**Parking Management System**

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**in**

**Computer Science and Engineering**

**School of Engineering and Sciences**

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**CERTIFICATE**

**Date: 19-Nov-24**

**This is to certify that the work present in this Project entitled “Parking Management System” has been carried out by [AYUSH, NAMAN, ANJALI, AKSHAT] under my/our supervision. The work is genuine, original, and suitable for submission to the SRM University – AP for the award of Bachelor of Technology/Master of Technology in School of Engineering and Sciences.**

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**Affiliation.**

**Acknowledgement**

**The satisfaction that accompanies the successful completion of any task would be incomplete without introducing the people who made it possible and whose**

**constant guidance and encouragement crown all efforts with success.**

**I am extremely grateful and express my profound gratitude and indebtedness to my project guide, Kavitha Rani Karnena , Department of Computer Science & Engineering, SRM University,Andhra pradesh, for her kind help and for giving me the necessary guidance and valuable suggestions in completing this project work.**

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**Table of Contents**

**1. Abstract**

**2. Introduction**

**3. Methodology And Implementation**

**4. Code And Outputs**

**5. Analysis**

**6. Conclusion**

**Abstract**

Due to urbanization and the rise in the number of cars on the road, efficient traffic management systems are needed to deal with traffic, delays, and irate patrons. This project uses C++ to create a Car Parking Administrative System that streamlines parking lot activities. The system's components include role-based availability, dynamic space allocation, cost calculation, and permanent data storage. Important outcomes include less manual labor, improved customer satisfaction, and scalability for up to 100 parking spots. The report outlines the project's problem description, methodology, implementation details, results, and future scope. By eliminating inefficiencies in traditional parking systems, this program creates the foundation for creative parking alternatives.

# Introduction

As cities grow, parking systems are unable to keep up with the increasing number of vehicles. Wasteful manual parking management leads to time delays, incorrect pricing, and misallocated places. The Car Park Manager solution is a software-driven solution that ensures dependability and efficiency by automating these tasks. The initiative, which was developed using C++, aims to provide scalability and an easy-to-use user interface while addressing the operational problems of traditional systems. **By automating these processes, the solution ensures reliable operations, optimal resource use, and efficiency. Designed to be scalable and equipped with a user-friendly interface, it is tailored to meet the demands of urbanization and integrates seamlessly with future smart city technologies.**

# Methodology

Programming Language and Development Equipment: - C++ - IDE

Utilized: Storage

Medium: Data-persistent text files Code::Blocks Design of the System:

1. Role-Based Access: Distinguish between users (limited access) and administrators

(complete access).

1. Dynamic Slot Allocation: Allocation of the next available slot is done using algorithms.
2. Data Management: Keep text files with vehicle information, spending records, and parking records.

**Workflow Diagram:**

**P.T.O**

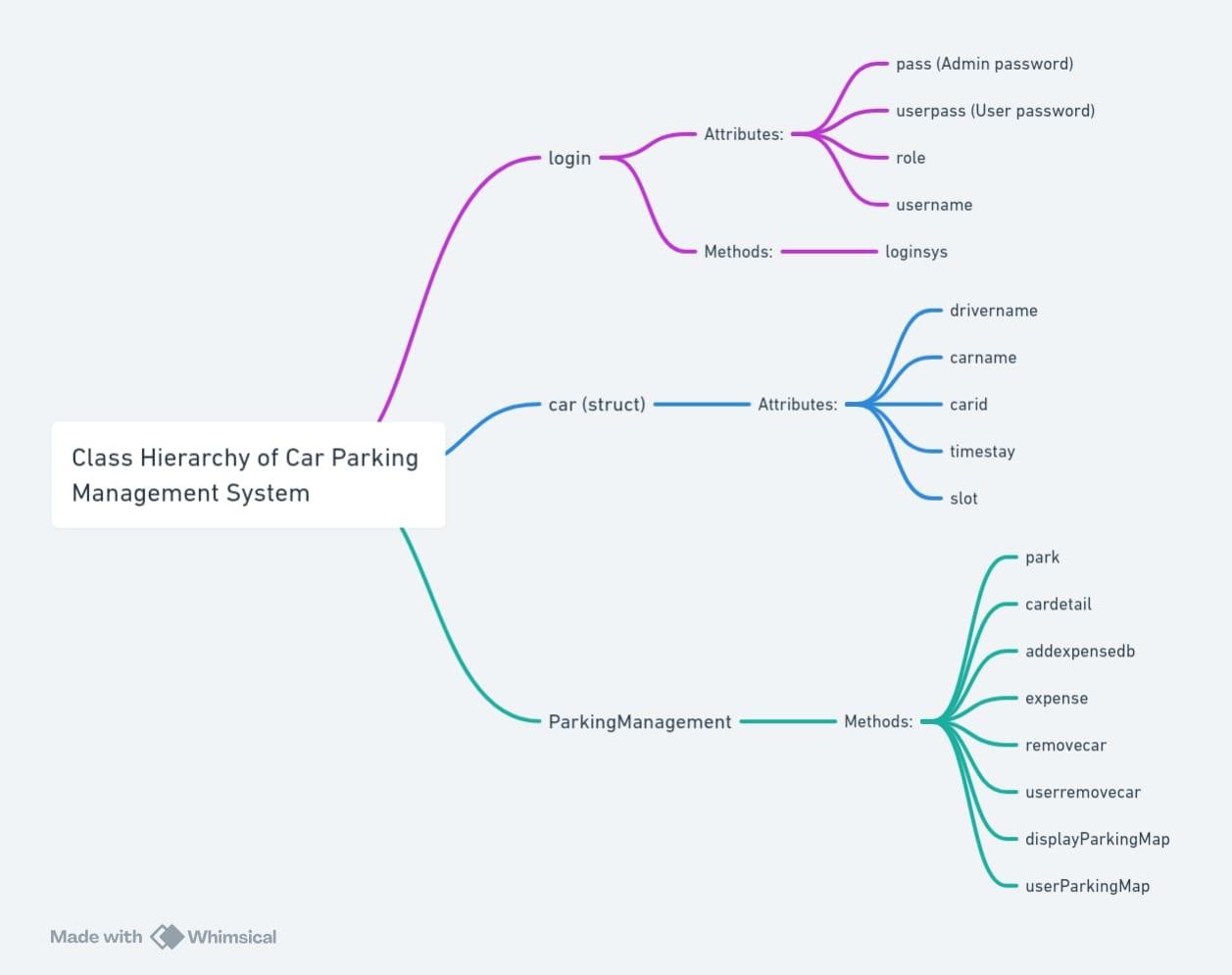
**User/Admin Login -> Role Verification**

**-> Display Options**

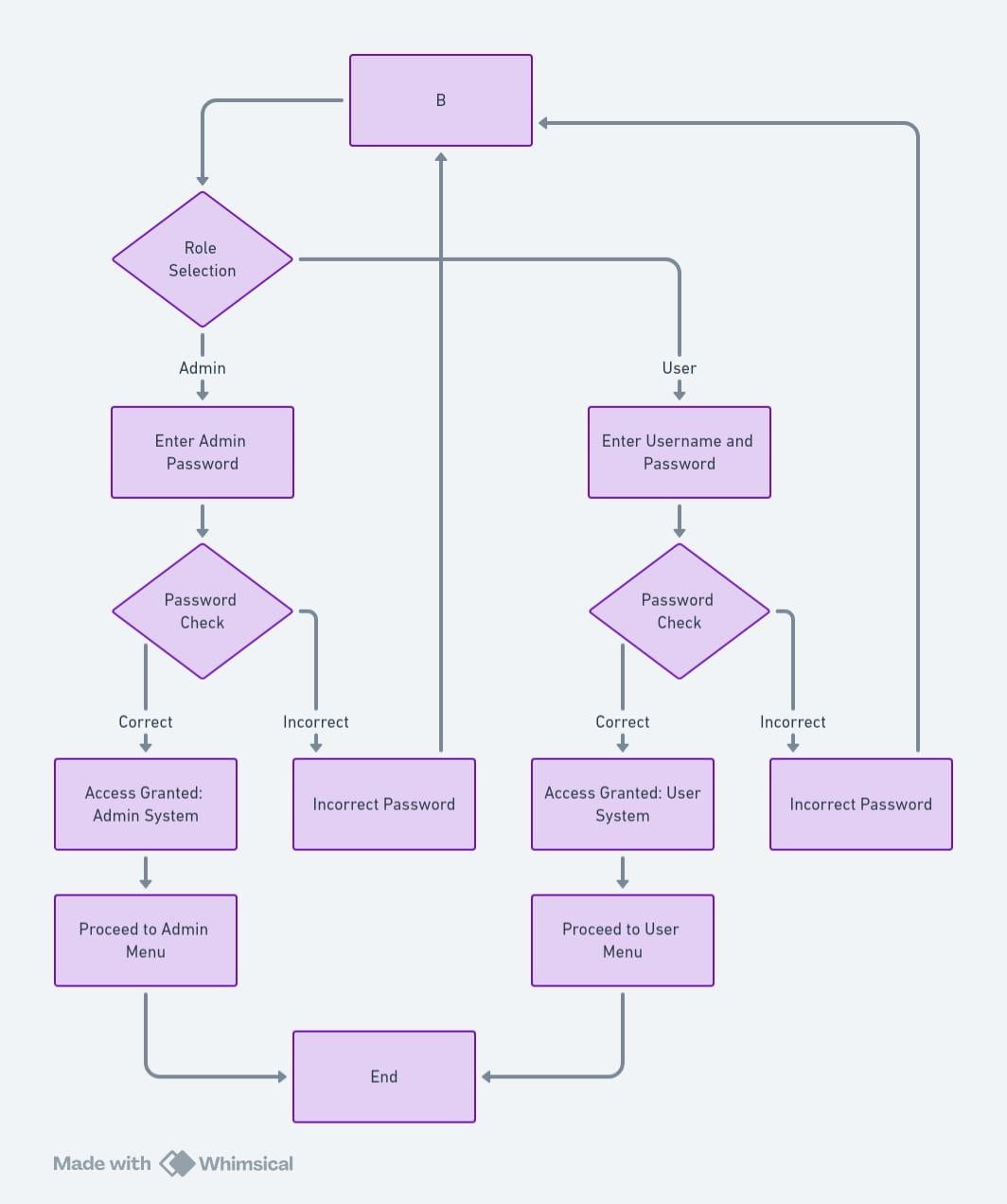
**-> Park Car -> Assign Slot -> Save Details**

**-> Remove Car -> Calculate Expenses -> Update Details**

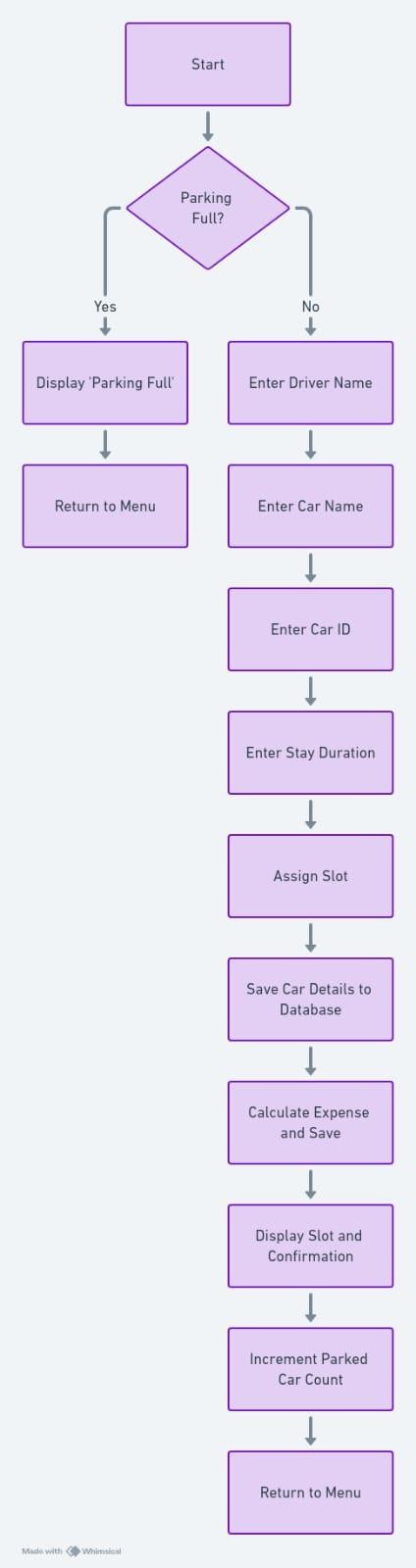
**-> Logout**



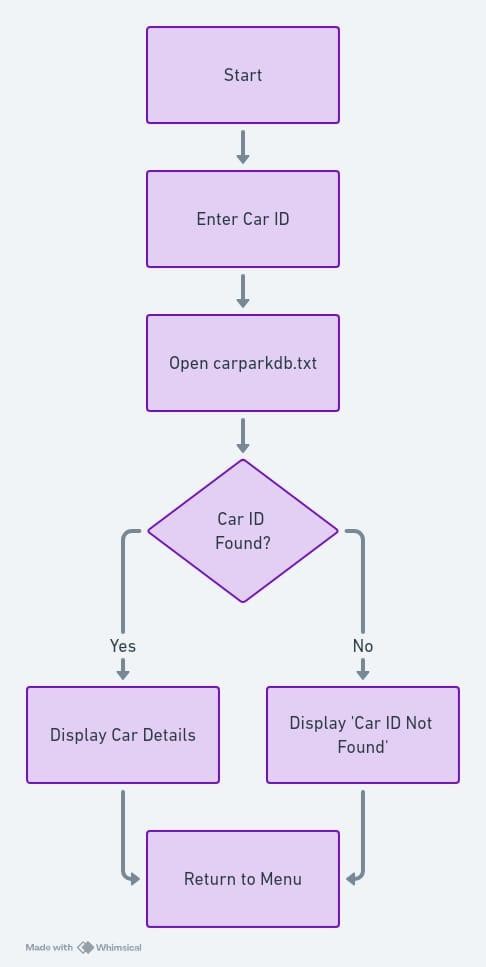
**Main Class Hierarchy class Data Members and members functions**



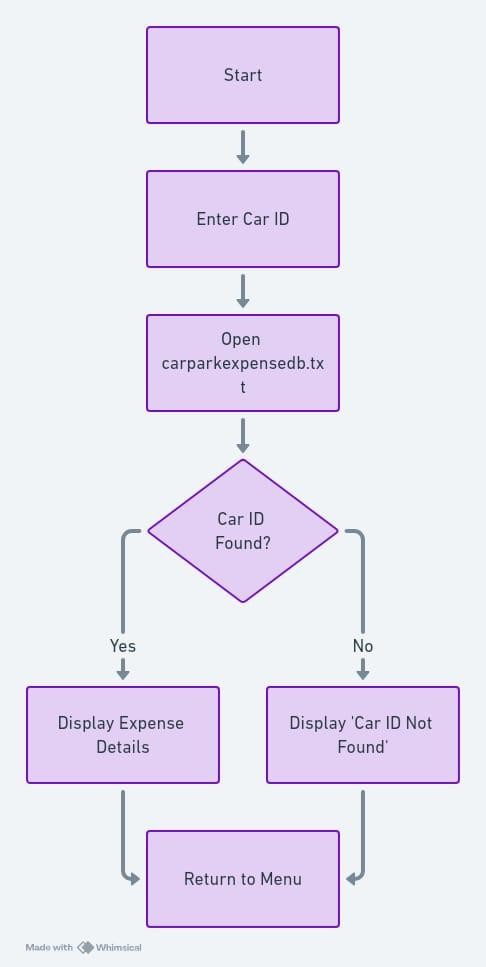
**Login System Flowchart**



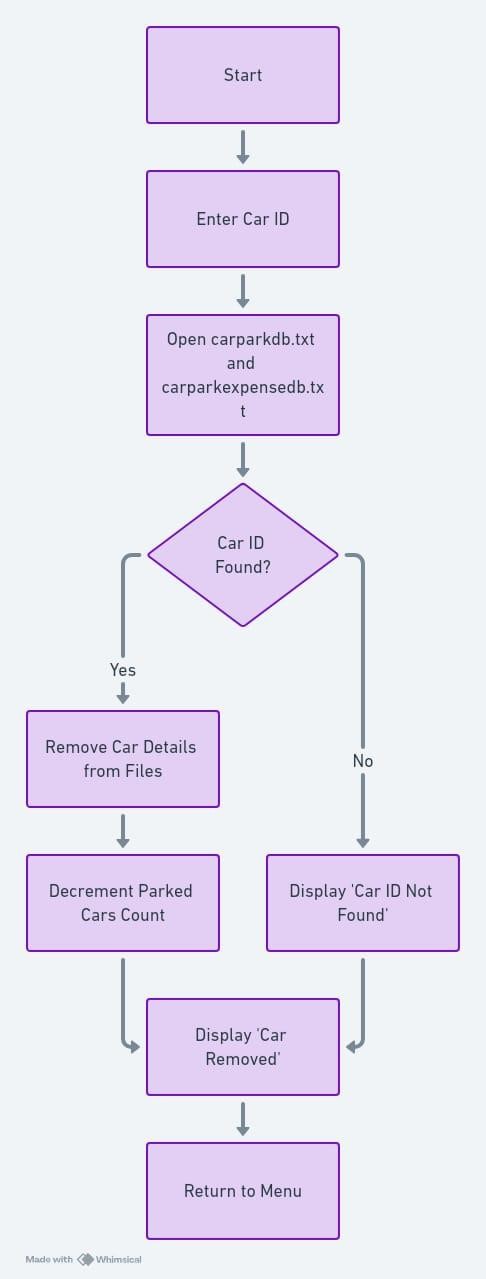
**Park Car Module Flowchart**



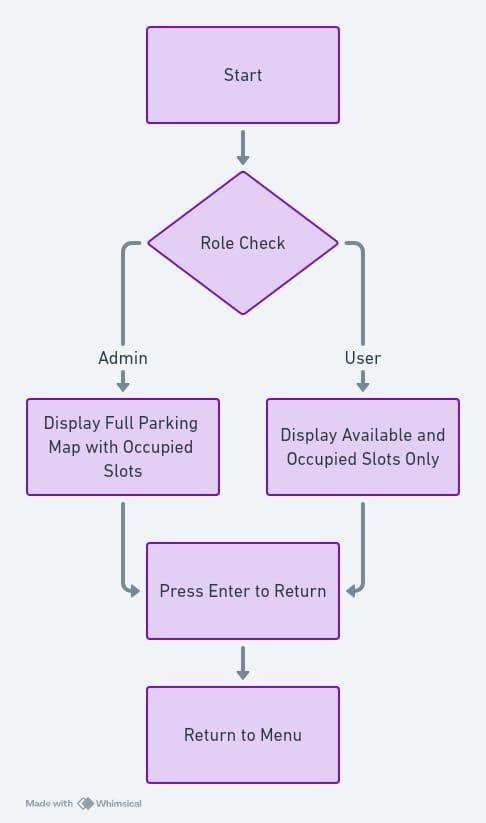
**View Car Details Module Flowchart**



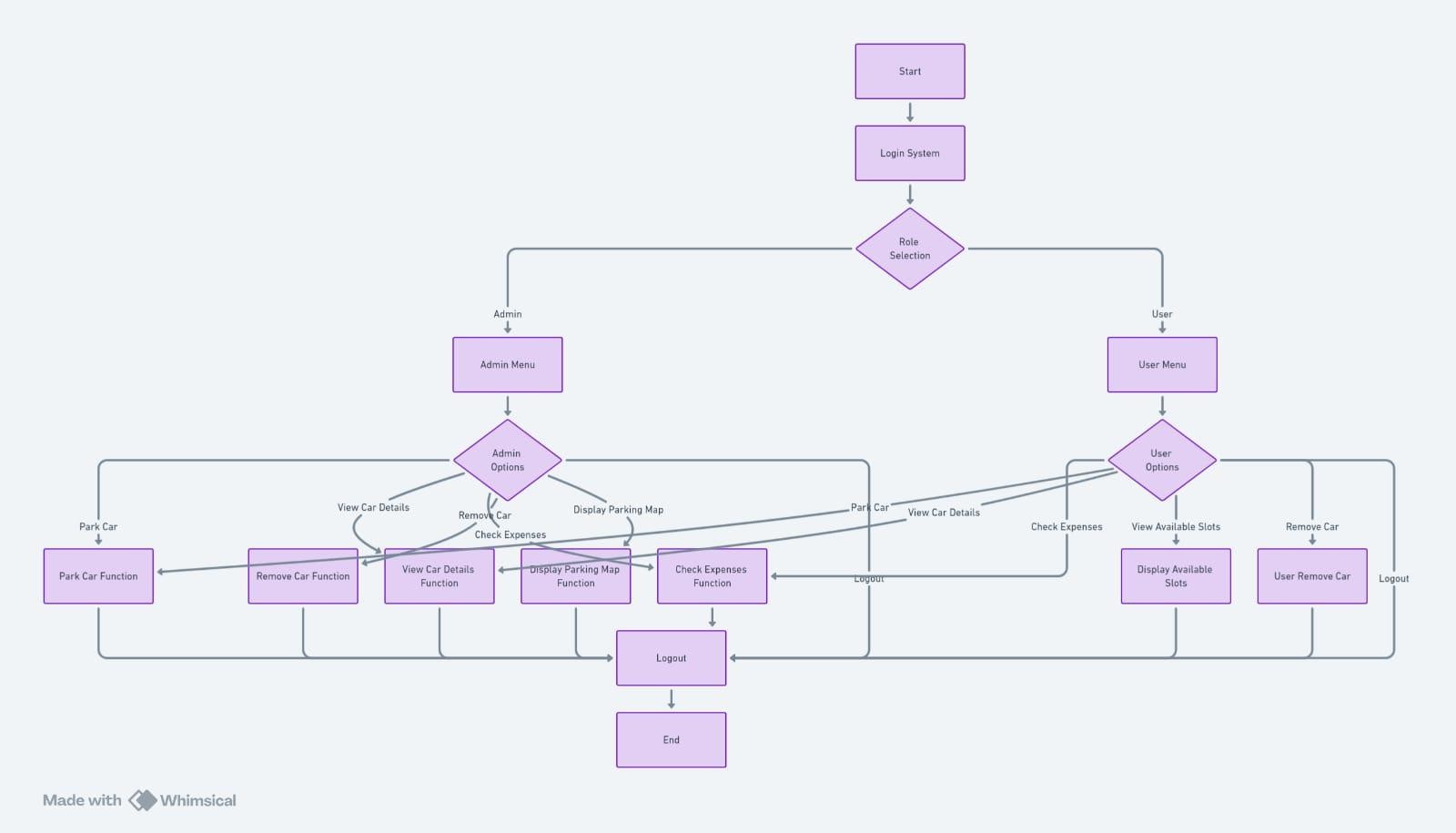
**Check Parking Expense Module Flowchart**



**Remove Car Module Flowchart**



**Display Parking map module Flowchart**



**Main flow chart**

# Implementation

Essential Features:

1. Login System: - Verifies user information. It prevents unwanted access.
2. Allocation of Slots:

It assigns the closest available space in real time.

The slot's state is updated as either occupied or unoccupied.

1. Cost Calculation: - Determines fees by calculating the amount of time spent within the parking lot.

Employs a set hourly wage.

File Handling: - Saves and retrieves vehicle information and costs from text files. Data persistence between sessions is ensured.

The following were the main issues and solutions:

Data Consistency: File locking techniques were used to guard against data corruption.

Scalability: Designed to expand slot capacity in modular fashion.

# CODE AND OUTPUTS:

*#include* <iostream> *#include* <conio.h> *#include* <stdlib.h> *#include* <fstream> *#include* <string> *#include* <vector> using namespace std;

const int MAX\_CAPACITY = 100;

int parkedCarsCount = 0;

class login { public:

int loginsys();

string pass = "admin"; *// Admin password* string userpass = "user"; *// User password* string role; *// To store the login role* string username; *// Store the username for*

*user login*

};

typedef struct car { string drivername; string carname; string carid;

int timestay; string slot;

} car;

vector<string> availableSlots;

void initializeSlots() {

*for* (int i = 1; i <= MAX\_CAPACITY; i++) { char slotLetter = 'A' + (i - 1) / 10; int slotNumber = (i - 1) % 10 + 1; availableSlots.push\_back(slotLetter +

to\_string(slotNumber));

}

}

int login::loginsys() {

*while* (1) {

string password; string user; string roleChoice;

cout << "\n\n\n\n\t\t\t\t >

CAR PARKING MANAGEMENT SYSTEM <----------" <<

endl;

char ch;

cout << "\n\n\n\t\t\t\t\t Car Parking Reservation System Login";

cout << "\n\n\n\n\t\t\t\t\t Choose Role (Admin/User): ";

cin >> roleChoice;

*if* (roleChoice == "Admin" || roleChoice

== "admin") {

cout << "\n\n\n\t\t\t\t\t Enter Admin Password: ";

cin >> password;

*if* (password == pass) {

cout << "\n\n\n\t\t\t\t\t Access Granted! Welcome to Admin System\n\n";

role = "Admin"; system("PAUSE"); *break*;

} *else* {

cout << "\n\n\n\t\t\t\t\t Incorrect Admin Password! Try again.\n";

system("PAUSE");

system("CLS");

}

}

*else if* (roleChoice == "User" || roleChoice == "user") {

cout << "\n\n\n\t\t\t\t\t Enter

Username: ";

Password: ";

cin >> username;

cout << "\n\n\n\t\t\t\t\t Enter

cin >> password;

*if* (password == userpass) { cout << "\n\n\n\t\t\t\t\t

Access Granted! Welcome to User System\n\n"; role = "User"; system("PAUSE");

*break*;

} *else* {

cout << "\n\n\n\t\t\t\t\t Incorrect Password! Try again.\n";

system("PAUSE");

system("CLS");

}

} *else* {

cout << "\n\n\n\t\t\t\t\t Invalid role! Please choose either 'Admin' or 'User'.\n";

system("PAUSE");

system("CLS");

}

}

*return* 1;

}

class ParkingManagement { public:

void park();

void cardetail();

void addexpensedb(car\* *CAR*, int *count*); void expense();

void removecar();

void userremovecar(); *// User remove car function*

void displayParkingMap(); *// Admin: Shows full parking map*

void userParkingMap(); *// User: Shows available parking slots with 'X' for occupied*

};

void ParkingManagement::park() {

*if* (parkedCarsCount >= MAX\_CAPACITY) { cout << "Parking is full. No slots

available.\n";

cout << "Press Enter Key To Return\n"; getch();

*return*;

}

ofstream out;

car CAR;

out.open("carparkdb.txt", ios::app);

cout << " cout << "

";

" << endl;

cout << "Enter Your Name : "; getchar();

getline(cin, CAR.drivername);

cout << " cout << "

";

" << endl;

cout << "Enter Your CarName : "; getline(cin, CAR.carname);

cout << " cout << "

";

" << endl;

cout << "Enter Your Car Number Plate (Unique Alphabet Sequence) : ";

cin >> CAR.carid;

cout << "

" << endl;

cout << "Enter Your Time Stay In Hours (Integer Only) : ";

cin >> CAR.timestay;

*// Assign slot*

CAR.slot = availableSlots[parkedCarsCount]; cout << "

cout << "

";

" << endl;

cout << "Your Car Is Parked At Slot: " << CAR.slot << endl;

|  |  |  |  |
| --- | --- | --- | --- |
| out << | "Car Name : " | << | CAR.carname |
| << | ", Car Id : " | << | CAR.carid << "\n" |
| << | "Driver Name : " | | << CAR.drivername |
| << | ", Car Time Stay | | : " << CAR.timestay |
| << | " hours, Slot: " | | << CAR.slot << "\n"; |

addexpensedb(&CAR, parkedCarsCount); parkedCarsCount++;

out.close();

cout << "Your Car Is Parked Now!\n"; cout << "Press Enter Key To Return\n"; getch();

}

void ParkingManagement::cardetail() { system("CLS");

int i = 0;

string detailid; string line; ifstream in;

cout << " -----------

--> Your Car Details <-------------" << endl << endl;

cout << "

cout << "

";

" << endl;

cout << "Enter Your CarID : "; getchar();

getline(cin, detailid); cout << "

cout << "

";

" << endl;

in.open("carparkdb.txt");

*while* (getline(in, line)) {

size\_t found = line.find(detailid);

*if* (found != string::npos) {

cout << "Your Car Details Are : \n"; cout << line;

getline(in, line);

cout << endl << line << endl; getch();

in.close(); i++;

*break*;

}

}

in.close();

*if* (i == 0) {

cout << "Car With CarID " << detailid << " Not Found\n";

cout << "TRY AGAIN! (Use Correct CarID)\n";

getch();

}

}

void ParkingManagement::addexpensedb(car\* *CAR*, int *count*) {

ofstream out; out.open("carparkexpensedb.txt", ios::app);

out << "Car ID : " << CAR->carid

<< ", Car Name : " << CAR->carname <<

"\n"

<< "Driver Name : " << CAR->drivername

<< ", Car Time Stay : " << CAR->timestay

<< " hours, Total Expense : " << CAR-

>timestay \* 100

<< " Rupees, Slot: " << CAR->slot <<

"\n";

out.close();

}

void ParkingManagement::expense() { system("CLS");

string cexpenseid, line; int i = 0;

cout << "Enter Your Car Id : "; cin >> cexpenseid;

ifstream in; in.open("carparkexpensedb.txt"); *while* (getline(in, line)) {

size\_t found = line.find(cexpenseid);

*if* (found != string::npos) {

cout << "Your Car Parking Expense Details Are : " << endl;

cout << line; getline(in, line);

cout << endl << line << endl; getch();

in.close(); i++;

*break*;

}

}

in.close();

*if* (i == 0) {

cout << "Car With CarID " << cexpenseid

<< " Not Found" << endl; getch();

}

}

void ParkingManagement::removecar() { system("CLS");

string rcarid, line;

cout << "Enter Your Car Id : "; cin >> rcarid;

ifstream in("carparkdb.txt"); ofstream out("temp.txt", ios::app); *while* (getline(in, line)) {

*if* (line.find(rcarid) == string::npos) {

out << line << endl;

}

}

in.close();

out.close();

remove("carparkdb.txt"); rename("temp.txt", "carparkdb.txt");

ifstream expenseIn("carparkexpensedb.txt"); ofstream expenseOut("tempexpense.txt",

ios::app);

*while* (getline(expenseIn, line)) {

*if* (line.find(rcarid) == string::npos) {

expenseOut << line << endl;

}

}

expenseIn.close(); expenseOut.close();

remove("carparkexpensedb.txt"); rename("tempexpense.txt",

"carparkexpensedb.txt");

cout << "Car Removed Successfully!\n"; parkedCarsCount--;

getch();

}

void ParkingManagement::userremovecar() { system("CLS");

string rcarid, line;

cout << "Enter Your Car Id : "; cin >> rcarid;

ifstream in("carparkdb.txt"); ofstream out("temp.txt", ios::app); *while* (getline(in, line)) {

*if* (line.find(rcarid) == string::npos) {

out << line << endl;

}

}

in.close();

out.close();

remove("carparkdb.txt"); rename("temp.txt", "carparkdb.txt");

ifstream expenseIn("carparkexpensedb.txt"); ofstream expenseOut("tempexpense.txt",

ios::app);

*while* (getline(expenseIn, line)) {

*if* (line.find(rcarid) == string::npos) { expenseOut << line << endl;

}

}

expenseIn.close(); expenseOut.close();

remove("carparkexpensedb.txt"); rename("tempexpense.txt",

"carparkexpensedb.txt");

cout << "Your Car Removed Successfully!\n"; parkedCarsCount--;

getch();

}

void ParkingManagement::displayParkingMap() { system("CLS");

cout << "Admin View: Displaying All Parking Slots\n";

cout << "

\n";

*// Show parking slots, with occupied ones marked as 'X'*

*for* (int i = 0; i < MAX\_CAPACITY; i++) {

*if* (i < parkedCarsCount) {

cout << "[ X ] "; *// 'X' indicates occupied slot*

} *else* {

cout << "[ " << availableSlots[i] << " ] "; *// Show available slot*

}

*// After every 10 slots, print a newline to format the parking map*

*if* ((i + 1) % 10 == 0) {

cout << endl;

}

}

cout << "\nPress Enter to Continue.\n"; getch();

}

void ParkingManagement::userParkingMap() { system("CLS");

cout << "User View: Displaying Available and Occupied Parking Slots\n";

cout << "

\n";

*// Show all slots, with occupied ones marked as 'X' (no removal of occupied slots)*

*for* (int i = 0; i < MAX\_CAPACITY; i++) {

*if* (i < parkedCarsCount) {

cout << "[ X ] "; *// 'X' indicates occupied slot*

} *else* {

cout << "[ " << availableSlots[i] << " ] "; *// Show available slot*

}

*// After every 10 slots, print a newline to format the parking map*

*if* ((i + 1) % 10 == 0) {

cout << endl;

}

}

cout << "\nPress Enter to Continue.\n"; getch();

}

int main() {

login obj1; obj1.loginsys();

ParkingManagement pm; initializeSlots();

*if* (obj1.role == "Admin") {

int choice;

*do* {

\n";

Expenses\n";

system("CLS");

cout << "----------- Admin Menu ----

cout << "1. Park Car\n";

cout << "2. View Car Details\n"; cout << "3. Check Parking

cout << "4. Remove Car\n";

cout << "5. Display Parking Map\n"; cout << "6. Logout\n";

cout << "Enter choice: "; cin >> choice;

*switch* (choice) {

*case* 1:

pm.park();

*break*; *case* 2:

pm.cardetail();

*break*; *case* 3:

pm.expense();

*break*; *case* 4:

pm.removecar();

*break*; *case* 5:

pm.displayParkingMap();

again.\n";

}

*break*; *case* 6:

cout << "Logging out...\n";

*break*; *default*:

cout << "Invalid choice. Try

*break*;

} *while* (choice != 6);

}

*else if* (obj1.role == "User") { int choice;

*do* {

\n";

Details\n"; Expenses\n"; Slots\n";

system("CLS");

cout << "----------- User Menu -----

cout << "1. Park Car\n"; cout << "2. View Your Car

cout << "3. Check Your Parking cout << "4. View Available Parking

cout << "5. Remove Your Car\n"; *//*

*Option to remove car*

cout << "6. Logout\n"; cout << "Enter choice: "; cin >> choice;

*switch* (choice) {

*case* 1:

pm.park();

*break*; *case* 2:

pm.cardetail();

*break*; *case* 3:

pm.expense();

*break*; *case* 4:

pm.userParkingMap();

*break*; *case* 5:

pm.userremovecar(); *// Remove car functionality for users*

*break*; *case* 6:

cout << "Logging out...\n";

*break*; *default*:

cout << "Invalid choice. Try

again.\n";

}

*break*;

} *while* (choice != 6);

}

*return* 0;

}

# OUTPUTS:

# Login Interface:

# Parking the car:

# Viewing Car Details:

# Check Parking Expenses

# Remove Car

# Display Parking Map

# Analysis:

* 1. Parking spaces for as many as 100 automobiles were assigned and monitored successfully.
  2. Accurate parking cost computation in a range of test scenarios.
  3. Easy access to and updating of vehicle information and available slots.
  4. Performance Metrics: Slot Allocation Time: For up to 100 automobiles, less than 1 second.
  5. ​

The accuracy of the expense calculation was confirmed with an accuracy rating of 100%.

For 100 records, the data retrieval time was less than two seconds.

Talk about

By automating parking procedures and removing human error, the initiative accomplishes its goals. Although it works well for small and medium-sized facilities, real-time updates and database integration in the future would expand the system's functionality.

Advantages:

1. Easy and economical solution.
2. Dependable file management for storing data.
3. Scalability to accommodate bigger parking lots.

Drawbacks:

1. No graphical interface (GUI) is available.
2. No cloud integration or real-time slot detection.

# Future Scope

1. Real-Time Slot Detection: Automated slot detection by integrating IoT devices.
2. GUI Development: To improve the user experience, develop a graphical user interface.
3. Database Integration: For bigger systems, use a database in place of file processing. Mobile Application: Provide a mobile application for remote access and user convenience

# Conclusion

The Car Parking Administration System adopts a software-driven approach to revolutionize parking management, automating critical operations such as pricing accuracy, seamless record maintenance, and efficient slot allocation. By leveraging the capabilities of C++, this system ensures precision and reliability in handling parking tasks, which are often prone to human error in traditional manual setups. Designed with scalability and cost-effectiveness in mind, the solution caters specifically to the needs of small and medium-sized parking facilities, making it an ideal choice for urban and suburban environments.

The system not only streamlines operations but also enhances user satisfaction by reducing wait times, ensuring transparent billing, and optimizing space utilization. Its robust architecture allows for easy integration with existing frameworks, paving the way for future upgrades and expansions. By addressing the operational challenges of conventional parking systems, this initiative offers a comprehensive and sustainable solution that aligns with the growing demand for smarter, automated urban infrastructure.