Submitted in partial fulfilment for the completion of the SE Degree Program 22.2

PUSL 2021 Computing Group Project

GROUP NO 49

Module Leader: Pramudya Heshan Thilakarathne

E-mail: Pramudya.h@nsbm.ac.lk

Coursework Type: Group (Only Allocated Groups)

Submission: 25/10/2023

Cruiser Park

Car Parking Slot Allocation System

Student Details (Table)

Student Name	NSBM ID	Plymouth ID
R.A.V.L Perera	26852	10899656
P.M.B. Jayakody	27353	10899554
D.N.L Premathilaka	27509	10899668
Y.G.A Amarasinghe	24735	10899158
W.M.R.R.B. Wijerathna	24802	10899730
J.A.D.D. Lakdineepa	26432	10899597

22.2 Software Engineering Degree Program

Faculty of Computing

NSBM Green University Town

Acknowledgment

We are incredibly thankful to our module creator for including this assignment in our module.

We would like to convey my heartfelt gratitude to our project mentor, Mr. Pramudya Thilakarathne, without whom this could not have taken place.

Lastly, we would like to express our heartfelt gratitude to everyone who contributed ideas and helped us, directly or indirectly, complete this project proposal.

We appreciate all your help!

Thank you kindly!

Content

Overview / Introduction

A Parking Slot Allocation System is a sophisticated and innovative solution designed to revolutionize the way parking spaces are managed in various environments, including university campuses, commercial parking lots, and public parking facilities. The primary aim of this system is to create a seamless and efficient experience for both parking facility operators and users by optimizing the allocation of parking slots and ensuring the effective utilization of resources. One of the central features of this advanced system is its real-time monitoring and availability tracking capabilities. It achieves these using sensors and camera that continuously detect the occupancy status of parking spaces. This information is then made readily available to users through a mobile app or on-site displays. This real-time data greatly reduces the time and frustration associated with searching for a parking spot, as users can quickly identify available spaces. Additionally, for facility administrators, this data serves as a valuable tool for making data-driven decisions concerning capacity planning and pricing strategies. Another critical aspect of this system is its reservation and booking functionality. This feature allows users to reserve parking slots in advance, mitigating the uncertainty often associated with parking availability. By securing their parking spaces ahead of time, users experience enhanced convenience and increased satisfaction. Furthermore, the integration of online payment platforms means that transactions can be cashless and ticketless, reducing the need for manual processes and ensuring a smoother experience for users. Security and access control features are paramount in the Parking Slot Allocation System. These features guarantee that only authorized vehicles can gain access to the parking area, employing barriers, license plate recognition systems, or RFID cards. In emergency situations or during maintenance activities, the system allows for swift access to specific areas, bolstering security and enhancing overall operational efficiency. The system goes a step further by integrating with navigation and guidance systems. Users are provided with clear directions to their reserved parking spaces, making it easier to locate a specific spot within a large parking facility. These guidance services can be delivered through mobile apps, on-site signs, or in-vehicle navigation systems, ensuring a user-friendly experience. Finally, administrators benefit from the system's ability to generate comprehensive reports and analytics. These reports offer insights into

various aspects of parking facility management, including occupancy rates, revenue generation, and user behavior. Armed with this valuable data, administrators can make informed decisions to optimize their parking facilities, adjust pricing strategies, and provide an overall better experience for both the facility and its users. In conclusion, the Parking Slot Allocation System represents a groundbreaking advancement in parking management technology. By providing real-time availability information, enabling reservations, enhancing security, integrating with navigation systems, and offering detailed insights for more effective management, it caters to the needs of parking facility operators and users alike, fostering efficiency, convenience, and improved resource utilization. This comprehensive approach to parking management is poised to reshape the parking experience in a wide range of settings, making it more user-friendly and efficient for everyone involved.

Objectives

- To facilitate remote monitoring and centralized management of parking facilities.
- To improve accuracy and efficiency and create a user-friendly and productive parking environment.
- To enhance the parking experience by using online and mobile applications that leverage real-time data from cameras and sensors.
- To reduce labor costs through automated processes, energy-efficient measures, and streamlined payment processing.
- To ease traffic, improve user convenience, and keep up with changing mobility trends.
- To reduce annoyance, improve the parking experience, and minimize traffic congestion within the building.
- To guarantee parking safety by safeguarding cars and improving user and vehicle safety, ultimately establishing a secure environment for both people and vehicles.
- To add parking spaces, tools, and services for long-term performance and sustainability, scalability in smart parking lots is ensured.
- To improve parking using automation and real-time data to cut down on user time and effort; faster parking via a smartphone app that shows available spots.
- To create a "Where to Locate the Car" feature that allows users to enter the position of their car and utilize the app to quickly locate it when it's time to go.

Budget plan

We are planning to make a simulator to represent our project. Therefore, we are planning to use some IOT components.

The following budget report is an estimate report. It will be useful for getting an idea about our project cost.

Software Components	**7000.00**
Firebase (Online database)	
PayPal (Payment gateway)	
Android Studio (Mobile app development)	
Apache Kafka (Real-time data processing)	
AWS (Cloud service)	
IoT Components	**20000.00**
Ultrasonic sensors	
Microcontroller	
Display panel	
IR sensors	
Camera system	
Magnetic sensors	
Total	**Rs. 27000.00**

Target users

Our project plan is about introducing a reliable vehicle parking system that can be used for less space available, in highly crowded traffic areas (Ex-Colombo, Gampaha) for public transport, or personal transport vehicles.

We use 3 types of parking, according to the available space.

1. We take for example a reliable parking system that can be used to use public transport and other daily activities can vary.

   Target users:

   - Commuters: People who use public transport to commute to work or other daily destinations and need a convenient parking solution near transit hubs.
   - Tourists: Visitors who are unfamiliar with the area and need a parking solution when exploring a city or tourist destination.
   - Business Professionals: Those who frequently travel for work and need a secure parking solution near airports, train stations, or their business destinations.
   - Parents: Families who need parking when taking their children to school or various activities.
   - Event Attendees: Individuals attending events like concerts, sports games, or conferences who require nearby parking.
   - Rideshare Drivers: Drivers who use their vehicles for ridesharing services and need a parking solution while not actively driving.
   - Disabled or Elderly Individuals: Those who may require accessible and convenient parking options.

2. A parking system in shopping malls typically targets a different set of users compared to a public transport-integrated system. Here are the potential target users for a mall parking system.

   Target users:

- Shoppers: The primary audience would be people visiting the shopping mall to buy goods, ranging from clothing to electronics and more.
- Diners: Individuals go to the mall to dine at restaurants and food courts.
- Moviegoers: People visit the mall for entertainment, such as watching movies at the cinema.
- Mall Employees: Staff working at the mall who require parking for their shifts.
- Event Attendees: Users attending special events, promotions, or sales at the mall.
- Families: Parents with children who come to shop, dine, or enjoy family-oriented activities in the mall.
- Tourists: Visitors who may want to explore shopping options in a new area.
- Seniors: Older individuals who may need convenient parking and access to shopping facilities.
- Disabled Individuals: Those who require accessible and accommodating parking facilities.
- Vehicles used for other essential vehicles

3. An underground car parking system in buildings caters to a specific set of users who often have unique needs. Here are some target users and examples for such a system.

Target users:

- Residential Building Residents: Residents of apartment complexes and condominiums that need a secure and convenient parking solution.
- Office Building Employees: People working in office buildings who require parking during their work hours.
- Hotel Guests: Visitors stay in hotels with underground parking facilities.
- Hospital and Healthcare Visitors: Patients, their families, and healthcare professionals who need parking when visiting hospitals or medical facilities.

- Event Venue Attendees: People attending events or conferences in buildings with underground parking, such as convention centers.
- Retail Shoppers: Shoppers visiting malls or retail stores within buildings who prefer underground parking for convenience.
- University and College Students: Students attending educational institutions located in buildings with underground parking.
- Restaurant and Bar Patrons: People dining at restaurants or visiting bars in buildings that require parking.
- Cultural and Entertainment Venue Visitors: Individuals going to theaters, museums, or other cultural venues with underground parking.
- Short-term Parkers: Those needing hourly or daily parking for various purposes, like meetings or appointments.
- Vehicles used for other essential vehicles

If there's no space available, it will suggest another queue to park the vehicle until space arrives. A “Driver can park the Vehicle at the Queue” is a system designed to efficiently manage and park vehicles. Drivers can enter the queue, where they receive instructions on available parking spaces. Once a suitable space becomes available in the vehicle park, vehicles are directed to it. This system prioritizes security, with surveillance provided by CCTV cameras and additional security measures to ensure the safety of parked vehicles.

Application features and description

In this project, we plan to develop a Web application and a Mobile application. Because these applications are crucial for providing a seamless and convenient experience for users.

Here are some features that we are planning to include in web and mobile applications.

- **Web application features**

User Registration and Verification: Allow users to create an account and securely log in.

Real-time parking availability: This web application ought to display to users which parking masses and garages have available spaces in real time. This can be achieved by using the usage of statistics from sensors or cameras, or by crowdsourcing statistics from different users.

Parking space reservations: Users need to be able to reserve parking spots earlier, specifically in areas wherein parking is scarce. This will help them keep away from losing time around seeking out a gap.

Payment process: Users need to be capable of paying for parking without delay through this web application, the use of a credit score card, or mobile wallet.

Navigation: The web application should be able to navigate users to the parking spot they have reserved, or to the nearest to be had parking spot.

Notification: Send users notifications about reservation confirmation, payment receipts, and real-time updates on parking availability.

Feedback and Support: Include a feedback option for users to report problems and ask for help.

- **Mobile application features**

Mobile Compatibility: Check that the app works on both Android and iOS devices.

GPS Integration: Use GPS to give real-time guidance to the parking facility.

Offline Mode: Allow users to get basic information and navigate to the parking facility even if their internet connection is poor or non-existent.

Parking spot finder: Make use of augmented reality or GPS to assist users in finding their reserved parking spot within the facility.

Digital wallet integration: Allow users to connect their digital wallets or mobile payment apps for a more convenient payment experience.

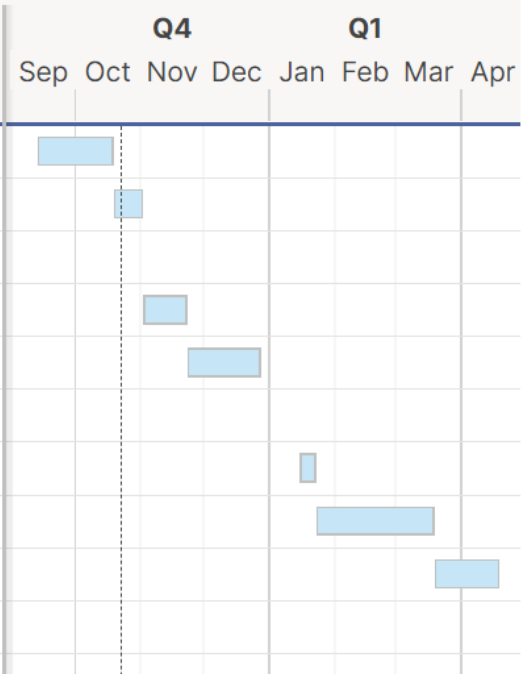
Emergency services: In case of car troubles, give them a direct line to emergency services like towing or assistance.

Our Smart Car Parking System utilizes integrated web and mobile applications to enhance user experience and optimize parking efficiency, paving the way for a smarter, more convenient future in urban mobility.

Time frame

To represent our time allocation according to the tasks in this project we use a Gannt chart. According to the below chart, we take 13th September 2023 as the project starting date and 18th April 2024 we take as the entire project ending date.

Task Name	Start	Finish
1. Project Initiation	**09/13/23**	**10/18/23**
2. Requirement gathering	**10/19/23**	**11/01/23**
Scrum 1 - Web Application		
3. Designing	**11/02/23**	**11/22/23**
4. Implementation	**11/23/23**	**12/27/23**
Scrum 2 - Mobile application		
5. Designing	**01/15/24**	**01/22/24**
6. Implementation	**01/23/24**	**03/18/24**
7. IOT simulator	**03/19/24**	**04/18/24**



Assumptions:

1. We Create this Gannt chart according to the monthly timeline.
2. We removed the subtasks also from the Gannt chart. Because then the Gannt chart will too long.
3. As our project type, we must create an Iot structure also. Therefore, we are planning to make that simulator at the end of the time period.
4. According to the exams, we removed the 1st January 2024 to 14th January 2024 time period from our project timeline.

Outcome

The Parking Slot Allocation System project is designed to bring about an important change in how we manage and use parking spaces in a variety of situations, connecting with the requirements of both parking facility operators and users. Several types of problems that have long plagued the parking sector are solved by this innovative system, including the difficulty of obtaining a spot, the inefficiencies of manual payment, and security difficulties.

The system's real-time monitoring and availability tracking, made possible by sensors and cameras that continuously update users on parking space occupancy, is one of its most important features. By helping users quickly identify available spaces and make reservations through web and mobile applications, this real-time data reduces the ambiguity that is frequently associated with parking availability. Furthermore, the system's integration with navigation and guidance services makes it possible for users to quickly find their reserved parking spaces inside important facilities.

The Parking Slot Allocation System provides the benefit of data-driven decision-making through thorough reports and analytics from the point of view of the facility operators. By using these insights into user behavior, revenue generation, and rates of occupancy, parking facilities can be improved, and everyone involved will get a better experience.

The project's goals go beyond purely practical considerations. It seeks to automate labor costs and simplify payment processing. In addition, it helps in traffic management, reducing congestion and enhancing the sustainability of urban mobility. The system's versatility and adaptability are highlighted by its capacity to serve a variety of users, including commuters, shoppers, tourists, and locals.

The Parking Slot Allocation System is an important development in parking management technology. By offering real-time information, reservation options, improved security, and user-friendly guidance services, it vows to transform the parking experience. As the project develops, it will not only make life simpler for people looking for parking but also provide a complete solution for parking facility operators, ensuring a more effective, convenient, and safe future for all.

Workload Metrix

Student Name	NSBM ID	Plymouth ID	Workload
R.A.V.L Perera	**26852**	**10899656**	**Application Features & Description**
P.M.B. Jayakody	**27353**	**10899554**	**Gantt Chart/Budget Plan**
D.N.L Prematthilaka	**27509**	**10899668**	**Outcome**
Y.G.A. Amarasinghe	**24735**	**10899158**	**Introduction/Overview**
W.M.R.R.B.Wijerathna	**24802**	**10899730**	**Objectives**
J.A.D.D. Lakdineepa	**26432**	**10899597**	**Target Users**

References

Top 10 parking management systems (2023) review guide (no date) *Parklio*. Available at: https://parklio.com/en/blog/top-10-parking-management-systems (Accessed: 24 October 2023).

Iot car parking system (2020) *Nevon Projects*. Available at: https://nevonprojects.com/iot-car-parking-system/ (Accessed: 24 October 2023).

(No date) *(PDF) smart car parking management system - researchgate*. Available at: https://www.researchgate.net/publication/337682025_Smart_Car_Parking_Management_System (Accessed: 24 October 2023).