Project Report - Smart Parking System

1. Project Title

Smart Parking System

2. Abstract

This project implements a Smart Parking System using C++. It simulates real-time vehicle parking management, tracking, and billing based on duration. The application supports different vehicle types and is built using object-oriented principles, file handling, and the Standard Template Library.

3. Objectives

- Simulate real-time parking slot management
- Calculate parking fees based on time
- Track parked vehicles using unique vehicle numbers
- Use object-oriented design to manage various vehicle types

4. Tools and Technologies Used

Language: C++

Compiler: g++

IDE: Visual Studio Code / Code::Blocks

Libraries: Standard Template Library (STL)

5. Class Structure

Main classes used:

- Vehicle (Base class)

- Car, Bike (Derived classes)

- ParkingLot (Manages parking slots and billing)

STL map is used to manage vehicles in the parking lot efficiently.

6. Code Snippet

Example method to calculate bill:

```
double calculateBill(time_t exitTime) {
    double hours = difftime(exitTime, entryTime) / 3600.0;
    return hours * 50;
}
```

7. Sample Output

User chooses to park a vehicle.

Enter vehicle number: MH12AB1234

Enter type (Car/Bike): Car

Vehicle parked successfully.

Then user exits:

Vehicle Number: MH12AB1234

Exit Time: [time]

Total Bill: Rs. 100

8. Conclusion

This project demonstrates a practical approach to managing parking systems using C++. It improves understanding of object-oriented programming, data structures, and real-world simulation using console-based applications.