gozalvez, et al. (2017): This review paper provided an overview of smart parking systems, including IoT-based solutions. It discusses different sensor technologies used for parking detection, communication protocols, and system architecture. The paper also evaluates the impact of smart parking systems on traffic congestion and environmental sustainability.[2]

Also while adding to the research An IoT-Based Smart Parking System for Improving Traffic and Parking Management in Urban Areas by S. Nazir, et al. (2020): This research paper presents an IoT-based smart parking system designed to improve traffic and parking management in urban areas. The system utilizes ultrasonic sensors and IoT devices to monitor parking spaces and provide real-time information to drivers through a mobile application. The study evaluates the system's effectiveness in reducing congestion and enhancing user experience.[3]

IoT-Based Smart Parking Management System Using Raspberry Pi" by N. Kumar, et al. (2019): This paper describes the development of a smart parking management system using IoT technologies and Raspberry Pi. The system integrates ultrasonic sensors for vehicle detection and communication protocols for data transmission. The authors evaluate the system's performance in terms of accuracy, reliability, and scalability.[4]

Focusing on the system optimization and management requirements after the delivery and completion of the project a research on Optimization of Smart Parking System Based on IoT and Big Data Analytics by K. B. Kim, et al. This study explores the optimization of a smart parking system by combining IoT technologies with big data analytics. The research focuses on data-driven approaches to improve parking space utilization, reduce search time for parking, and enhance overall efficiency. The authors discuss the integration of sensors, data processing techniques, and machine learning algorithms for intelligent parking management.[5]

By reviewing these and other relevant literature sources, researchers and practitioners can gain valuable insights into the current state of parking management using IoT and sensors, emerging trends, challenges, and opportunities for further advancements in this field.[6]

3. PROBLEM STATEMENT

In urban environments, traditional parking spaces are characterized by inefficiencies such as suboptimal space utilization, prolonged search times for parking spots, increased traffic congestion, and environmental impact due to unnecessary vehicle movements. Upgrading these traditional parking spaces to smart parking management systems using Internet of Things (IoT) technologies and sensors is essential to address these challenges and improve overall efficiency and user experience.

1. Poor understanding of parking spaces: In case of large parking areas the conflict of resident and guest parking is very common and leads to hefty fines.

2. **Spotfreezing:** Timeless parking of vehicles / Spot Freezing, is a practice in which unknown vehicles uses a parking slot for too much long durations that causes problems for the management
3. **Trespassing:** Unauthorized vehicles with regards to the authorities entering and leaving the infrastructure of the concerned.
4. **No Real-time info of parking slots:** No provision for slot booking/slot availability can cause multiple guests parking issues and may cause conjunction in the parking area.
5. **Physical monitoring of parking space:** Ensuring an optimal parking area needs constant monitoring. Incase of large parking areas it is mainly done via physical means and thus is a very hard job.

This problem statement forms the basis for the development of a portfolio website that aims to address these challenges and provide a solution that effectively showcases the skills, accomplishments, and potential of individuals and organizations in the digital

4. PROPOSED SYSTEM

1. User Registration and Profile Management

- Users can create accounts with profile information
- Users can manage their personal details, contact information, and portfolio content.

2. Booking Slots

- Users can book their parking slots.
- They can have an estimation time of 5 min prior reaching their destination

3. Real-time watch

- Realtime watching of the slots
- Multiple parking spaces can be navigated

4. Mobile Responsiveness

- Quick response to the real time changes in the parking slot as well as the booking conditions

5. Search and Filtering

- Color code filtering using Red-Yellow-Green color code
- Red shows slot occupied, Yellow shows slot is booked and yet to be occupied, Green shows slot is not booked either occupied

6. Accessibility and Inclusivity

- Ensure the website complies with accessibility standards to reach a broader audience.
- Provide options for alternative text for images and other accessibility features.

7. Analytics and Tracking

- Implement tracking and analytics tools to allow users to monitor the movement on their slot.
- Provide data on visitor engagement, views, and interactions.

4.1 ALGORITHM

Designing an algorithm for parking management using IoT involves several steps to efficiently utilize sensors, IoT devices, and data processing techniques. Below is a simplified algorithm outline for managing parking spaces using IoT:

PSEUDOCODE:

```
initialize_iot_devices()
setup_communication_protocols()
```

while True:

```
# Collect real-time data from sensors
parking_data = collect_sensor_data()
```

```
# Process and analyze data
available_spaces = process_data(parking_data)
```

```
# Update user interface
update_user_interface(available_spaces)
```

```
# Handle user interactions (e.g., reservations, payments) handle_user_interactions()
```

```
# Manage parking allocation and optimization manage_parking_spaces()
```

```
# Send notifications and alerts
send_notifications()
```

```
# Store data and manage data
storage store_data()
```

```
# Gather feedback and make improvements gather_feedback()
make_improvements()
```

4.2 BLOCK DIAGRAM

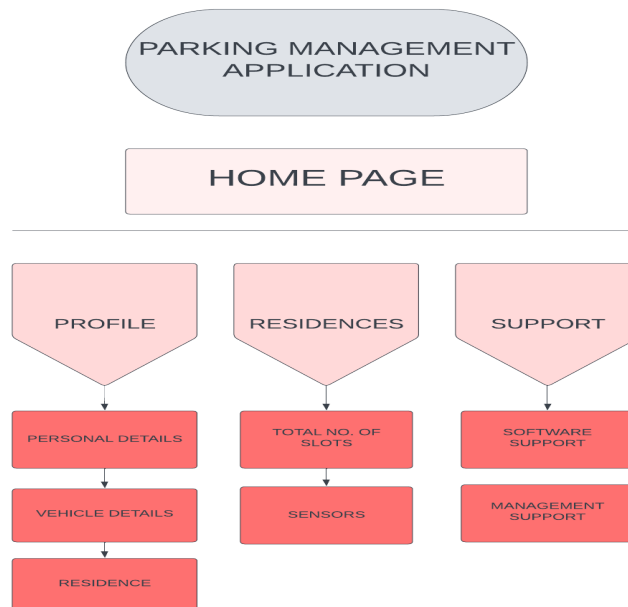


fig 4.2.1

4.3 FLOW CHART DIAGRAM

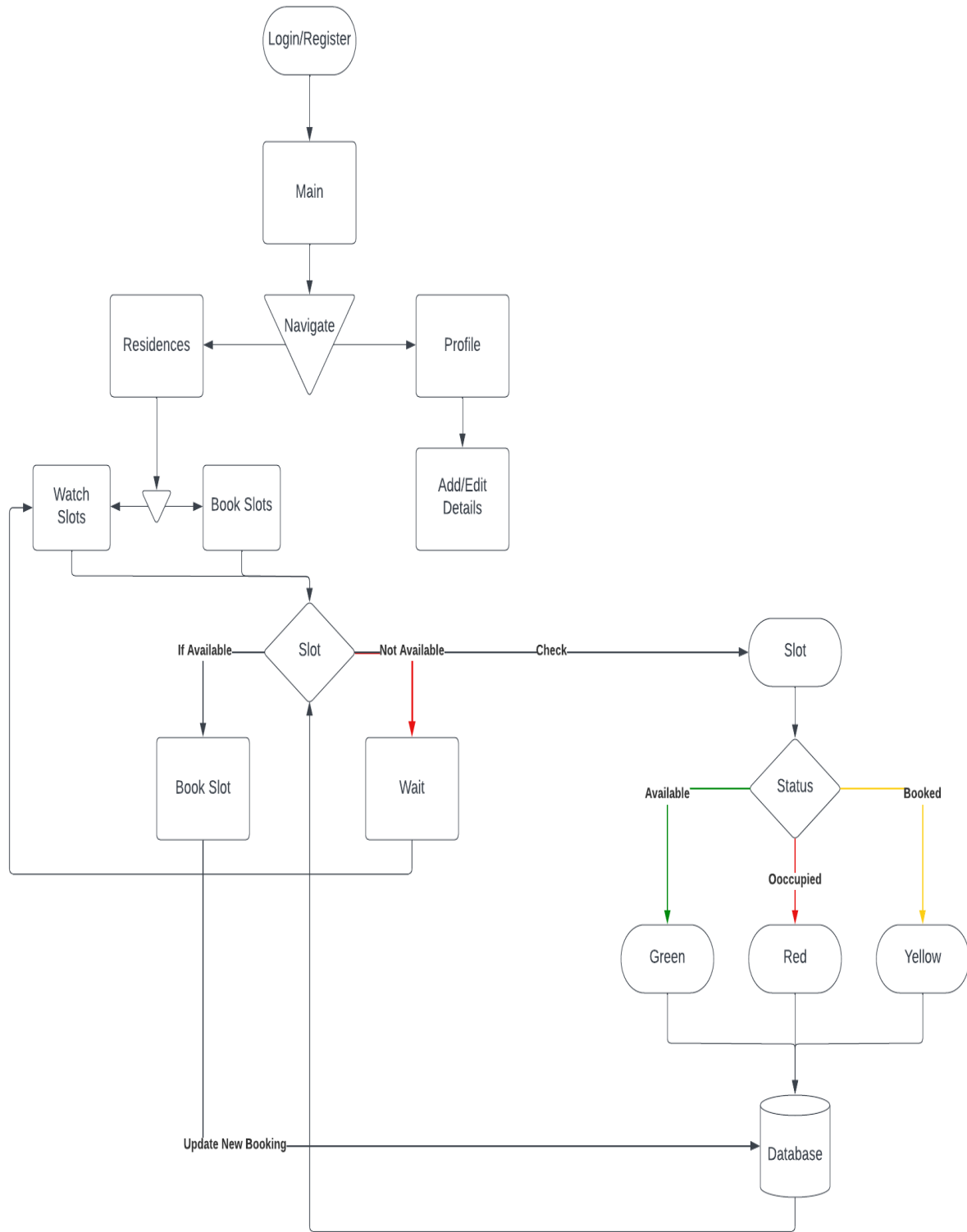


fig 4.3.1

4.4 DFD DIAGRAM

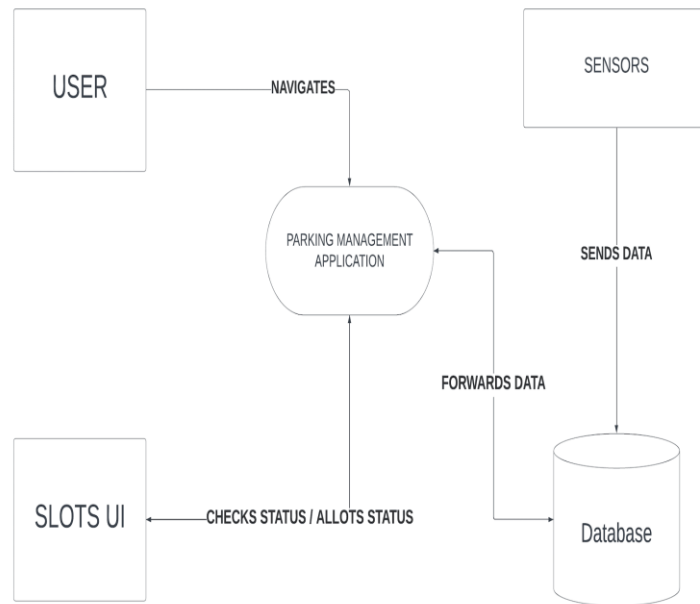


fig 4.4.1

4.5 USE CASE DIAGRAM

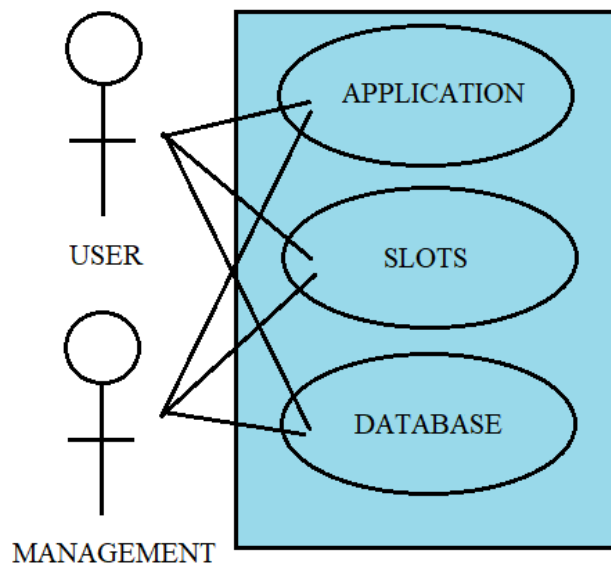
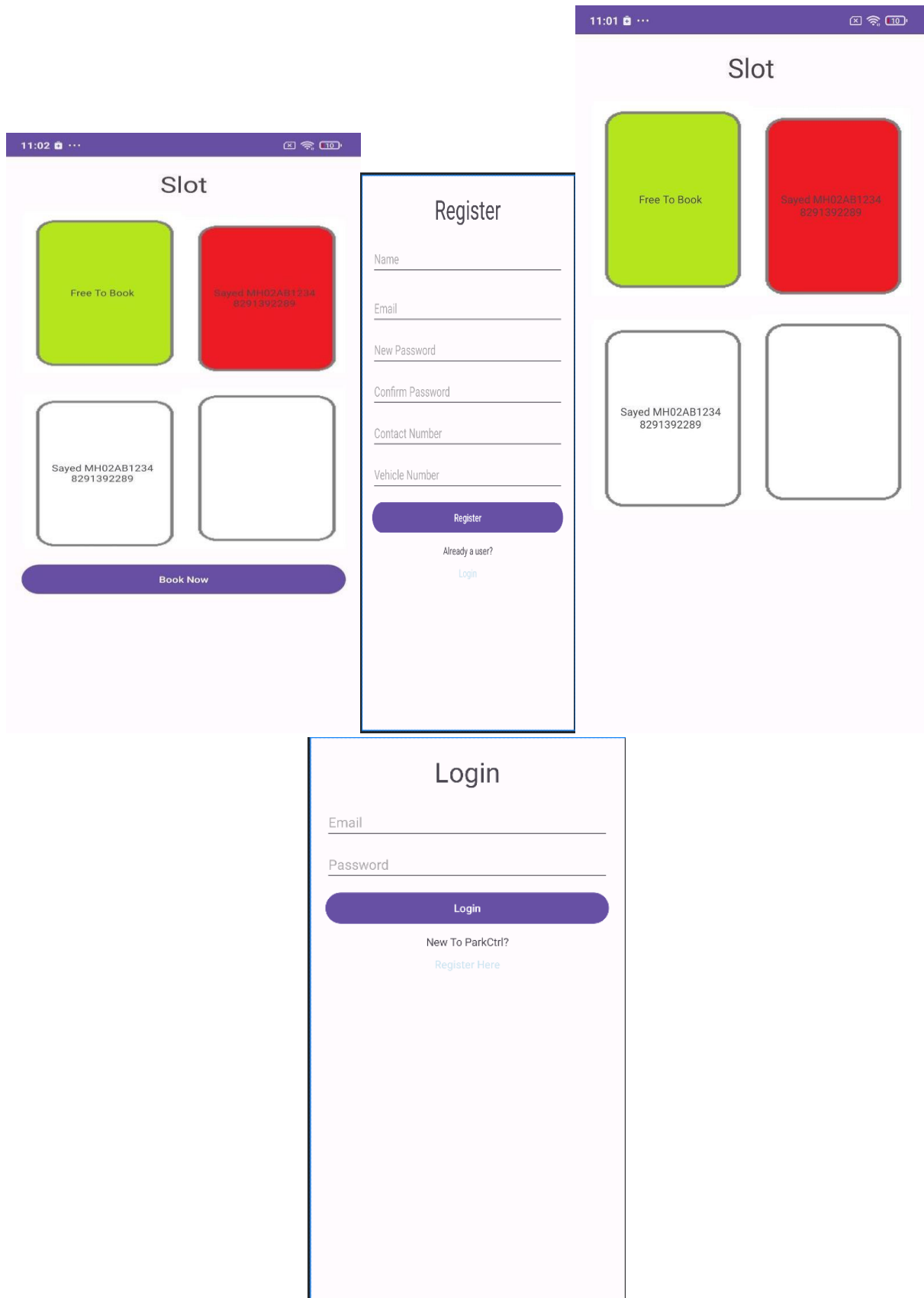
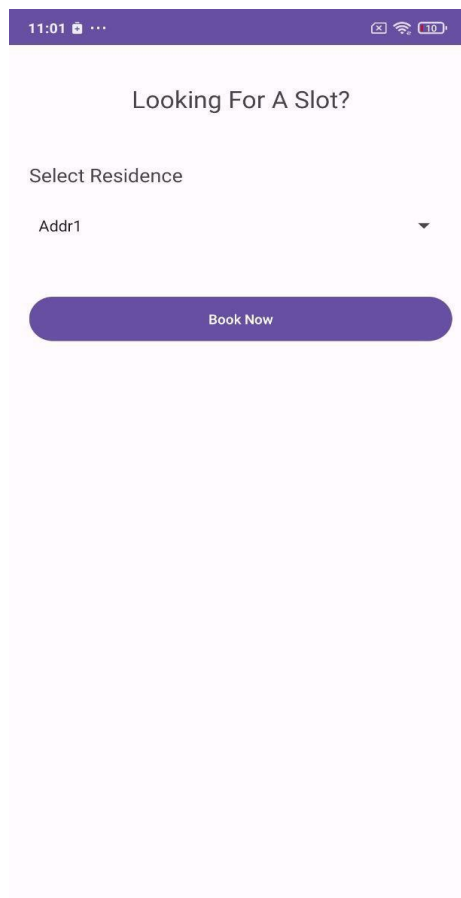


fig 4.5.1

5. IMPLEMENTATION





6. FUTURE SCOPE

The future scope of parking management systems using IoT is vast and promising, with ongoing advancements in technology and increasing urbanization driving innovation in this domain. Some key areas of future scope for parking management systems using IoT include:

Integration with Smart Cities: IoT-based parking management systems will play a crucial role in the development of smart cities. These systems can be integrated with other smart infrastructure components like traffic management, public transportation, and environmental monitoring to create holistic and efficient urban environments.

AI and Machine Learning: The integration of artificial intelligence (AI) and machine learning (ML) algorithms will enhance the capabilities of parking management systems. AI-powered analytics can provide predictive insights into parking demand, optimize space allocation, and improve decision-making processes.

Autonomous Vehicles and Parking: With the rise of autonomous vehicles, IoT-enabled parking systems can facilitate seamless integration by providing real-time data on available parking spaces, navigation assistance, and automated parking processes for self-driving cars.

Dynamic Pricing and Revenue Generation: IoT-based parking systems can implement dynamic pricing models based on demand, time of day, and user preferences. This flexibility in pricing can optimize revenue generation for parking operators while incentivizing efficient space utilization.

Environmental Sustainability: Parking management systems using IoT can contribute to environmental sustainability by reducing traffic congestion, minimizing vehicle emissions, and promoting alternative transportation modes such as electric vehicles and shared mobility services.

Overall, the future of parking management systems using IoT is exciting, with potential advancements in technology.

7. CONCLUSION

In conclusion, IoT-based parking management systems offer a transformative approach to address the challenges faced by traditional parking systems. By leveraging IoT technologies and sensors, these systems can optimize space utilization, enhance user experience, and contribute to more sustainable and efficient urban environments. However, careful consideration of security, scalability, interoperability, and maintenance is crucial to realizing the full potential of IoT in parking management. This system greatly contributes in solving parking related issues and also achieves such measures by not affecting jobs of the personnel involved in the management of traditional parking management. ParkCtrl can also be made better with suggested future scopes in the coming future and will ensure even better working of the system and hardware software components involved in the process.

8. REFERENCES

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