**A black and white logo

Description automatically generated**

**The Open University of Sri Lanka**

**EEY4189 Software Design in Group 2024/25**

**Project Proposal**

Project Name – ParkNGo

Smart Parking Management System

**Group Members**

S.A.A Gunawardhana - s23010457 – Leader

S.H.N Malkini – s23010206

W.A.D.R Dharmasena – s23010288

N.D Kodikara – s23010664

K.G.I.K Koongoda – s23010486

**Introduction and Background**

Web Application name **- ParkNGo**

Parking problems are a big issue in many cities and towns. As more people buy vehicles, it becomes harder to find parking spots. Drivers waste a lot of time driving around looking for space. This also causes traffic jams, fuel waste, and air pollution. Many places still use manual parking systems, which are slow and not efficient.

A smart parking system can help solve this problem. It can use modern technology to show drivers where parking is available, let them book a spot online, and help manage all parking activities in real-time. With a smart system, both drivers and parking managers will save time and effort.

For our university project, we are developing a smart parking web app called **ParkNGo** using the **MERN stack** (MongoDB, Express.js, React.js, and Node.js). This system will help users find and book parking spaces easily through a web interface. It will also provide useful tools for administrators to manage parking zones, view usage reports, and keep the system updated in real-time.

**Problem Statement and Project Objectives**

**Problem Statement**

In busy cities and towns, finding a parking space can be very difficult. Many drivers waste a lot of time and fuel looking for parking. This causes stress, traffic, and even pollution. The problem becomes worse because many parking areas still use manual systems, which do not give real-time updates about slot availability. There is no easy way for users to check, book, or manage parking online.

A better, smart solution is needed to help drivers find parking spots quickly and to help parking managers organize and monitor parking spaces more easily.

**Project Objectives**

1. **To develop a user-friendly web application called ParkNGo** that shows real-time parking slot availability and allows users to book a slot in advance.
2. **To provide an admin panel** where administrators can manage parking zones, monitor slot usage, and view reports for better decision-making.

**Introduction to Similar Type of Systems**

In Sri Lanka, the concept of smart parking systems is still developing. Most public and private parking areas continue to use manual methods such as issuing paper tickets or tokens and assigning slots through parking attendants. These traditional methods do not provide real-time updates, online booking, or digital payment options, which leads to long waiting times and inefficient use of space.

However, a few smart solutions have begun to emerge in larger cities like Colombo and Kandy. For example, some private parking facilities now use **automated barriers** and **QR-code based tickets**, mainly in shopping malls and airports. Also, mobile-based payment systems like **ParkMe** (offered in some areas by Dialog Axiata) allow users to pay for parking through their mobile wallets, although they do not offer full slot reservation or real-time updates.

Currently, no widely used web-based parking management platform exists that supports features like real-time availability, smart slot booking, admin control panels, and reports for data analysis in one complete system. This gap shows the need for a solution like **ParkNGo**, which will bring a full-featured smart parking system to Sri Lankan users in a simple and efficient way.

**Proposed Solution**

The proposed web application, **ParkNGo**, is a smart parking management system that helps users and administrators manage parking in an easy and efficient way. This system will solve the problems of manual parking by providing a digital platform with real-time updates and booking features.

**Key Features of ParkNGo**

* **User Registration & Login -** Users can create an account and log in securely.
* **Real-Time Parking Slot Availability -** Users can see which parking slots are available at the moment.
* **Online Slot Booking -** Users can book a parking slot before they arrive.
* **QR Code Generation -** After booking, users receive a QR code to scan when entering or exiting the parking area.
* **Admin Dashboard -** Administrators can add, remove, or update parking slots and zones.
* **Smart Pricing System -** Charges may vary based on peak hours or slot location.
* **Analytics and Reports -** Admins can view daily usage, income, and other reports.

This system will have two main user types,

* **Regular Users (Drivers) -** Who book and use parking slots.
* **Administrators -** Who manage the system and parking spaces.

**Technology Planning to Use**

To build **ParkNGo**, we will use modern web development tools and technologies that support fast performance, real-time updates, and easy management.

**Backend Technologies**

* **Node.js & Express.js**  
  Used to create the server and build APIs (the code that connects the frontend to the database).
* **MongoDB**  
  A NoSQL database to store data like user details, parking slots, bookings, and payments.
* **Mongoose**  
  A tool to help us easily connect and manage data in MongoDB using JavaScript.
* **JWT (JSON Web Tokens)**  
  Used for secure login and user authentication.
* **Socket.io**  
  For real-time updates so users can instantly see slot availability without refreshing the page.

**Frontend Technologies**

* **React.js**  
  Used to build the user interface (what users see and use on the website).
* **Redux Toolkit or Zustand**  
  Helps manage and organize data (state) across the whole app efficiently.
* **Tailwind CSS / Material UI**  
  Tools to make the design look clean, modern, and responsive on all devices.
* **Axios**  
  A library to send and receive data from the server (API calls).

**Design and Planning Tools**

* **Figma or Adobe XD**  
  For creating UI/UX designs and mockups before starting actual development.
* **Lucidchart or Draw.io**  
  For drawing diagrams like the system architecture, use cases, and database design.

These tools and technologies will help make **ParkNGo** a fast, secure, and user-friendly smart parking system for both users and administrators.

**Project Timeline and Conclusion**

**Timeline**

|  |  |
| --- | --- |
| **Week** | **Task** |
| 1 | Requirements gathering and research |
| 2 | UI design and mockup creation |
| 3 | Backend setup and database schema design |
| 4 | API development and testing |
| 5 | Frontend development and integration |
| 6 | Real-time features (Socket.io) and QR module |
| 7 | Admin dashboard, analytics, and reporting module |
| 8 | Final testing, deployment, and documentation |
|  |  |

**Conclusion**

The proposed Smart Parking Management System is an innovative web solution tailored to address the shortcomings of traditional parking methods. By using the MERN stack and integrating features like real-time availability, smart booking, and admin analytics, this system aims to improve user convenience and optimize space utilization. This project not only enhances technical skills but also contributes to sustainable and smart urban living.