Kingdom of Saudi Arabia
Ministry of Education
Imam Abdulrahman bin Faisal University
College of Science and Humanities-Jubail
Department of Computer

جامعة الإمام عبدالرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY
كلية العلوم والدراسات الإنسانية - الحاسب الآلي
College of Science and Humanities - Computer Department

CarWash System using Queue Data Structure

Data Structure Course

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Team Members:

Khaznah M. Alhajri

Reem S. Almualem

Ghala M. Alkhaldi

Fida M. Alelou

May M. AlOtaibi

Narjis Al-Jumaia

Jumanah Aljassim

Supervised by:

Dr. Enas El-Sharawy

TA. Hessa Almutauri

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1. INTRODUCTION

Recently, the population of cars has increased many fold and car owners would rather have a quick car service than leave their vehicle at a service station for the entire day. The car services industry has grown too sophisticated technologies. The managers of this type of business may like to consider all the key points which may affect business today as well as, in the future. One of these points is to have a system that allows the manager to keep the business flow flexible and organized. The idea of the queue data structure is that elements can be inserted at any time, but only the element that has been in the queue the longest can be next removed **[1]**. In this report, an idea of a system called "**CarWash**" that designed and implemented to manage the car services process by a Java programming language using a queue data structure by Netbeans tool is presented. The rest of the report is organized as follows. Section 2 shows the challenges. Section 3 illustrate the solution. Section 4 presents the methods and explanation. Section 5 shows the results and output screens. Finally, section 6 draws the conclusion.

2. CHALLENGES

The challenge was choosing the appropriate structure to apply it and achieve efficiency and keeps the flow flexible and organized. As well as, finding the appropriate idea that fits the chosen structure.

3. SOLUTION

A Java program using Queue data structure by Netbeans tool is an appropriate solution. Queue data structure can keep the flow of the cars flexible and organized, while each car takes a place in the queue/line and wait for its turn without needing an employee to organize this process. Which can save time and effort on the staff and business managers. Queue data structure was chosen due to several reasons, which are:

1. Queue is a FIFO (First in First Out) structure.
2. Once a new into the Queue, all the elements inserted before the new element in the queue must be removed, to remove the new element.

4. METHODS & EXPLANATION

Service Methods:

isEmpty(): Returns 0 when there is no care is served.

getSize(): Get the total served cars.

getFront(): Get the first served car.

getRear(): Get the last served car.

display(): Display all the cars that has been served.

EnQueueRear(String service, int price): Add a service and the price at the end of the service list

DeQueueFront(): It will Delete a service at the beginning of the list.

DeQueueRear(): Delete a service at the end of the list.

EnQueueFront(String service, int price): Add a service and the price at the beginning of the service list.

Customer Methods:

isEmpty(): Return 0 when there is no Appointments.

EnQueue (String name, String time, String service, String total_price): Add an appointment at the biggening, includes Customer name, appointment Time, The selected service and the Total price.

DeQueue(): Delete an appointment at specific position.

display(): Display the incoming appointments includes Customer name, appointment Time, The selected service and the Total price.

reminingTime(): Calculate the remaining time after finishing the service.

5. RESULTS & OUTPUT SCREENS

When the users execute the program, they will see three option to choose from, whether they are the admin, customers, or exit as shown in the Figure 1.

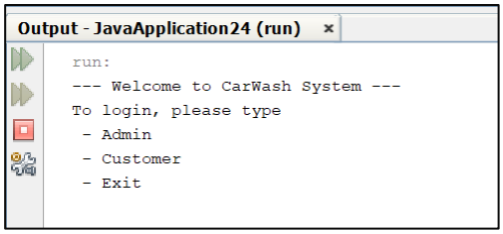

***Figure 1**: choosing if the user is an admin or customer*

When then user chooses "admin", the admin logs in by a username and a password and then they can select what they want to do, whether to add an offer, to display the total served cars, income of the day, the upcoming appointments, or exit. As shown in the Figure 2.

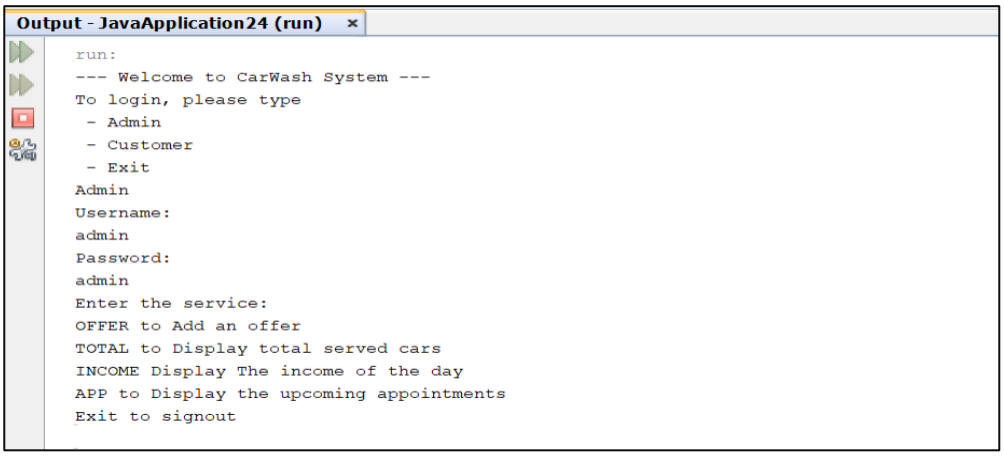

***Figure 2**: Admin's functionalities*

To add an offer to a specific service, the admin types "OFFER", then determine the number of the services to add the offer to them, after that the admin types the service name and determine the new price and the offer will be displayed. As shown in Figure 3. However, when the admin types "TOTAL", the number of served cars will appear. As shown in the Figure 4. When "INCOME" is typed, the income of the day will be displayed. As shown in Figure 5. “APP” shows the upcoming appointments, as shown in Figure 6. Finally, “EXIT” terminates the run of the system.

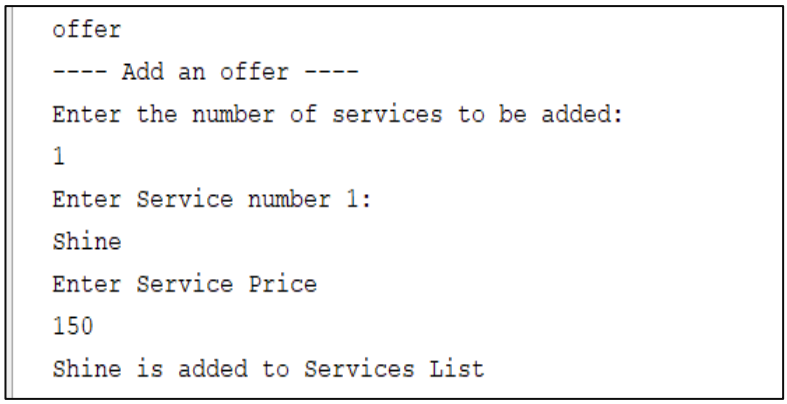

***Figure 3**: Adding an Offer to a specific service.*

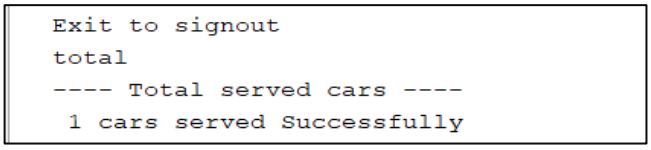

***Figure 4**: The total number of served cars*

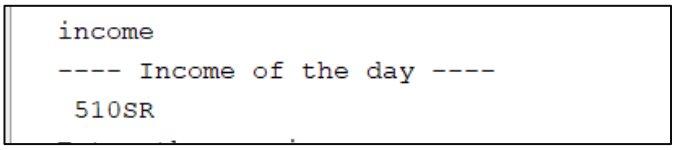

***Figure 5**: The total income*

```
app
---- Upcoming appointments ----
We have in sunday (2 )Appointments
We have in Monday (0 )Appointments
We have in Tuesday (0 )Appointments
We have in Wednesday (0 )Appointments
We have in Thursday (0 )Appointments
We have in Friday (0 )Appointments
We have in Saturday (0 )Appointments
```

***Figure 6**: The upcoming appointments.*

Now if the user is a customer, they can type "CUSTOMER", then they type the name and the menu. The customer can choose the service from the list and types the desired day and time. The total price will be calculated and displayed. As shown in Figure 7 and Figure 8. Then, All the booking information will be added to a queue and displayed as shown in Figure 8.

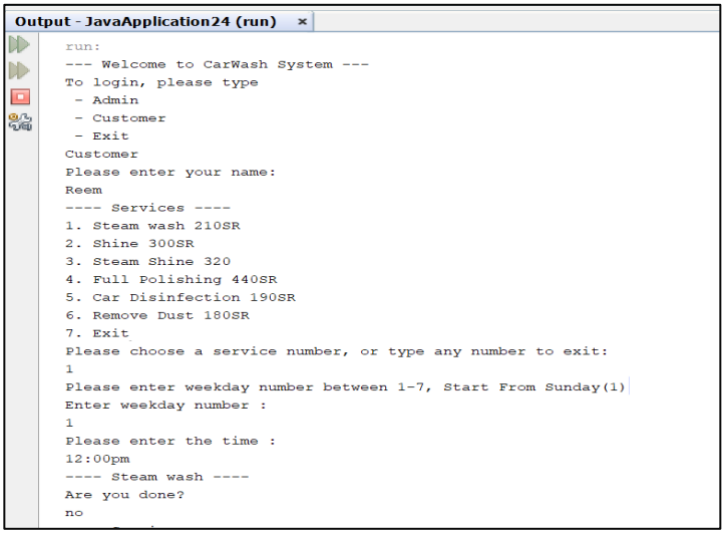

***Figure 7**: Booking an appointment*

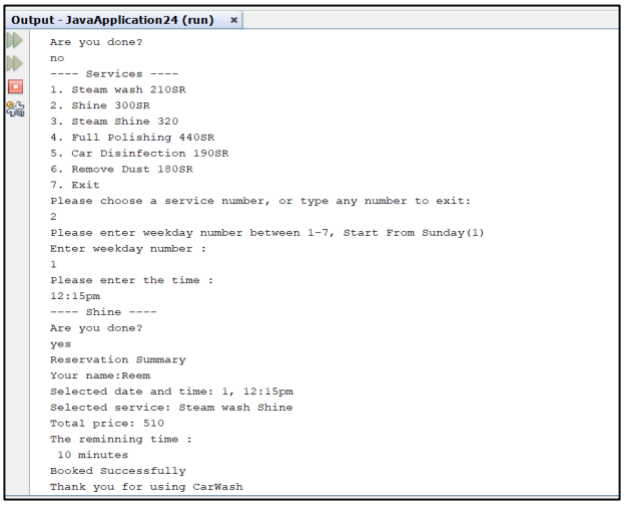

***Figure 8**: Booking an appointment*

6. CONCLUSION

CarWash system is a system designed and implemented by Netbeans to manage the car services process using a queue data structure with multiple methods to gain efficiency. **CarWash** system provide a quick car service that helps business owners to increase their business efficiency and provide more services to the customer. In addition, it will save time for the customer instead of waiting for a long time waiting for the desired service. For future work, a good graphical user interface can be added to improve the user experience.