Bahria University, Islamabad

Department of Software Engineering

Data Structures & Algorithms Lab

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Comments:

Signature

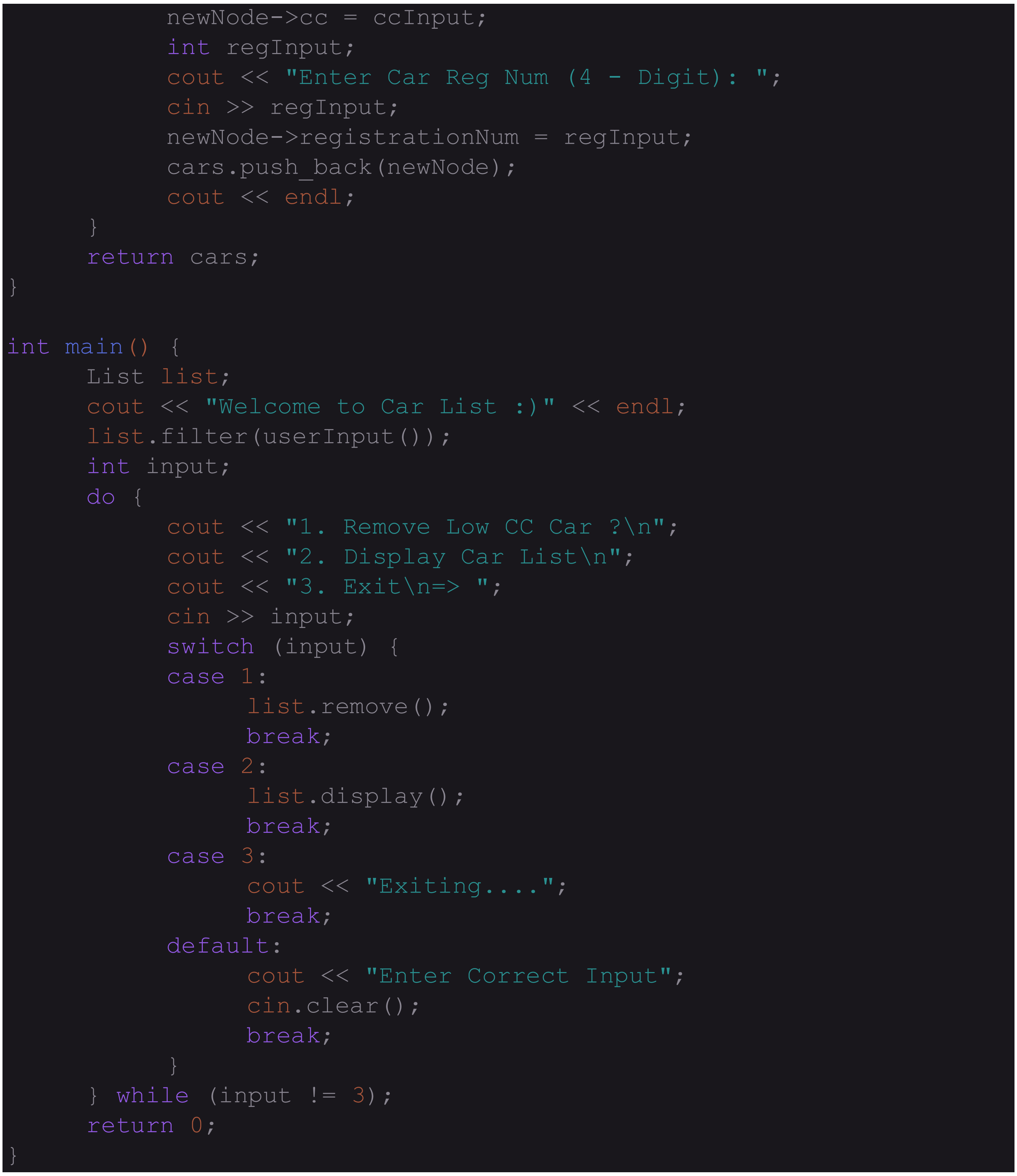
Code:

List.h

```
#pragma once
#include<iostream>

typedef struct Node* Nodeptr;

struct Node
{
    int registrationNum;
    int cc;
    Nodeptr next;
    Nodeptr prev;
};

class List {
    Nodeptr head = nullptr;
public:
    void sort(Nodeptr car){
        if (isEmpty()) {
            Nodeptr newNode = car;
            newNode->next = head;
            newNode->prev = nullptr;
            head = newNode;
            return;
        }
        else if (head->next == nullptr) {
            if (head->cc << car->cc) {
                Nodeptr newNode = car;
                newNode->next = head;
                head->prev = newNode;
                newNode->prev = nullptr;
                head = newNode;
                return;
            }
            else {
                Nodeptr newNode = car;
                newNode->prev = head;
                head->next = newNode;
                newNode->next = nullptr;
                head = newNode;
                return;
            }
        }
        else {
            for (Nodeptr p = head; p != nullptr; p = p->next) {

                if (p->cc < car->cc) {
                    Nodeptr newNode = car;
                    newNode->next = p;
                    newNode->prev = p->prev;
                    if (p->prev != nullptr) {
                        p->prev->next = newNode;
                    }
                    p->prev = newNode;
                    return;
                }
            }
        }
    }

    void filter(std::vector<Nodeptr> cars) {
        for (Nodeptr i : cars) {
            if (i->registrationNum % 2 == 0) {
                sort(i);
            }
            else {
                std::cout << "\nCar with Reg Num: " << i-
>registrationNum << " not ready for departure.\n";
            }
        }
    }

    bool isEmpty() {
        return head == nullptr;
    }

    void display() {
        if (!(isEmpty())) {
            Nodeptr lastNode = nullptr;
            for (Nodeptr p = head; p != nullptr; p = p->next) {
                if (p->next == nullptr) {
                    lastNode = p;
                }
            }
            int i = 1;
            for (Nodeptr q = lastNode; q != nullptr; q = q-
>prev) {
                if (q != nullptr) {
                    std::cout << "Car #" << i << ": \n";
                    std::cout << "Reg No. : " << q-
>registrationNum << "\n";
                    std::cout << "Engine Capacity: " << q->cc
<< "\n";
                    std::cout << "----------------------------
--\n";
                    i++;
                }
            }
        }
        else {
            std::cerr << "List is Empty";
        }
    }

    void remove() {
        if (!(isEmpty())) {
            Nodeptr lastNode = nullptr;
            for (Nodeptr p = head; p != nullptr; p = p->next) {
                if (p->next == nullptr) {
                    lastNode = p;
                }
            }

            std::cout << "\nCar Removed: \n";
            std::cout << "Reg No. : " << lastNode-
>registrationNum << "\n";
            std::cout << "Engine Capacity: " << lastNode->cc <<
"\n";
            std::cout << "-----------------------------\n";
            if (lastNode->prev != nullptr) {
                lastNode->prev->next = nullptr;
            }
            else {
                head = nullptr;
            }
            delete lastNode;
        }
        else {
            std::cerr << "List is Empty";
        }
    }
};
```

Main

```
#include <iostream>
#include <vector>
#include "list.h"
using namespace std;

vector<Nodeptr> userInput() {
    vector<Nodeptr> cars;
    cout << "How many Car do you want to register?\n=> ";
    int carNum;
    cin >> carNum;
    for (int i = 0; i < carNum; i++) {
        Nodeptr newNode = new Node;
        int ccInput;
        cout << "Car " << i + 1 << ": \n";
        cout << "Enter Car Engine Capacity (cc): ";
        cin >> ccInput;
```



```
        newNode->cc = ccInput;
        int regInput;
        cout << "Enter Car Reg Num (4 - Digit): ";
        cin >> regInput;
        newNode->registrationNum = regInput;
        cars.push_back(newNode);
        cout << endl;
    }
    return cars;
}

int main() {
    List list;
    cout << "Welcome to Car List :)" << endl;
    list.filter(userInput());
    int input;
    do {
        cout << "1. Remove Low CC Car ?\n";
        cout << "2. Display Car List\n";
        cout << "3. Exit\n=> ";
        cin >> input;
        switch (input) {
        case 1:
            list.remove();
            break;
        case 2:
            list.display();
            break;
        case 3:
            cout << "Exiting....";
            break;
        default:
            cout << "Enter Correct Input";
            cin.clear();
            break;
        }
    } while (input != 3);
    return 0;
}
```