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DATA STRUCTURES

Course Instructor:
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PROJECT: USED CAR BUY AND SELL RECOMMENDATION SYSYTEM

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Introduction:

The Aim of this project is to create an efficient recommendation system based on concepts of Data Structures. With the rise of online entertaintenment and services people wanted to buy and sell things based on their requirements. So we made a recommendation system on which user can search cars to buy in our project. From e-commerce to online advertisements recommender system are unavoidable in our daily online life.

Data Set Analysis:

This data set is taken from Kaggle. It contains data of used U.S cars including their model name, company name, color, mileage, interior and exterior designer and many more columns. The main data set is 10 GB bus we took a sample of it used after cleaning.
Data Set Link: https://www.kaggle.com/ananaymital/us-used-cars-dataset/version/1#

IDE:

The programming language we are using is C++ and IDE is DEV C++ and Visual Studio Code.

Problem Statement:

- The first problem was finding the data set.
- Filtering the unwanted data from the .csv file.
- Then which data structure to use to handle data set.
- Then platform to build a project using data structure and concepts that has following functionalities:
    - Recommending cars based on user requirement
    - Searching Specific Car
    - Adding more car to sell

Design and Architecture:

C++ programming language is used for implementation of used car recommendation system. The program has been partitioned between different class and functions:

- ✓ **Class Node**

Used in order to create AVL tree, Includes Left and right and height of each node and many other string parameters, variables, constructors and methods.

```
class Node
{
public:
    string vehicleNumber, bodyType, city, engineType, exteriorColor, fuelType, interiorColor, url, majorOptions, make;
    string seatingCapacity, modelName, transmission, transmissionDisplay, wheelSystem, WSD, engineDisplacement, hp;
    string mileage, price, year, listing_color;
    Node *left, *right;
    int height;

    Node(string vin, string body_type, string city, string eD, string eT, string exc, string fT, string hp,
         string iC, string url, string make_name, string maximum_seating, string mileage,
         string model_name, string price, string ts, string tsD, string wheel_system,
         string wheel_system_display, string year, string major_options, string list_color)
    {
        this->vehicleNumber = vin;
        this->bodyType = body_type;
        this->city = city;
        this->engineDisplacement = eD;
        this->engineType = eT;
        this->exteriorColor = exc;
        this->fuelType = fT;
        this->hp = hp;
        this->interiorColor = iC;
        this->url = url;
        this->make = make_name;
        this->seatingCapacity = maximum_seating;
        this->mileage = mileage;
        this->modelName = model_name;
        this->price = price;
        this->transmission = ts;
        this->transmissionDisplay = tsD;
        this->wheelSystem = wheel_system;
        this->WSD = wheel_system_display;
        this->year = year;
        this->majorOptions = major_options;
        this->listing_color = list_color;
        left = NULL;
        right = NULL;
    }
};
```

- ✓ **Class BST**

Used in order to create self-balancing called AVL tree it contains root of tree, constructors destructors and methods

```
58  class BST
59  {
60  private:
61      Node *root;
62
63      Node *insert(string vin, string body_type, string city, string eD, string eT, string exC, string fT, string hp,
64                   string iC, string url, string make, string seat, string mileage, string model_name, string price, string ts,
65                   string tsD, string ws, string WSD, string year, string ma_op, string list_color, Node *p)···
105
106     int Max(int a, int b)···
114
115     void MakeEmpty(Node *p)···
123
124     Node *SingleRightRotate(Node *&p)···
133
134     Node *SingleLeftRotate(Node *&p)···
143
144     Node *DoubleLeftRotate(Node *&p)···
149
150     Node *DoubleRightRotate(Node *&p)···
155
156     Node *FindMin(Node *p)···
165
166     Node *FindMax(Node *p)···
175
176     Node *Remove(string vin, string price, Node *p)···
257
258     int Height(Node *p)···
262
263     int GetBalance(Node *p)···
270
271     virtual void visit(Node *p)···
295     void pre_order(Node *p)···
304
305 public:
306     BST()···
310
311     void Insert(string vin, string body_type, string city, string eD, string eT, string exC, string fT, string hp,
312                 string iC, string url, string make, string seat, string mileage, string model_name, string price, string ts,
313                 string tsD, string ws, string WSD, string year, string ma_op, string list_color)···
```

- ✓ **Other Functionalities**

These functions are made to display main menu, data and time, and taking input and searching for user depending upon user input.

```
335 > void input(string company, string CarName, string YearReg, string trans, string max_mile, string color)···
397
398 > int t(void)···
406
407 > void LOGO()···
415
416 > char Search()···
465
466 > char Recommend(vector<string> arr)···
633
634 > char AddData()···
741
742 > void menu()···
797
```

- ✓ **Libraries included**

```
1   #include <iostream>
2   #include <fstream>
3   #include <algorithm>
4   #include <string>
5   #include <string.h>
6   #include <ctime>
7   #include <string>
8   #include <vector>
9
10  using namespace std;
11
```

Implementation:

An Efficient program to recommend user used cars based on their requirements. The user will be asking to enter car details that the like to buy and sell then program based on their input recommend cars.

- ✓ Recommend cars
- ✓ Search Specific Car
- ✓ Add Car to sell

```
                                    ****************************
                                          US USED CARS
                                    ****************************


Date : Jan 17 2022
Time : 19:12:15



                                    Welcome To US Used Car Portal

1. Recommendation For Your Car
2. Search For Specific Car
3. Add Your Car For Selling
4. Exit

Enter Your Choice:
```

✓ Recommended cars

```
                                        ****************************
                                              US USED CARS
                                        ****************************


Recommended Cars:

1. Civic
2. Accord
3. Accord Hybrid
4. Clarity Hybrid Plug-In
5. Insight
6. Civic Hybrid

Want More Recommendations Y/N
```

✓ Search specific Car

```
Transmission: A - Automatic
Wheel Drive: FWD - Front-Wheel Drive
Year Registered: 2021
MajorOptions: "['Adaptive Cruise Control', 'Bluetooth', 'Backup Camera']"

Vehicle Number: JTDVPMAE1MJ131411
Body Type: Sedan
City Registered: Manchester
Engine Displacement: 1800.0 CC
Engine Type: I4
Exterior Color: Black Sand Pearl
InteriorColor: LT. GRAY
Color: BLACK
Horse Power: 139.0
Fuel Type: Gasoline
Image Link:
Company Make: Toyota
Car Name: Corolla
Seating Capacity: 5 seats
Mileage Driven: 10.0
Price: 23153.0
Transmission: A - Automatic
Wheel Drive: FWD - Front-Wheel Drive
Year Registered: 2021
MajorOptions: "['Bluetooth', 'Backup Camera', 'Blind Spot Monitoring', 'Android Auto', 'CarPlay', 'Convenience Package']"



Showing Results For 19 Cars

Press any key to continue . . .
```

✓ Add cars

```
                                        ****************************
                                              US USED CARS
                                        ****************************


Enter Vehicle Number: 12345
Enter Vehicle Body Type: abcd
Enter Vehicle's Registration City: karachi
Enter Engine Displacement: 5678
Enter Engine Type/Name: mast
Enter Vehicle's Exterior Color: brown
Enter Vehicle Fuel Type: petrol
Enter Vehicle's HorsePower: 567
Enter Vehicle's Interior Color: greeb
Enter Vehicle's Exterior Color Category: tyte
Enter Vehicle's Image Link(optional): http//asdasdasd.com
Enter Vehicle's Company Name: gaditek
Enter Vehicles's Seating Capacity: 4
Enter Vehicle's mileage: 56777
Enter Vehicle's Name: ahad
Enter Price: 2300000
Enter Transmission(Short Form): A
Enter Transmission Display(Full Form): Automatic
Enter Wheel System(Short Form): four
Enter Wheel System Display(Full Form): four wheels
Enter Year Registered: 2019
Enter Vehicle's Major Options: full
Press any key to continue . . .
DATA ENTERED IN FILE SUCCESSFULLY!...
Want To ADD More Y/N
```

Conclusion:

Buying and selling used cars are common need of todays. Recommendation system are used innumerable ways and are beneficial to both customers and sellers. In this particular system we have focused on providing the user the used cars name based on their search.