Used Cars Management System

By Jiaxu Zhu, JiaJing Liao, Haocheng Song, Yufan Chen

Introduction

Used car market are always vibrant in US. To manage such mass number of information, car dealers need to able to easily track all available cars in storage and connect each car with corresponding listing online while at the same time they communicate with prospective buyers. Customers also need to easily browse cars with different price tag and quality along with the source, age, cleanness and other important information before they make a decision. To help fulfill this demand, we create this database system(DBS) to bridge the transactions so that dealer can handle this process in transparent, safe and highly efficient manner. Beside handling simple operations such as insert, update and delete, this system will also handle complicated request from the dealer or customers. For example, customers will be able to pick the top deals by sales numbers, querying and predicting future sales based on previous results. customers can also sort the listing by price and pick candidate by their personal favor. Some quality of life function will also be implemented such as shopping cart that customers can store multiple products so they can compare different deals.

Dataset

The dataset we used is coming from real world used-car listing records on Craigslist, a popular US second-hand market. These data are collected by Austin Reese and date of listing ranged from 1900 to 2019. There are 509577 rows of listing, and each row has 20 columns of attributes including listing id, url link, region, price, year, etc. Link to dataset:

https://www.kaggle.com/austinreese/craigslist-carstrucks-data

Design

Dealers and users should be able to interact with the pre-designed database system through web-based graphic user interface. On functional level, this system is made by 3 parts including dealer, database and users. First, the dealer should be the administrator of the system, it has all the power to manipulate the database, including insert, update, delete and view. Second, the database should be the core of the system, it storages all the used car data entities and relations. At last, many users should be able to view the database smoothly without delay, and they should not be able to intervene the work process of dealer. The Figure 1 below shows a general concept of this design. For clarification, every interaction between dealers or users and database is covered by graphic user interface functionality. Thus, users do not need to handle complicated SQL query demand. The graphic user interface will allow users to perform all simple functions such as insert and delete and more than 5 complex functions which will be shown in the later section.

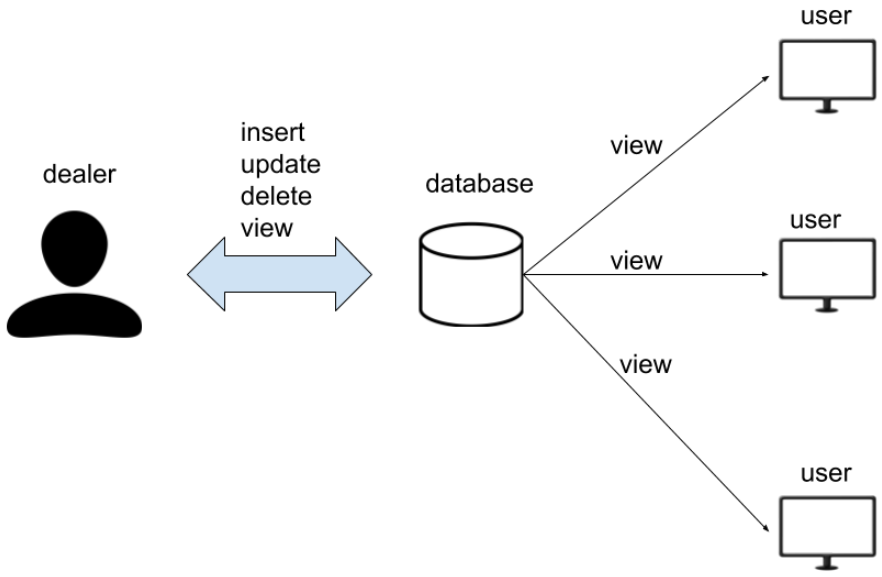

Figure 1. A dealer manages the listing database while multiple users can browse and interact.

About the user interface, dealer and users should be able to sign into a web-based user interface and interact with the database by using textfield, scroll bars and other general user-interface component. The database will be able to handle those query, execute SQL function and update the operation result to users.

General Concern

What are the main functions that the web-based user interface should provide?

1. Welcome page: show a beautiful image and user can click on a button to be redirected to the login page.

2. login page: it allows dealer to input username and password to login as administrator. After dealer login, a main page will be displayed.

3. Main page: to fulfill the function of "view", including searching, filtering and simplifying used car data information, it should be able to show the database to user and dealer. Furthermore, there should also be buttons that allow dealer to insert, delete, update and view detailed information and allow user to view detailed information. It should also include buttons that could redirect to or show the special functions described in the previous chapter.

4. form page: it allows dealer to input the information of car to be inserted or updated.

5. delete page: it allows dealer to delete a specified listing.

How do the different functions work together? Sometimes there are dependencies between different functions.

We will follow the general principle of modular programming, but there do exist some loosely couple. For example,

1. the insert and the update function depends on the form page. So, the system can only insert or update a car after getting correct information from the form page.

2. some special function, such as "show the yearly total sales of top 10 model on a line chart" can only be executed if the correct data is present after we have derived the correct SQL sentences.

3. the authentication system should identify the identity of a user and set the limitation accordingly.

Complex Functions

Below is a series of important complex function that the user can achieve by using this application.

1. Showing a sorted listing based on cars' price in descending/ascending order with specific car model,condition and manufacturer.

Reason: the users may want to look for the cheapest deal in general. They may want to skim the list from the cheapest to the most expensive with their personal favors in car condition, different car model and manufacturer before they make a decision.

Rationale: To sort cars based on price with preset condition to better ammondate users' need in good deals.

2. Showing the yearly total sales of top 10 models on a line chart, and predicting the sales of top 10 model in the coming year, and also display it on the above line chart by special color

Reason: the users may want to know the sales of recent years to help making a decision, the history scientists may want to know the sales trend of past years and record it, and the dealer may want to know the sales trending too so as to investing in the right model.

Rationale: to show the sales trending of top 10 model, and also predict the trending of coming year. To help someone who doesn't know about cars makes a choice.

3.Showing the yearly total sales of bottom 10 models on a line chart, and predicting the sales of bottom 10 model in the coming year, and also display it on the above line chart by special color

Reason: the users may want to know the sales of recent years to help avoid the traps, the history scientists may want to know the worst sales model of past years and record it, and the dealer may want to know the sales trending too so as to transferring their invest.

Rationale: to show the sales trending of bottom 10 model, and also predict the trending of coming year. To help everyone avoid the traps.

4. Showing the relationship between mileage and conditions of all vehicles of a specific manufacturer in a line chart, the horizontal axis represents mileage, and the vertical axis represents condition.

Reason: when users select a car from a manufacturer, they concern a lot about safety. It's not all about just the specific car model they want to buy, but also the overall quality of all the products for this manufacturer, and this can be reflected by the relationship between mileage and vehicle condition. If the vehicles produced by a company as a whole can still maintain a good condition with high mileage, it can be inferred that the products from this manufacturer are reliable and it will be a good choice to buy a car from this company.

Rationale: For a given manufacturer, a chart can be generated to show the changes in vehicle conditions as mileage increases.

5.Showing the rank of each manufacturer based on the average price of all its products.

Reason: sometimes users may care about the brand positioning when they select a car. For example, some people prefer luxury cars so they are more likely to choose a brand that has a higher average price overall, while there are some others want to buy a normal car, so those manufacturers with lower average vehicle prices will be better.

Rationale: All the manufacturers will be sorted by descending average prices, so it means the top is the most luxurious brand among all brands.

6.Showing total numbers of vehicles in different price ranges in different regions.

Reason: This is for dealer to know about the user demand for used cars in different regions and in different price ranges, so they can provide more information for the different needs of different groups of people.

Rationale: For each region, the total number of vehicles in it will be displayed, and the amount in each price range is also shown, with the range of 10000 dollar.

Tools and Implementation

For the database part, we use Oracle as the database system and use SQL to complete operations in the Oracle database. For the backend part, we use Java and Spring framework to build the complete backend to receive requests from the front-end (user interface) and execute appropriate operations in the database part. For the frontend part, we use CSS, HTML, JS to build the website and user interface. We may also use some frontend framework and tools such as AngularJS and bootstrap to build the website.

Work Division

Below is the work division on each phase of the product.

Phase I : Jiaxu Zhu, Jiajing Liao, Yufan Chen

Phase II : Haocheng Song, Jiaxu Zhu, Jiajing Liao

Phase III : Yufan Chen, Haocheng Song, Jiaxu Zhu

Implementation Part (Phase VI and Phase V):

Database part : Jiajing Liao, Yufan Chen

Java backend part : Haocheng Song, Jiajing Liao

Website frontend part : Jiaxu Zhu, Haocheng Song

Queries: Yufan Cheng, Haocheng Song, Jiaxu Zhu, Jiajing Liao

Test and debug: Yufan Chen, Jiaxu Zhu