

Ferris Wheel Car Parking: User Manual



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User Manual: Features of the Code and Decisions Taken

This parking will include 5 car parkings in total (for the sake of demonstration) named A, B, C, D, and E. Each parking has 12 platforms where the position 6 is considered to be the base position platform, and each parking has a controlboard associated to it. Each of these parkings occupies 20 square meters (roughly the size of two cars). Five out of the seven levels of the parking have two parking platforms, while the top and the ground level each accommodate one car. This makes the ferris wheel car parking 20 meters tall.



The tower acts efficiently, in such a way that the car on the top level platform will take a minute to arrive at ground level. However, the levels in between the top and the ground level will take less. We computed the time in such a way that, if the car was at level 5 it would take 50 seconds (level 5 x 10seconds delay of rotation). With the same reasoning, levels 4,3,2, and 1 will take 40secs, 30secs, 20secs, and 10secs respectively.

Now we present to you the features provided (and decisions taken) for a user upon his/her arrival to the car parking. First, the car parking information is displayed, meaning the available empty platforms in each car parking tower, and initially all parking platforms are empty (Figure 1).

Next, the user can choose to register, login, continue as a new guest, or continue as an oldguest (Figure 2). Also, the user will choose what to do with his car from the options 'park' ,

'release', 'location', and 'exit'. These options will remain to appear until the user enters 'exit'. the users below demonstrate the above features:

```
Parking A Info:
There are 12 empty spots in Parking A
You can proceed to this parking.

Parking B Info:
There are 12 empty spots in Parking B
You can proceed to this parking.

Parking C Info:
There are 12 empty spots in Parking C
You can proceed to this parking.
|
Parking D Info:
There are 12 empty spots in Parking D
You can proceed to this parking.

Parking E Info:
There are 12 empty spots in Parking E
You can proceed to this parking.

Choose between the 5 parkings by entering their corresponding name:
```

Figure 1: Initial Car Parking information

For this example, let us consider the user chooses parking A, the user may enter "a" or "A" both upper and lower case are accepted.

```
Welcome to Parking A!
To register as a new user, enter 'register'
To login, enter 'login'
To continue as a new guest, enter 'guest'
If you are a guest and you already have an ID, enter 'oldguest'
```

Figure 2: After a user chooses a parking, he/she will be given options to choose from

- If a user chose a car parking that is full, in this case parking A is full, the following message will be displayed, showing available spots in other parkings:

Parking A Info:

Parking A is Full. Please check the other parkings.

Parking B Info:

There are 10 empty spots in Parking B

You can proceed to this parking.

Parking C Info:

There are 12 empty spots in Parking C

You can proceed to this parking.

Parking D Info:

There are 12 empty spots in Parking D

You can proceed to this parking.

Parking E Info:

There are 12 empty spots in Parking E

You can proceed to this parking.

- **Register:**

If a user wants to register (create a new account), the user should enter 'register' then input their name, family name, car model, plate number, username, password, and bank account number (Figure 3). If nothing goes wrong, the user is added to the text file 437User along with the previously registered users. In this file, a user's line respectively contains: name, family name, car model, plate number, username, password, bank account number, number of visits, and time (initially 0 if not parked yet) (Figure 5).

```

register
Name:
Ali
family name:
Wehbi
car model:
Audi
plate number:
B730289
username:
anw03
password:
Password1
Bank account number:
19012345
Welcome Ali, you have been registered as a user!

```

Figure 3: Ali Wehbi entering his information

If Ali Wehbi, a new user, wants to register and enters a username that is already taken (already present in the file), the console will show an error message (Figure 4).

```

Username already exists, please choose a different username:

```

Figure 4: Error displayed in case a user enters a username already taken by another user

```

Ali Wehbi Audi B730289 anw03 Password1 19012345 9 0
Dania Tabch BMW B901254 lou12 ILoveLou 89435467 10 0
Mohammad Abdallah Nissan B109203 mma13 Password2 19990231 1 2020-12-25@16:48:25.239305
Reine Chami Mercedes A109234 rkn12 Password334 90101019 1 2020-12-25@16:50:35.897721
Ayman Matar Cadilac B111111 aym12 pAsswoRd 67854758 1 2020-12-25@16:54:09.586934
Tamer Hosny McLaren N313566 ths36 masromIdonya 02040506 1 2020-12-25@17:40:06.246612

```

Figure 5: The registered users file (437User)

- **Login:**

If a user is already registered, he/she can log in by entering 'login' then input their username and password. Let us consider Ali Wehbi, a registered user who already has an account and his information is stored in the 437User file.

```
login
Input the username
anw03
Input the password
Password1
Login sucessful!
```

Figure 6: Ali Wehbi logging in successfully

- If Ali tries to login with an incorrect username, an error message will be displayed:

```
Incorrect username, please type the correct username and password
```

Figure 7: Entering wrong username

- If Ali tries to login with an incorrect password, an error message will be displayed:

```
Invalid password, Please type the correct password
```

Figure 8: Entering wrong password

- **Continue as a new guest:**

If a user wants to continue as a new guest, the user should enter 'guest' then input their name, family name, car model, and plate number (Figure 9). For guest users, a unique ID is generated for each guest and is displayed, where this ID should be taken as input later from the guest upon the withdrawal of his/her car. If nothing goes wrong, the user is added to the text file 437Guest (Note: guest is added to file ONLY after he/she parks the car). In this file, a guest's line respectively contains: name, family name, car model, plate number, ID, and start time (initially 0 if not parked) (Figure 10).

```

guest
Please enter your name:
Ali
Please enter your family name:
Mansour
Please enter your car model:
Honda
Please enter your car's plate number:
B467384
Welcome Ali!
Your ID number is: 10053
Remember your ID number, you must enter it back to pick up your car.

```

Figure 9: Ali Mansour entering his information to become a guest

```

Ali Mansour Honda B467384 10053 2020-12-25@16:45:05.767091
Fatima Ghou1 Audi B038942 10114 2020-12-25@16:45:53.481853
Abdo Hakim Nissan N890435 10182 2020-12-25@16:46:22.813111
Mohammad Salman Kia B657349 10284 2020-12-25@17:06:07.864456
Reeda Saintbai Ferrari A454545 10352 2020-12-25@17:34:55.823939
Karim Ghaddar Cherokee N121233 10410 2020-12-25@17:36:08.864298
Louay Bazzi Tesla D000000 10496 2020-12-25@17:38:20.802903

```

Figure 10: The guest file (437Guest)

- **Continue as an old guest:**

If a user wants to continue as an old guest, the user should enter 'oldguest' into the console then input their ID that was given to them upon their arrival to the parking. Let us consider Fadi, who upon arrival received the ID 10235 which he now inputted:

```
If you are a guest and you already have an ID, enter 'oldguest'  
oldguest  
What's your ID?  
10235  
Welcome back Fadi
```

Figure 11: Fadi enters his ID and successfully returns as an oldguest to access the features

- Finally, if the user enters anything different than "register", "login", "guest", or "oldguest", an error message will be displayed:

```
Invalid Input, redirecting you to main page
```

What happens after the user successfully registers/login/continues as guest/continues as oldguest?

- **After a successful "register" / After a successful "login" :**

Users who are successfully registered or logged in, now the features that they can access are displayed:

```
Choose one of the following options and type it below:  
If you want to park your car, enter 'park'  
If your car is already parked and you want to check your car location enter 'location'  
If your car is already parked and you want to release it enter 'release'  
If you want to sign out enter 'exit'
```

Figure 12: A registered user can choose from these options

- ❑ **Park:**

For the registered user to park his/her car, the closest empty platform is brought to ground level.

Note: For all Parkings A, B, C, D, and E that have 12 platforms, the empty platform is brought to the base position platform 6.

As the user parks the car, this platform will be assigned to the car. Finally, a message will be printed to the user that their car has been parked successfully (Figure 13).

```
park
Your Honda has been parked!
```

Figure 13: Registered User parked successfully

If the car is already parked then an error will show up displaying to the user that his/her car is already parked (Figure 14).

```
park
Your car is already parked!
```

Figure 14: If user enters "park" again after he/she already parked, an error will be displayed

❑ Release:

For the registered user to release his/her car, the platform that the car is parked on is brought to the base ground.

Note: For all Parkings A, B, C, D, and E that have 12 platforms, the platform is brought to the base platform positioned at 6.

Registered Users pay 1,000L.L per hour either by cash or by credit card.

Finally, a message will be printed to the user that their car has been released successfully (Figure 15). Let us consider a registered user Ali Wehbi:

```
release
To release your car, you should pay first.
Total Bill: 1141 L.L
To pay by cash, enter 'cash'
To pay by credit card, enter 'credit'
credit
Payment is successful.
Your car is being released, please wait. Time estimated: 60 seconds.
Your Audi has been released.
Have a great day Ali!
```

Figure 15: User's car released successfully

If the car is not parked and the user requests their car, then an error will show up displaying to the user that his/her car is not parked (Figure 16).

```
release
Your car is not parked
```

Figure 16: If user enters "release" yet his/her car is not parked, this error will be displayed

An additional feature for registered users is free parking if their number of visits is a multiple of 10. Let us consider the user Dania Tabch, first logs in successfully and upon withdrawal of the car she receives free of charge parking (Figure 17).

```
username:
lou12
password:
ILoveLou
Login sucessful!

release
Today is your 10th visit!
Your bill today is free of charge! Thank you for visiting us Dania
Your BMW is always in safe hands.
Your BMW has been released.
Have a great day Dania!
```

Figure 17: Free parking reward for registered users

❑ Location:

The feature 'check car location' is provoked when the user enters 'location' in the console. As a result, a message will show up containing the platform name as well as the level on which the user's car is placed in the parking:

```
location
Your Car Audi is on Platform A6 and it's on level 6
```

Figure 18: A registered user checking his/her car's location

- ❑ Exit: It ends the session for the user, and displays back the welcome function so that another user can proceed.

- **After a successful “guest” / After a successful “oldguest” :**

When a guest user successfully enters his/her information, or when an old guest enters his/her correct ID, now the features that he/she can access are displayed:

Choose one of the following options and type it below:

If you want to park your car, enter 'park'

If your car is already parked and you want to release it enter 'release'

If you want to sign out enter 'exit'

Figure 19: A guest user can choose from these options

- ☐ **Park:** Similar Implementation to the Park function described above.
- ☐ **Release:** Similar Implementation to the Release function described above, but what changes is that the guest must enter their correct ID that was generated upon parking the car. (You can check Scenario 1 below for more details.)

The guest will pay 1,500L.L per hour either using a credit card by entering their information, or by paying cash to the machine administrator.

Finally, a message will be printed to the guest user that their car has been released successfully (Figure 20).

```
release
To release your car, you should pay first.
Total Bill: 1171 L.L
To pay by cash, enter 'cash'
To pay by credit card, enter 'credit'
cash
You can now pay to the machine administrator.
Your car is being released, please wait. Time estimated: 50 seconds.
Your Honda has been released.
Have a great day Fadi!
```

Figure 20: Guest's car released successfully

If the car is not parked and the guest user requests their car, then an error will show up displaying to the guest that his/her car is not parked (Figure 21).

```
release
Your car is not parked
```

Figure 21: If guest enters “release” yet his/her car is not parked, this error will be displayed

- ❑ Exit: It ends the session for the user, and displays back the welcome function so that another user can proceed.

Scenario 1:

Let us consider a new user Fadi, who will now continue as a guest.

1. After he enters 'guest', he inputs his name, family name, car model, and plate number. A unique ID is generated for him and is displayed.

Welcome Fadi!

Your ID number is: 10235

Remember your ID number, you must enter it back to pick up your car.

2. Now, Fadi must choose between his given options 'park', 'release', or 'exit' (all previously explained in the above section). He chooses to park his car so he enters 'park' to the console, and his car was successfully parked.

park

Your Honda has been parked!

3. Fadi is now added to the text file 437Guest. In this file, his line respectively contains: name, family name, car model, plate number, ID, and the time he parked his car.

Fadi Zaraket Honda N777777 10235 2020-12-25@16:56:34.569190

4. Let us examine what happens to the car parking platforms as this action took place. Since Fadi just parked, his car is placed on the platform which is at the base position 6. Other platforms will be adjusted accordingly.

Platform A0 is at position 6, and on it we have Fadi Zaraket's Honda

Platform A1 is at position 7, and on it we have Ayman Matar's Cadillac

Platform A2 is at position 8, and on it we have Abdo Hakim's Nissan

Platform A3 is at position 9, and on it we have Fatima Ghouli's Audi

Platform A4 is at position 10, and on it we have Ali Mansour's Honda

Platform A5 is at position 11, and on it we have Dania Tabch's BMW

Platform A6 is at position 0, and on it we have Ali Wehbi's Audi

Platform A7 is at position 1 and it's empty.

Platform A8 is at position 2 and it's empty.

Platform A9 is at position 3 and it's empty.

Platform A10 is at position 4 and it's empty.

Platform A11 is at position 5 and it's empty.

5. After Fadi has parked, Tamer, Louay, Karim, Reeda, and Mohammad also parked their cars, and now the parking is full.

Platform A0 is at position 11, and on it we have Fadi Zaraket's Honda

Platform A1 is at position 0, and on it we have Ayman Matar's Cadillac

Platform A2 is at position 1, and on it we have Abdo Hakim's Nissan

Platform A3 is at position 2, and on it we have Fatima Ghouli's Audi

Platform A4 is at position 3, and on it we have Ali Mansour's Honda

Platform A5 is at position 4, and on it we have Dania Tabch's BMW

Platform A6 is at position 5, and on it we have Ali Wehbi's Audi

Platform A7 is at position 6, and on it we have Tamer Hosny's McLaren

Platform A8 is at position 7, and on it we have Louay Bazzi's Tesla

Platform A9 is at position 8, and on it we have Karim Ghaddar's Cherokee

Platform A10 is at position 9, and on it we have Reeda Saintbai's Ferrari

Platform A11 is at position 10, and on it we have Mohammad Salman's Kia

6. Here, Fadi has returned to the parking's control board, but since he has already entered as a guest before and parked his car, this time he will enter to continue as an "oldguest".

```
If you are a guest and you already have an ID, enter 'oldguest'
oldguest
What's your ID?
10235
Welcome back Fadi
```

7. After Fadi enters as an "oldguest" using his ID, he releases and pays by cash to the machine administrator.

```
release
To release your car, you should pay first.
Total Bill: 1171 L.L
To pay by cash, enter 'cash'
To pay by credit card, enter 'credit'
cash
You can now pay to the machine administrator.
Your car is being released, please wait. Time estimated: 50 seconds.
Your Honda has been released.
Have a great day Fadi!
```

8. The ferris wheel, represented by this linked list below, shows that when Fadi releases his car which was on platform A0 at position 11, it is brought back down to base position 6 and is released, which makes the platform empty. Other positions are adjusted according to the function `update_positions()` (See details below)

```
Platform A0 is at position 6 and it's empty.

Platform A1 is at position 7, and on it we have Ayman Matar's Cadillac

Platform A2 is at position 8, and on it we have Abdo Hakim's Nissan

Platform A3 is at position 9, and on it we have Fatima Ghoul's Audi

Platform A4 is at position 10, and on it we have Ali Mansour's Honda

Platform A5 is at position 11, and on it we have Dania Tabch's BMW

Platform A6 is at position 0, and on it we have Ali Wehbi's Audi

Platform A7 is at position 1, and on it we have Tamer Hosny's McLaren

Platform A8 is at position 2, and on it we have Louay Bazzi's Tesla

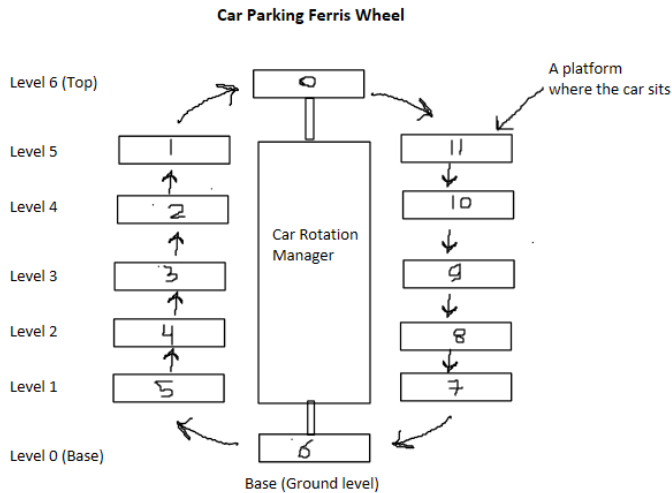
Platform A9 is at position 3, and on it we have Karim Ghaddar's Cherokee

Platform A10 is at position 4, and on it we have Reeda Saintbai's Ferrari

Platform A11 is at position 5, and on it we have Mohammad Salman's Kia
```

How are other platform positions being adjusted:

Here's a reminder of how the positions and levels of a parking prototype are fixed:



```
def return_platform_to_base(self, pos): # moves the platform as passed
    tempnode = self.llist.head
    i = 0
    while i < self.llist.length:
        if (pos == tempnode.data.Position):
            steps = abs(
                tempnode.data.Position - self.basepos) # In our Parkin
            if tempnode.data.Position <= self.basepos:
                rotate_clockwise = False
            else:
                rotate_clockwise = True
            tempnode.data.Position = self.basepos
            break
        tempnode = tempnode.next
        i += 1
    self.update_positions(steps, tempnode.data.name, rotate_clockwise)
```

When a user/guest calls to release his car, we return the platform where his car is parked to the base position. After doing so, we update the positions of the rest of the platforms using the function `update_positions` according to an equation that we came up with. Consider the example where Fadi's car is parked at the 11th position (Platform A0) and we want to bring it to the base position (position 6, base). So, the number of required steps to move from position 11 to position 6 will be $11 - 6 = 5$ steps, and they'll be clockwise rotations since the initial position (11) is closer to 6 if we rotate clockwise, while the number of steps would be 7 if we rotate anticlockwise.


```

def update_positions(self, steps, NewBaseName,
                    rotate_clockwise): # updates the positions of all platforms (Rotating by c
    tempnode = self.llist.head
    i = 0
    if rotate_clockwise == True:
        while i < self.llist.length:
            if (tempnode.data.name != NewBaseName):
                if tempnode.data.Position >= steps:
                    tempnode.data.Position = tempnode.data.Position - steps
                else:
                    tempnode.data.Position = tempnode.data.Position - steps + self.llist.length
            tempnode = tempnode.next
            i += 1
    elif rotate_clockwise == False:
        while i < self.llist.length:
            if (tempnode.data.name != NewBaseName):
                if tempnode.data.Position + steps <= (self.NumPlatforms - 1):
                    tempnode.data.Position = tempnode.data.Position + steps
                else:
                    tempnode.data.Position = tempnode.data.Position + steps - self.llist.length
            tempnode = tempnode.next
            i += 1
    return # END OF FUNCTION

```

To update the rest of the positions, let's take for example the one at position 9 (platform A10): We simply do New position = 9 - (steps) = 9 - 5 = 4 and 4 becomes the new position (platform A10 moves from position 9 to position 4). Another example, if we take the position 4 (platform A5), we will need to subtract from it the number of steps and also add the total length of the array to get the correct position in the circular list. So, New position = 4 - 5 + 12 = 11 which is correct if we look at the parking info printed in pages 25 and 26. (Platform A5 moves from position 4 to position 11).

So, in general, for the clockwise condition, if the position being updated is greater than the number of steps :

New position = Old position - steps

And if the position being updated is smaller than the number of steps:

New position = Old position - steps + list size

For the Anticlockwise condition:

if the position being updated is greater than the number of steps :

New position = Old position + steps

And if the position being updated is smaller than the number of steps:

New position = Old position + steps - list size

Scenario 2:

Let us consider user Ali Wehbi, who is a registered user who previously parked, and will now access many features:

1. Ali successfully logs in by entering his correct credentials as saved in the 437User file:

```
login
Input the username
anw03
Input the password
Password1
Login sucessful!
```

2. Ali uses the feature 'check car location' by entering 'location' in the console. As a result, a message will show up containing the platform name as well as the level on which his car is placed in the parking:

```
location
Your Car Audi is on Platform A6 and it's on level 6
```

3. Ali successfully releases his car by entering 'release' in the console, which then provokes the payment function. He decides to pay by credit, and since he is already a registered user, the payment will be automatically done because we already have his credit card information in the 437User file:

```
release
To release your car, you should pay first.
Total Bill: 1141 L.L
To pay by cash, enter 'cash'
To pay by credit card, enter 'credit'
credit
Payment is successful.
Your car is being released, please wait. Time estimated: 60 seconds.
Your Audi has been released.
Have a great day Ali!
```

Since

Ali's Car was on level 6 (according to the location function), it will take 60 seconds for the platform to move from level 6 to level 0(base position).

This is the list after Ali Wehbi releases his car:

Platform A0 is at position 0 and it's empty.

Platform A1 is at position 1, and on it we have Ayman Matar's Cadillac

Platform A2 is at position 2, and on it we have Abdo Hakim's Nissan

Platform A3 is at position 3, and on it we have Fatima GhouL's Audi

Platform A4 is at position 4, and on it we have Ali Mansour's Honda

Platform A5 is at position 5, and on it we have Dania Tabch's BMW

Platform A6 is at position 6 and it's empty.

Platform A7 is at position 7, and on it we have Tamer Hosny's McLaren

Platform A8 is at position 8, and on it we have Louay Bazzi's Tesla

Platform A9 is at position 9, and on it we have Karim Ghaddar's Cherokee

Platform A10 is at position 10, and on it we have Reeda Saintbai's Ferrari

Platform A11 is at position 11, and on it we have Mohammad Salman's Kia