

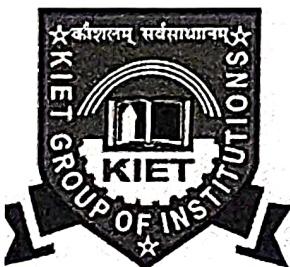
Project Synopsis
on

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System and method for resolving the parking issues using smart vehicle parking.

Submitted as a part of the course curriculum for

Bachelor of Technology
in
Computer Science



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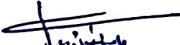
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ABSTRACT

The imbalance between the number of cars and parking areas creates a lot of chaos. The saturation of parking space during rush hour results in roadblocks and a lot of inconveniences. So, we would be bringing the vacant area owned by any individual entity under one roof which can be utilized for parking under one label/roof/umbrella so that they could be easily accessible for the same. By doing so, not only the problem of saturated parking space would be solved but also it would be an approach for Smart City and Sustainable Development and the land-owner may generate a little revenue out of the same. We would be installing the IOT modules in the vacant area which would automatically detect and sense if the plot is free or not and would update it on the web app. The area owner is also given flexibility and may cancel if they do not want the area to be booked. The safety concerns of both parties would be well taken care of by the rating and review system and by verification before entering the premises to park the vehicle.

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1.1 INTRODUCTION

The imbalance between the number of cars and parking areas creates a lot of chaos. Along with it the fear of getting challan because of parking here and there and other safety concerns just add to the chaos. We aim to solve parking issues in Metropolitan cities with over-crowded markets and tourist places, without putting up additional resources to build new infrastructure is our fundamental goal.

- The imbalance between parking supply and demand is the main reason for the metropolis parking problem.
- On-street parking: This leads to traffic congestion and roadblocks by parking anywhere (even in front of someone's house).
- Cruising: Another problem that arises is cruising which also leads to traffic congestion and pollution.
- Risk of challan and safe parking.
- Lack of standard size of area(dimensions) for parking in the parking slot which also causes a lot of inconvenience.

1.2 PROBLEM STATEMENT

Parking problems in India are severe, with the average parking time significantly exceeding the global average. This inefficiency leads to an estimated annual monetary loss of 1.56% of India's GDP. Highly populated cities face saturation of parking spaces, and there's a notable lack of spaces for road freight transport. These issues necessitate innovative solutions.

Parkezy, our project, addresses the challenge of parking saturation during peak hours by consolidating underutilized spaces for parking. This endeavor aligns with the goals of Smart Cities and Sustainable Development, offering an additional income stream for landowners. To ensure safety and flexibility, we've implemented a robust rating, review, and verification system.

1.3 OBJECTIVE

- 1. Consolidate vacant parking spaces under a centralized platform:** Develop a web application that aggregates and displays available parking spaces from individual sources, such as empty plots, garages, and underutilized areas in private properties.
- 2. Community Engagement and Collaboration:** Facilitate connections between individuals willing to rent out parking spaces and those seeking available parking spots, fostering a collaborative parking ecosystem.
- 3. Promote Sustainable development:** Utilize existing empty slots, including residential spaces, for parking without additional infrastructure or costs, fostering sustainable development by optimizing available resources and minimizing environmental impact.
- 4. Streamline parking management:** Offering personalized booking options based on user preferences like distance and cost, our platform revolutionizes the parking experience. Users can seamlessly reserve tailored parking spaces, boosting urban mobility convenience and efficiency.
- 5. Secure Payment Integration:** Design a user-friendly platform that guides users through the verification process and ensures secure payment transactions using industry-standard protocols.
- 6. Integration of Review and Rating Service:** Incorporate a review and rating system on the website to allow users to provide feedback on their parking experiences, improving transparency and enhancing user satisfaction.

1.4 TECHNOLOGY USED

- 1. Backend – Django, Firebase, SQL**
- 2. Frontend – ReactJS**
- 3. IoT - ESP8266, sensors, Arduino**

2.1 ACTIVITY FLOW DIAGRAM

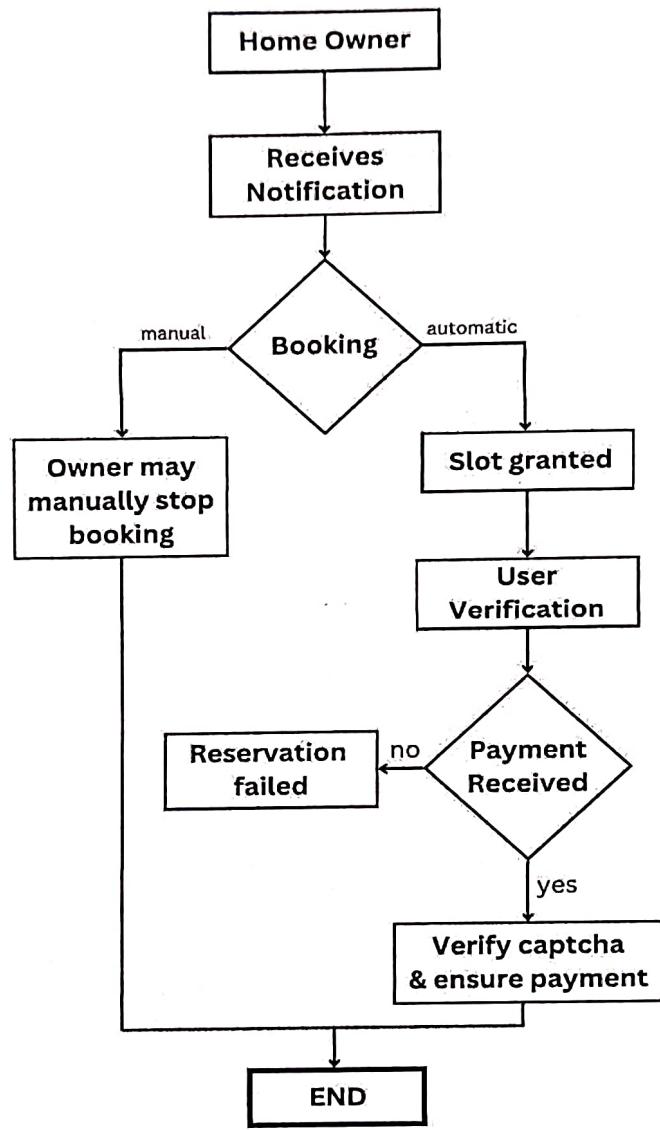


Fig 1: Area owner module

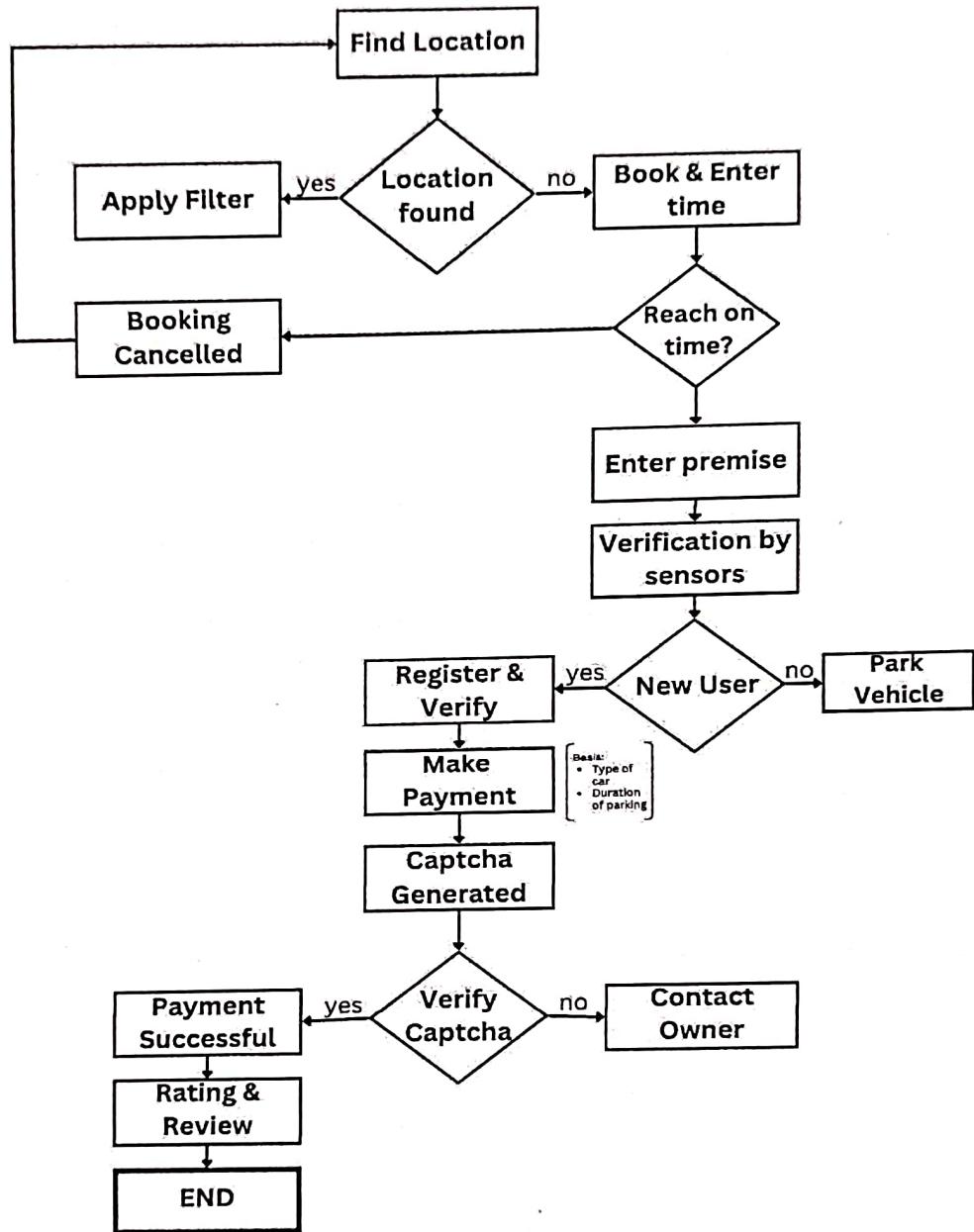


Fig 2: Vehicle owner module

2.2 METHODOLOGY

Step 1: Research and Analysis

1. User Requirements:
 - Identify the needs and preferences of the target users of the ParkEzy platform.
 - Understanding the demographics of potential users, such as age, location, and occupation.
 - Determining the specific features and functionalities that users expect from a parking management platform, such as an easy booking process, secure payment options, and a user-friendly interface.
2. Market Trends:
 - Stay informed about the latest trends and developments in the parking management industry. This may include:
 - Analyzing industry reports, articles, and publications to understand emerging technologies and best practices in parking management.
 - Monitoring market trends related to urbanization, transportation, and smart city initiatives that may impact the demand for parking solutions.
3. Competitor Analysis:
 - Identify and analyze competitors operating in the parking management space. This may involve:
 - Analyzing competitor websites, mobile apps, and marketing materials to understand their features, pricing models, and target audience.
 - Identifying each competitor's strengths, weaknesses, opportunities, and threats (SWOT analysis) to assess the competitive landscape and identify areas for differentiation.

Step 2: Design and Planning

- Develop detailed design specifications for each module, focusing on usability and scalability.
- Plan the integration of Google Maps API and payment gateway.

Step 3: Development

1. Backend Implementation with Java and Spring Boot:
 - Utilize Java programming language and Spring Boot framework to develop robust backend functionalities.
 - Implement RESTful APIs to facilitate communication between the frontend and backend components.
 - Employ Spring Boot's features such as dependency injection, security, and data access to streamline development.
2. Database Management with MySQL:
 - Utilize MySQL relational database management system to store and manage data efficiently.

- Design and implement database schemas to support the storage of user profiles, booking information, parking area details, and other relevant data.
 - Implement database queries, transactions, and optimizations to ensure reliable and scalable data management.
3. Frontend Web Application Development:
- Develop the frontend web application using HTML, CSS, and JavaScript (JS) technologies.
 - Design intuitive and responsive user interfaces (UIs) to enhance user experience and usability.
 - Implement dynamic frontend components and interactive features using JavaScript libraries and frameworks such as React.js or Angular.js.
 - Ensure cross-browser compatibility and accessibility of the web application for a diverse user base.

Step 4: Testing

1. Module Testing:
 - Conduct thorough testing of each module independently to identify and rectify any defects or inconsistencies.
 - Verify that each module functions correctly and meets its specific requirements.
2. Integration Testing:
 - Perform rigorous testing of the integrated system to ensure seamless communication and interaction between different modules.
 - Validate data flow and functionality across the entire system to detect and resolve any integration issues.

Step 5: Deployment

1. Application Deployment:
 - Deploy the developed application on a reliable hosting platform such as Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP).
 - Ensure a smooth deployment process with minimal downtime to maintain accessibility for users.
2. Security Configuration:
 - Implement robust security measures to safeguard user data and transactions.
 - Utilize encryption protocols (e.g., HTTPS) to secure data transmission.

Step 6: Monitoring and Maintenance:

- Implement monitoring tools to track system performance and user feedback.
- Provide ongoing maintenance and updates to address any issues and incorporate user feedback.

3. LITERATURE REVIEW

Introduction:

India, as the second most populated country globally, grapples with accommodating over 40 million vehicles amid urbanization and economic growth. This surge in vehicle ownership, even during economic downturns, has led to severe parking issues across all urban areas. Parking problems manifest in two forms: off-street parking, common in shopping malls and large offices, and on-street parking, dictated by market forces, often leading to congestion. Overlooking parking in urban policy frameworks results in issues such as poor transport quality, land misuse, and environmental costs. To address these challenges, expanding parking spaces, enhancing accessibility, and optimizing existing infrastructure are essential. Additionally, incentivizing public transportation use, implementing variable parking pricing, and strategically pricing parking in commercial areas can effectively manage demand.

Review:

The research on parking issues in India delves into a multifaceted problem exacerbated by rapid urbanization, population growth, and increasing vehicle ownership. This comprehensive review encapsulates key findings and solutions proposed across several papers, highlighting the urgency of addressing parking scarcity and its implications on urban mobility.

India's urban landscape transformation is coupled with unprecedented population and vehicular traffic growth, straining existing parking infrastructure. In response, innovative technologies have been explored to optimize parking utilization. The paper by Manjaly and Joseph^[1] emphasizes the urgency of the problem, with annual monetary losses due to parking issues calculated as 1.56% of India's GDP. Their proposed smart parking systems offer promising solutions to allocate parking spaces efficiently, enhancing convenience and reducing traffic congestion.

Mobile applications emerge as valuable tools for parking management, as discussed in the study by Parmar et al.^[3], allowing users to locate nearby parking facilities, reserve spots, and receive navigation guidance. Case studies demonstrate the efficacy of such applications in enhancing the overall parking experience and maximizing the utilization of existing parking infrastructure.

Aligning policy frameworks with urban planning objectives, as advocated by Peñalosa^[2], is crucial. Municipal authorities play a pivotal role in formulating regulations and guidelines to govern parking supply, pricing, and enforcement effectively. Strategies such as zoning regulations, parking space mandates for new developments, and dynamic pricing mechanisms incentivize efficient land use and discourage excessive vehicle ownership.

Integrated transportation planning prioritizing sustainable modes of mobility, including public transit, walking, and cycling, is emphasized. The lack of parking spaces for road freight transport, discussed by Lizbetin and Bartuska^[4], underscores the broader challenges. Promoting alternative transportation options and establishing transit-oriented development principles can reduce dependency on private vehicles and alleviate parking demand.

Surveys and empirical studies provide insights into public perceptions and behavior regarding parking. Understanding user preferences and travel patterns, as mentioned in Ahmed's^[5] examination of the car parking problem in urban areas, is essential for designing tailored interventions. Environmental sustainability, highlighted in various studies, is another critical dimension of parking management, with measures such as green parking infrastructure and electric vehicle charging stations contributing to climate mitigation efforts.

Public-private partnerships (PPPs) in financing and implementing parking infrastructure projects, as proposed by Ahmed^[5], are advocated. Collaborative models involving government agencies, private developers, and technology providers enable resource mobilization for scaling up parking solutions. Community engagement and stakeholder participation are integral, fostering consensus-building and inclusive decision-making processes.

Summary:

In summary, the parking challenges in highly populated Indian cities are multifaceted and require a comprehensive solution. The saturation of parking spaces, lack of regulation in parking tariffs, and environmental concerns have underscored the need for innovative approaches to parking management. Efforts to improve parking must be accompanied by effective policy measures, public awareness campaigns, and technological innovations. By addressing parking issues comprehensively, India can mitigate traffic congestion, reduce environmental impact, and enhance the overall quality of urban life.

Efforts to improve parking management must be accompanied by effective policy measures, public awareness campaigns, and technological innovations. By addressing parking issues comprehensively, India can mitigate traffic congestion, reduce environmental impact, and enhance the overall quality of urban life. Integrating insights from studies by Manjaly and Joseph^[1], Parmar et al.^[3], Peñalosa^[2], Lizbetin and Bartuska^[4], and Ahmed^[5], this review provides a roadmap for policymakers, urban planners, and stakeholders seeking to create more accessible, efficient, and livable cities in India and beyond.

4. ER diagram

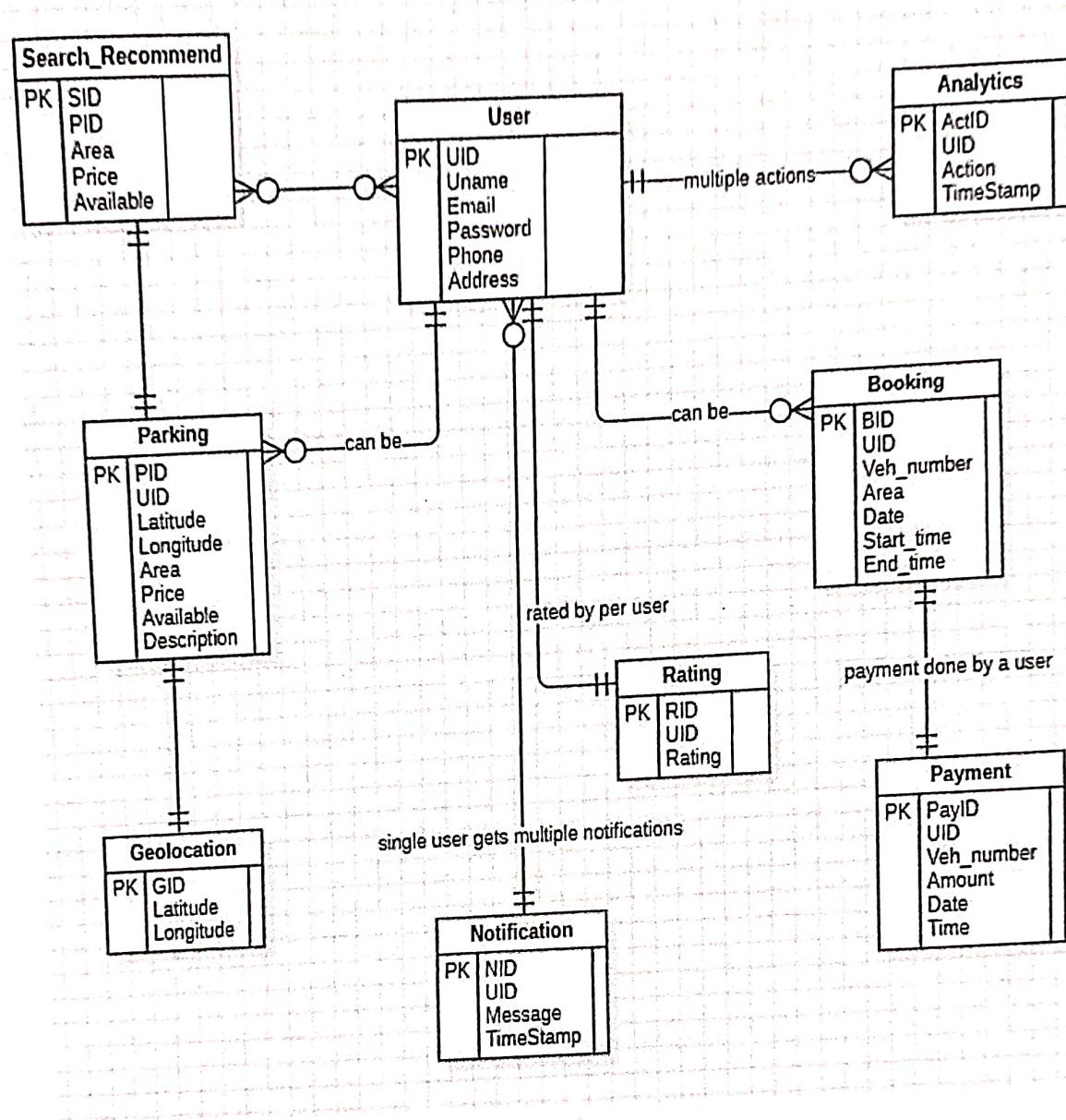


Fig 3: ER Diagram

5. CONCLUSION

In conclusion, the proposed invention addresses the pressing issues associated with the ever-expanding number of vehicles and the limited availability of parking spaces. As urban areas grapple with the challenges of congestion and insufficient parking facilities, our innovation aims to streamline the process by aggregating vacant areas under a unified platform dedicated to parking solutions.

The current imbalance between the increasing number of vehicles and the stagnant parking infrastructure results in chaotic situations during peak hours, causing roadblocks and inconvenience. Our approach involves consolidating individual entities' vacant spaces under a common label or umbrella, making them easily accessible for parking. This not only resolves the problem of saturated parking spaces but also aligns with the vision of Smart City initiatives and Sustainable Development goals. Moreover, landowners have the opportunity to generate additional revenue by participating in this shared parking system.

To facilitate efficient space utilization, the invention incorporates IoT modules in vacant areas, automatically detecting and updating the availability status on a dedicated web application. Landowners retain flexibility, with the option to cancel bookings for their spaces as needed. Furthermore, the safety concerns of both parties are addressed through a robust rating and review system, coupled with a verification process before allowing entry onto the premises for vehicle parking.

By mitigating the challenges associated with cruising for parking spaces, our innovative solution promises to enhance the overall safety and accessibility of parking facilities. The accompanying figures provide detailed insights into the functionality and impact of the proposed parking system, marking a significant step towards addressing the current parking crisis in urban environments.

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