Visual Paradigm for UML

FROM TEXTUAL DESCRIPTION TO UML USE CASE DIAGRAM

Mario G.C.A. Cimino

Department of Information Engineering

1. Unstructured Requirements

Power Driver is a vehicle rental company. Power Driver has 105 branches over the world. Currently there is no linkage between these branches. Power Driver needs a computer system to connect all these branches together to support better services to the customer in a more efficient way. Following are the requirements of the computer system.

The system should be able to store the vehicle records. A vehicle record includes model number, serial number, status, booking schedule and booking history. The status of the vehicle should be available, rented, repairing or reserved. Staffs only allow in searching the vehicle records. Only the branch's manager allows in maintaining vehicle records. The system stores the customer records. The customer record includes name, ID, status and rental history. The status of the customer can be normal, VIP or suspend. The normal and VIP customers can rent vehicles but suspended customers are not allowed to rent vehicles. All staffs can maintain customer records. But only the branch's manager allows changing the status of the customers. Each branch has one manager.

The system should provide a function for staffs to input the rental record. The staff can only create the rental record for the car in his own working branch. The staff cannot create a rental record for other branches. After the vehicle is returned, the staff needs to update the rental record. The system should have a reserved car function for booking the car. The start of the booking period should be within next 7 days. Normal staff cannot make a booking request to another branch. Only the manager can request a booking to another branch.

The staff can use the system to check the availability of the car by using model number, or booking schedule. If there are suitable car(s) for renting, the staff can use the system to reserve or rent the car. If the car is rented, other staffs should not rent the car to another customer until the rental period is over. The staff can search the customer records by using customer's name, ID or telephone.

The system should provide a report generation function to generate a monthly report of the branch.

2. Structured requirements

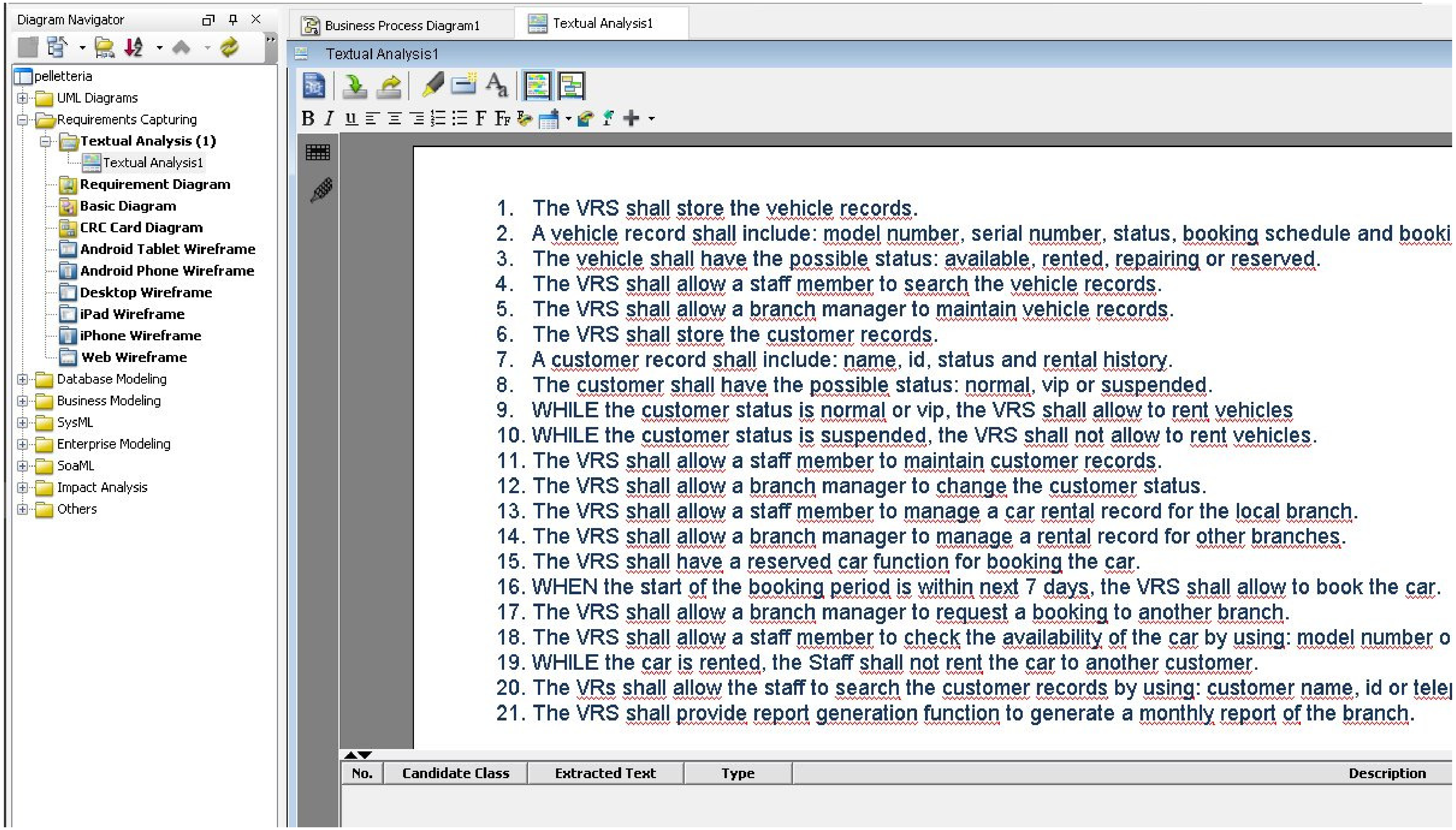
Requirement Type	Syntax Pattern	Example
Ubiquitous	The <system name> shall <system response>	The FCC shall control communication on the Avionics Bus in accordance with MIL-STD-1553B and Table 3.1 of the program ICD.
Event-Driven	WHEN <trigger> <optional precondition> the <system name> shall <system response>	When the power button is depressed while the system is off, the system shall initiate its start-up sequence.
Unwanted Behaviour	IF <unwanted condition or event>, THEN the <system name> shall <system response>	If the battery charge level falls below 20% remaining, then the system shall go into Power Saver mode.
State-Driven	WHILE <system state>, the <system name> shall <system response>	While in the Power Saver mode, the system shall limit screen brightness to a maximum of 60%.
Optional Feature	WHERE <feature is included>, the <system name> shall <system response>	Where the car is furnished with the GPS navigation system, the car shall enable the driver to mute the navigation instructions via the steering wheel controls.

Power Driver is a vehicle rental company. Power Driver has 105 branches over the world. Currently there is no linkage between these branches. Power Driver needs a computer system to connect all these branches together to support better services to the customer in a more efficient way. Following are the requirements of the Vehicle Rental System (VRS).

1. The VRS shall store the vehicle records.
2. A vehicle record shall include: model number, serial number, status, booking schedule and booking history.
3. The vehicle shall have the possible status: available, rented, repairing or reserved.
4. The VRS shall allow a staff member to search the vehicle records.
5. The VRS shall allow a branch manager to maintain vehicle records.
6. The VRS shall store the customer records.
7. A customer record shall include: name, id, status and rental history.
8. The customer shall have the possible status: normal, vip or suspended.
9. WHILE the customer status is normal or vip, the VRS shall allow to rent vehicles
10. WHILE the customer status is suspended, the VRS shall not allow to rent vehicles.
11. The VRS shall allow a staff member to maintain customer records.
12. The VRS shall allow a branch manager to change the customer status.
13. The VRS shall allow a staff member to manage a car rental record for the local branch.
14. The VRS shall allow a branch manager to manage a rental record for other branches.
15. The VRS shall have a reserved car function for booking the car.
16. WHEN the start of the booking period is within next 7 days, the VRS shall allow to book the car.
17. The VRS shall allow a branch manager to request a booking to another branch.
18. The VRS shall allow a staff member to check the availability of the car by using: model number or booking schedule.
19. WHILE the car is rented, the Staff shall not rent the car to another customer.
20. The VRs shall allow the staff to search the customer records by using: customer name, id or telephone.
21. The VRS shall provide report generation function to generate a monthly report of the branch.

3. Textual Analysis and candidate items

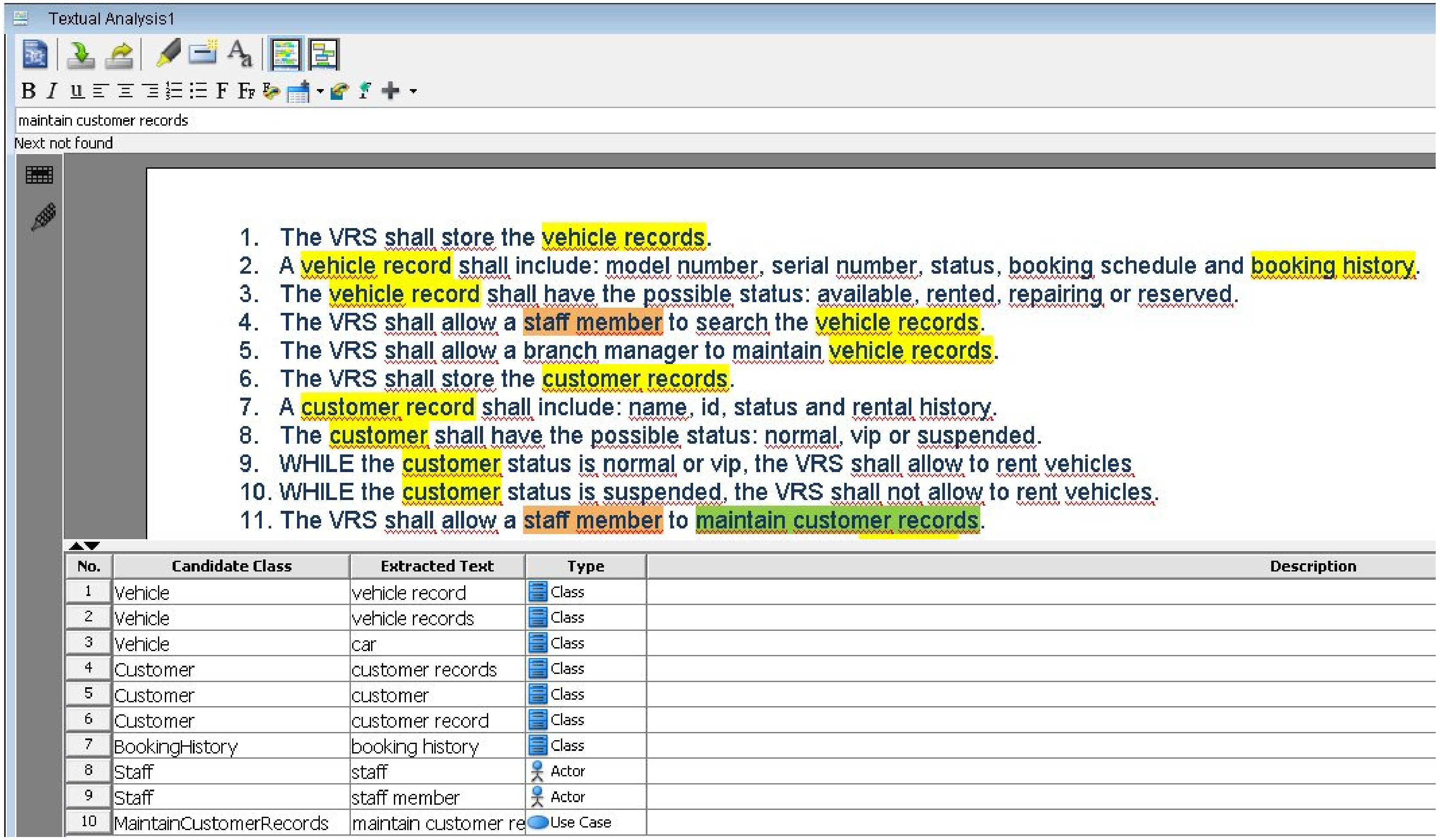
1. Diagram Navigator \ Requirements Capturing \
2. Right click on Textual Analysis → *New Textual Analysis*
3. Paste or import textual description



1. The VRS shall store the vehicle records.
2. A vehicle record shall include: model number, serial number, status, booking schedule and booki
3. The vehicle shall have the possible status: available, rented, repairing or reserved.
4. The VRS shall allow a staff member to search the vehicle records.
5. The VRS shall allow a branch manager to maintain vehicle records.
6. The VRS shall store the customer records.
7. A customer record shall include: name, id, status and rental history.
8. The customer shall have the possible status: normal, vip or suspended.
9. WHILE the customer status is normal or vip, the VRS shall allow to rent vehicles
10. WHILE the customer status is suspended, the VRS shall not allow to rent vehicles.
11. The VRS shall allow a staff member to maintain customer records.
12. The VRS shall allow a branch manager to change the customer status.
13. The VRS shall allow a staff member to manage a car rental record for the local branch.
14. The VRS shall allow a branch manager to manage a rental record for other branches.
15. The VRS shall have a reserved car function for booking the car.
16. WHEN the start of the booking period is within next 7 days, the VRS shall allow to book the car.
17. The VRS shall allow a branch manager to request a booking to another branch.
18. The VRS shall allow a staff member to check the availability of the car by using: model number o
19. WHILE the car is rented, the Staff shall not rent the car to another customer.
20. The VRs shall allow the staff to search the customer records by using: customer name, id or tele
21. The VRS shall provide report generation function to generate a monthly report of the branch.

No.	Candidate Class	Extracted Text	Type	Description

4. Right click on the term *vehicle, vehicles, car, cars* → Class
5. Right click on the term *customer* , *customers* → Class
6. Right click on the text *booking history* → Class
7. Right click on the term *staff, staffs* → Actor *Staff*
8. In the underlying table, make uniform the field *candidate class* for singular/plural forms and synonyms by using the *camel case format* (e.g. *booking history* → *BookingHistory*)
9. Right click on the text *maintain customer records* → Use case *MaintainCustomerRecords*


Textual Analysis1

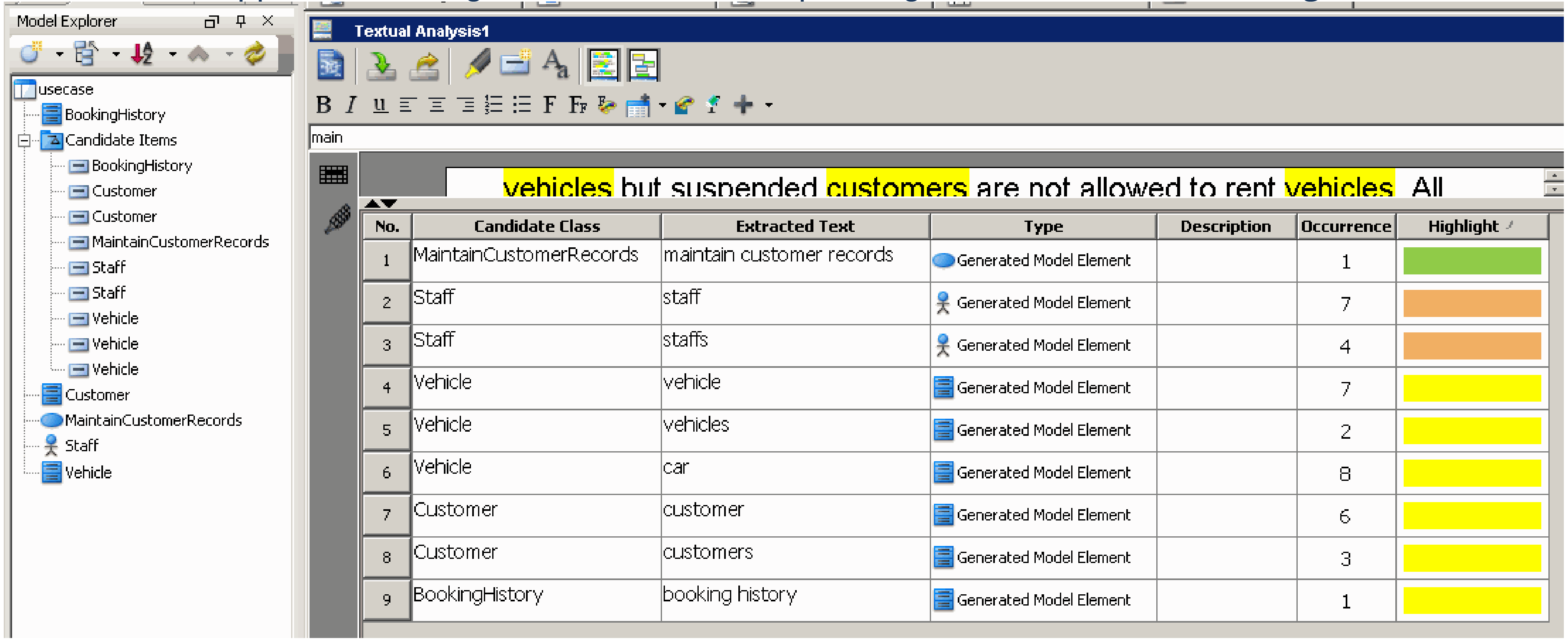
maintain customer records
Next not found

1. The VRS shall store the vehicle records.
2. A vehicle record shall include: model number, serial number, status, booking schedule and booking history.
3. The vehicle record shall have the possible status: available, rented, repairing or reserved.
4. The VRS shall allow a staff member to search the vehicle records.
5. The VRS shall allow a branch manager to maintain vehicle records.
6. The VRS shall store the customer records.
7. A customer record shall include: name, id, status and rental history.
8. The customer shall have the possible status: normal, vip or suspended.
9. WHILE the customer status is normal or vip, the VRS shall allow to rent vehicles
10. WHILE the customer status is suspended, the VRS shall not allow to rent vehicles.
11. The VRS shall allow a staff member to maintain customer records.

No.	Candidate Class	Extracted Text	Type	Description
1	Vehicle	vehicle record	Class	
2	Vehicle	vehicle records	Class	
3	Vehicle	car	Class	
4	Customer	customer records	Class	
5	Customer	customer	Class	
6	Customer	customer record	Class	
7	BookingHistory	booking history	Class	
8	Staff	staff	Actor	
9	Staff	staff member	Actor	
10	MaintainCustomerRecords	maintain customer re	Use Case	

4. Model Elements

1. Right click on the row number corresponding to a candidate element → *Create Class Model Element → Do not visualize → close.*
2. If a model element with the same name already exists, the system asks whether the existing model element can be used. For synonym, plural/singular forms, select *yes*
3. Generated elements appear in the *Model Explorer* tab (on the left).
4. A model element which does not appear in any diagram is called ***hidden*** element. A classifier which appears in a diagram without a corresponding model element is called ***ghost*** *element*.



- usecase
  - BookingHistory
  - Candidate Items
    - BookingHistory
    - Customer
    - Customer
    - MaintainCustomerRecords
    - Staff
    - Staff
    - Vehicle
    - Vehicle
    - Vehicle
  - Customer
  - MaintainCustomerRecords
  - Staff
  - Vehicle

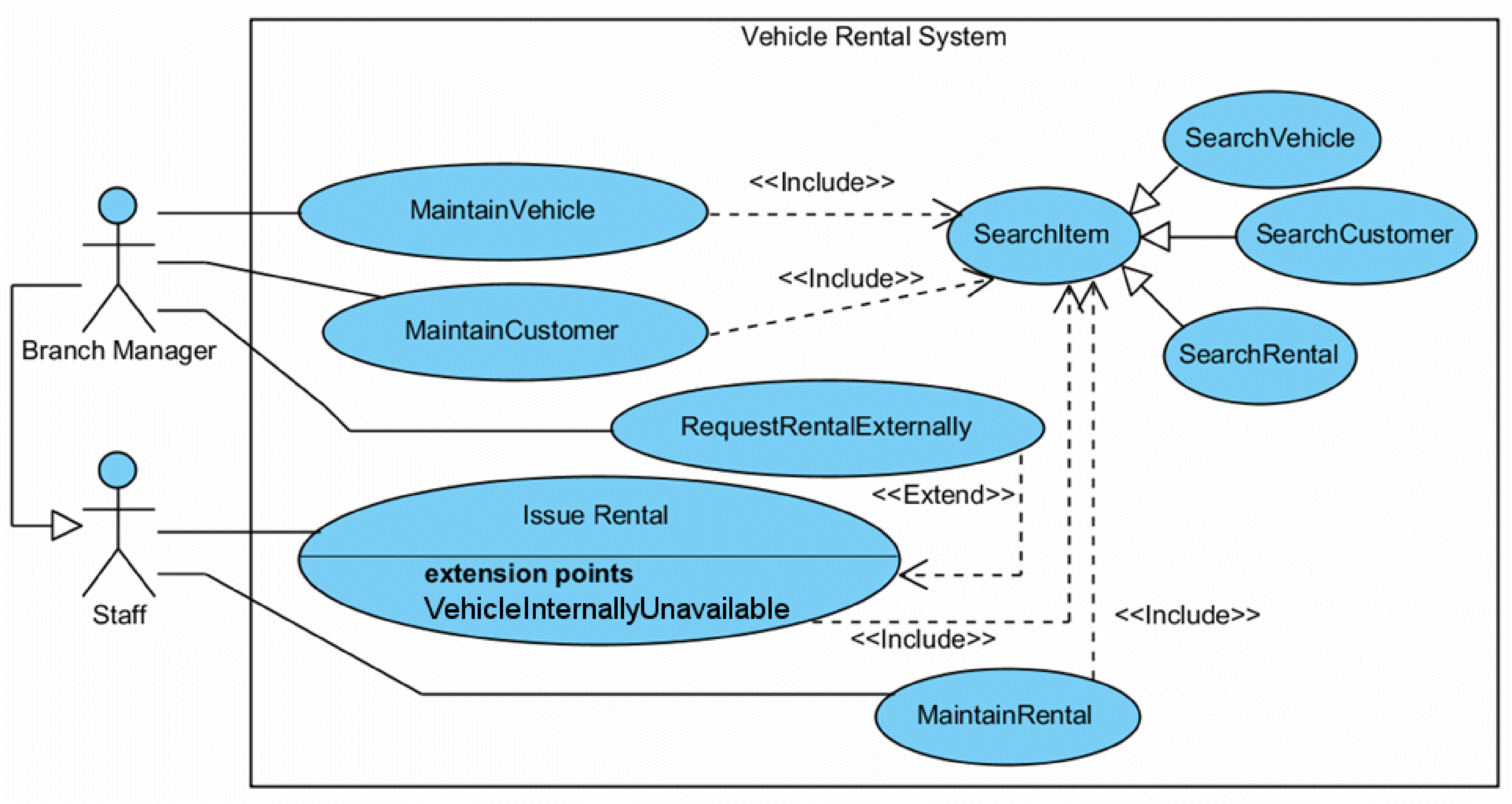
vehicles but suspended customers are not allowed to rent vehicles. All

No.	Candidate Class	Extracted Text	Type	Description	Occurrence	Highlight
1	MaintainCustomerRecords	maintain customer records	Generated Model Element		1	🟩
2	Staff	staff	Generated Model Element		7	🟧
3	Staff	staffs	Generated Model Element		4	🟧
4	Vehicle	vehicle	Generated Model Element		7	🟨
5	Vehicle	vehicles	Generated Model Element		2	🟨
6	Vehicle	car	Generated Model Element		8	🟨
7	Customer	customer	Generated Model Element		6	🟨
8	Customer	customers	Generated Model Element		3	🟨
9	BookingHistory	booking history	Generated Model Element		1	🟨

5. Model elements can be dragged to diagrams, generating views.

5. Use Case Diagram

1. Right click on the Diagram Navigator \ Use case Diagram → *New Use Case Diagram.*
2. Drag the actor and the use case model elements *Staff* and *MaintainCustomerRecords* from the Model Explorer to the Use Case Diagram
3. Rename *MaintainCustomerRecords* to *MaintainCustomer*
4. Create new elements in the diagram using the toolkit (on the left).
5. To create a relationship between elements: hover mouse over an element, choose the relationship, drag the chosen relationship to the other element.
6. Define *BranchManager* as an extension of *Staff* (a *manager* is as an employee with other additional capabilities. A manager can take the place of any employee (*substitutability principle* in object-oriented models). As an effect, ***redundancy*** in the diagram is reduced.
7. Define an extension point over the *IssueRental* use case, entitled *VehicleInternallyUnavailable* connected to *RequestRentalExternally*
8. Add a *SearchItem* use case, included by the other use cases, with three specializations *SearchVehicle, SearchCustomer* and *SearchRental*.


Vehicle Rental System
Branch Manager
Staff
MaintainVehicle
MaintainCustomer
RequestRentalExternally
Issue Rental
extension points
VehicleInternallyUnavailable
MaintainRental
SearchItem
SearchVehicle
SearchCustomer
SearchRental
<<Include>>
<<Include>>
<<Extend>>
<<Include>>
<<Include>>

6. Unstructured Use Case Details

Power Driver: informal use case details "Maintain Rental"

1. The staff login the System
2. The system validates the staff identity with user name and password
3. After validation, the staff can maintain the rental records. The staff can query, insert, update or archive the rental records.

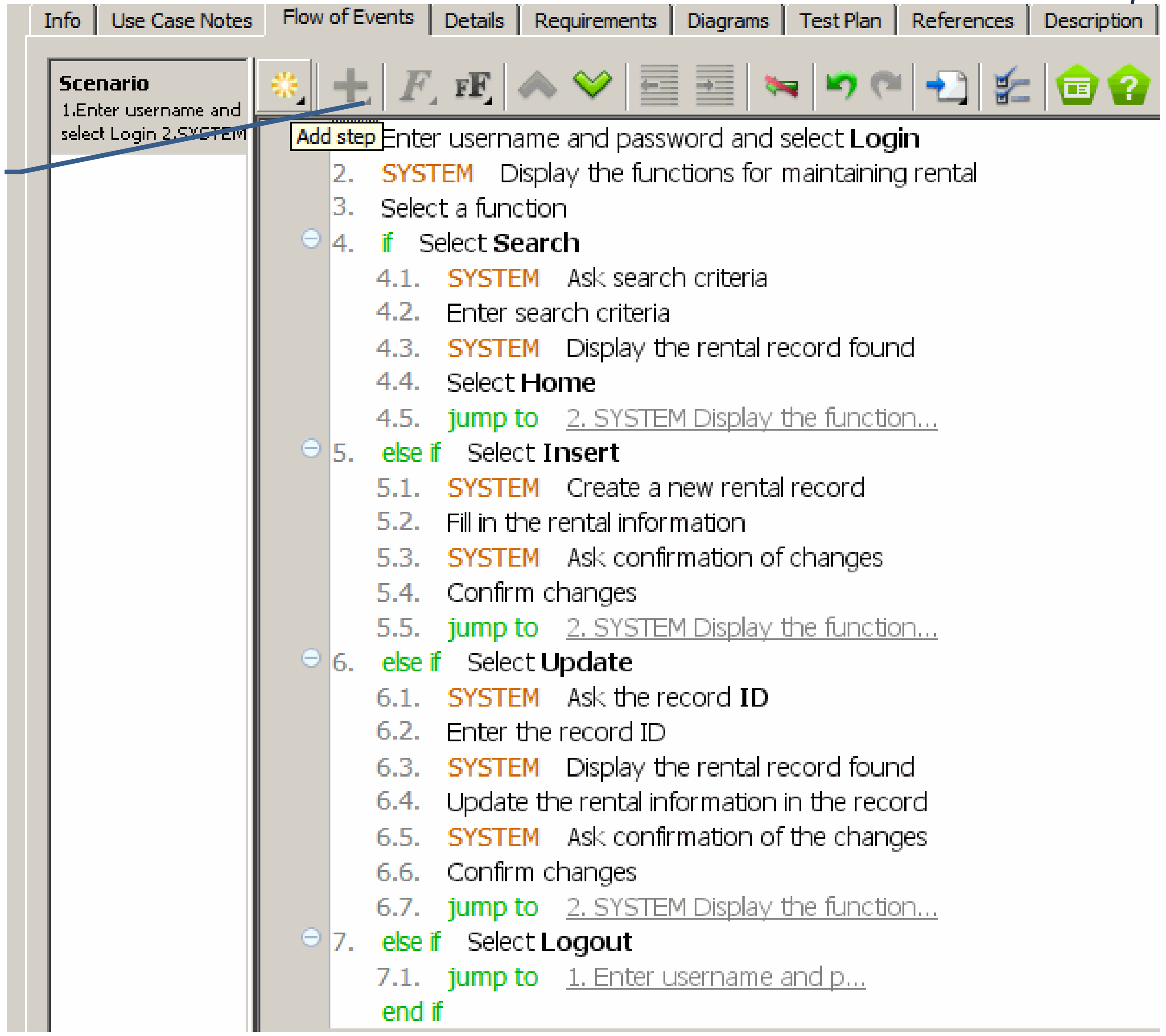
a) Query rental records
  i) Get the query criteria
  ii) Find the rental records with the criteria
b) Insert rental record
  i) Create a new rental record
  ii) Fill in the rental information
  iii) Confirm the changes
c) Update rental records
  i) Find the rental record with record ID
  ii) Update the rental information in the record
  iii) COnfirm the changes

4. Logout the system

7. Structured Use Case Details

1. Right click on the MaintainRental use case → *Open UseCase Details…*
2. Tab *Flow of events* → Insert the main flow. For alternative flows use the *add step* button:

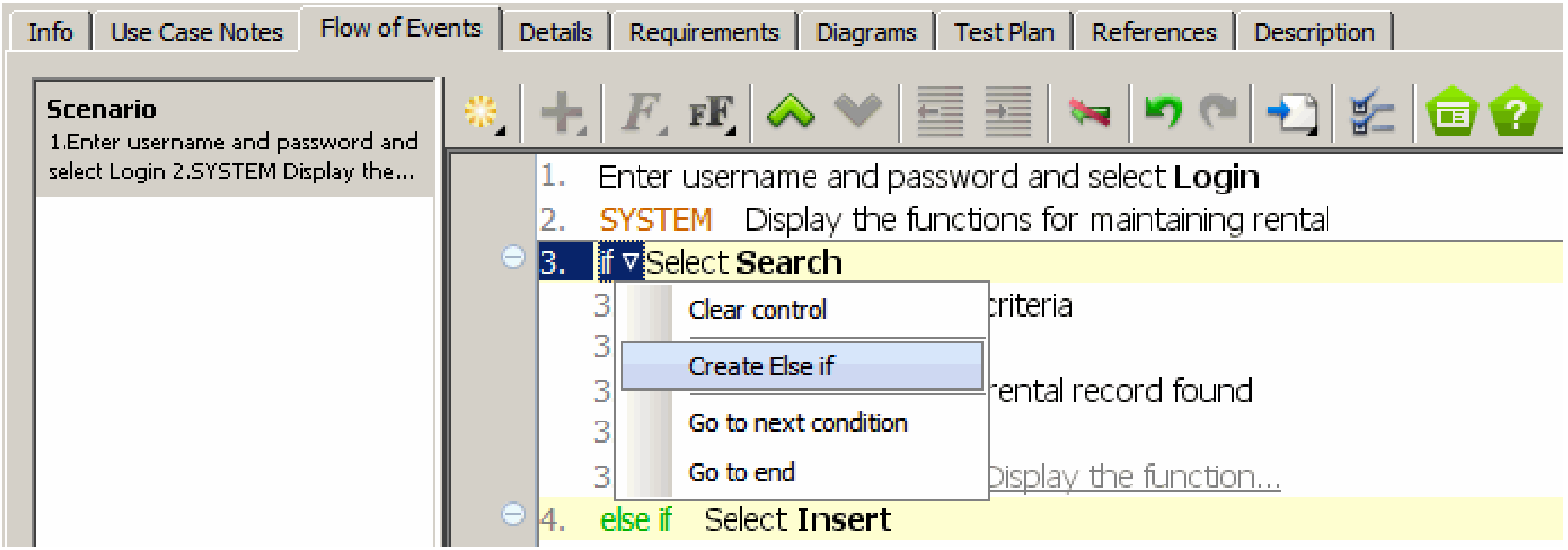
You can also add the actor involved



Enter username and password and select **Login**
2. SYSTEM Display the functions for maintaining rental
3. Select a function
4. if Select **Search**
   4.1. SYSTEM Ask search criteria
   4.2. Enter search criteria
   4.3. SYSTEM Display the rental record found
   4.4. Select **Home**
   4.5. jump to 2. SYSTEM Display the function...
5. else if Select **Insert**
   5.1. SYSTEM Create a new rental record
   5.2. Fill in the rental information
   5.3. SYSTEM Ask confirmation of changes
   5.4. Confirm changes
   5.5. jump to 2. SYSTEM Display the function...
6. else if Select **Update**
   6.1. SYSTEM Ask the record **ID**
   6.2. Enter the record ID
   6.3. SYSTEM Display the rental record found
   6.4. Update the rental information in the record
   6.5. SYSTEM Ask confirmation of the changes
   6.6. Confirm changes
   6.7. jump to 2. SYSTEM Display the function...
7. else if Select **Logout**
   7.1. jump to 1. Enter username and p...

end if

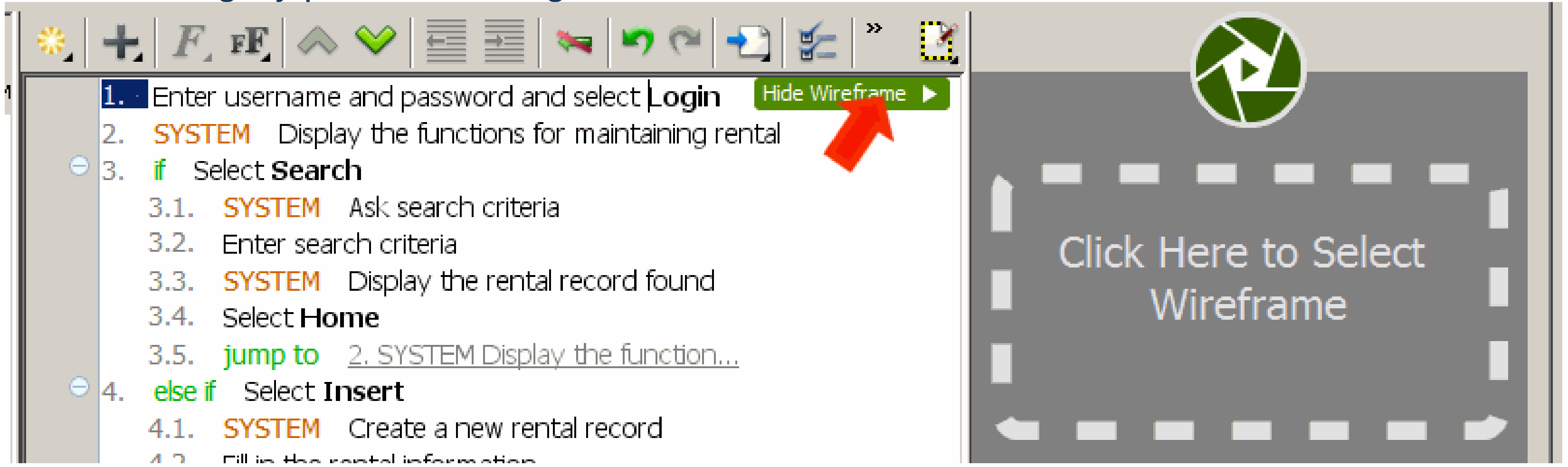
3. To *create* an *Else* branch, hover mouse over an *If* branch and select *Create Else*.



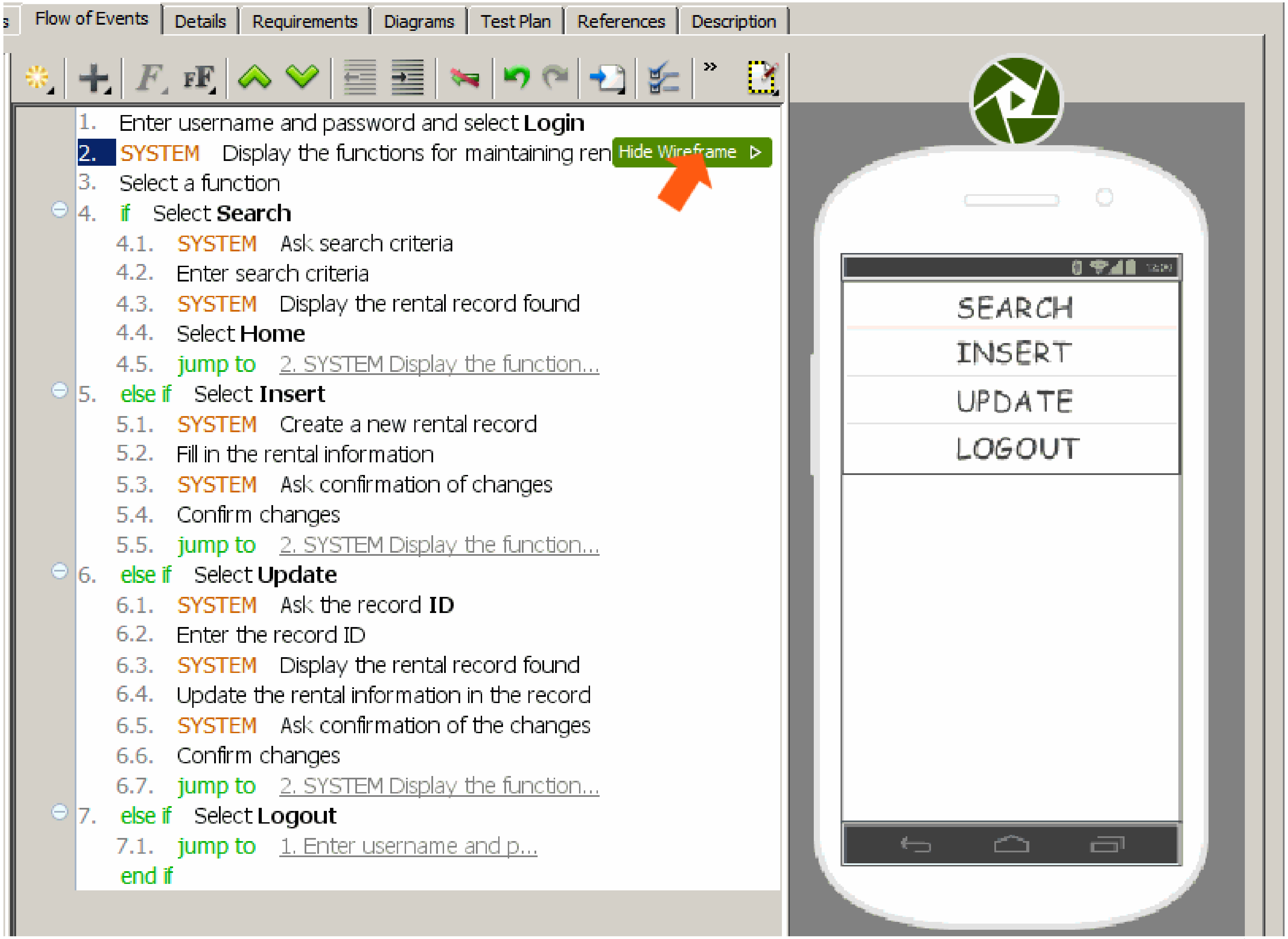
Scenario
1.Enter username and password and select Login 2.SYSTEM Display the...

1. Enter username and password and select **Login**
2. SYSTEM Display the functions for maintaining rental
3. if Select **Search**
4. else if Select **Insert**

4. To Create a Wireframe (screen flow of “mockups”, or “sketches” of the interface) move the mouse pointer over the green Wireframe button on the right hand side of the step. Click on it.
5. This shows a gray pane on the right hand side. Click on it to select a kind of wireframe to create



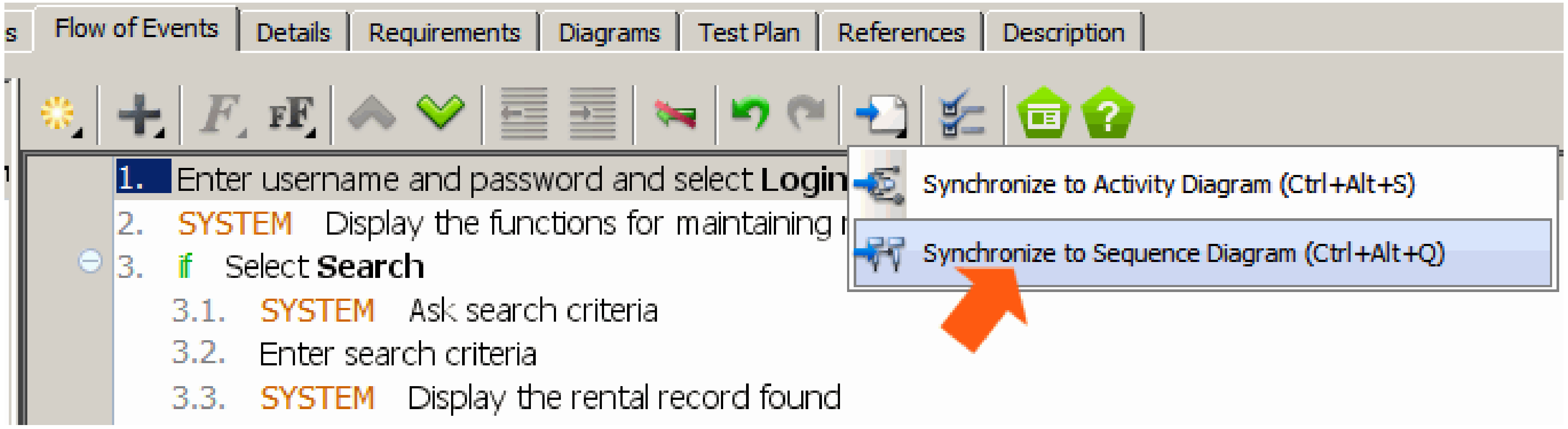
1. Enter username and password and select **Login**
2. SYSTEM Display the functions for maintaining rental
3. if Select **Search**
   3.1. SYSTEM Ask search criteria
   3.2. Enter search criteria
   3.3. SYSTEM Display the rental record found
   3.4. Select **Home**
   3.5. jump to 2. SYSTEM Display the function...
4. else if Select **Insert**
   4.1. SYSTEM Create a new rental record



```
1.    Enter username and password and select Login
2.    SYSTEM   Display the functions for maintaining ren
3.    Select a function
4.    if   Select Search
  4.1.   SYSTEM   Ask search criteria
  4.2.   Enter search criteria
  4.3.   SYSTEM   Display the rental record found
  4.4.   Select Home
  4.5.   jump to   2. SYSTEM Display the function...
5.    else if   Select Insert
  5.1.   SYSTEM   Create a new rental record
  5.2.   Fill in the rental information
  5.3.   SYSTEM   Ask confirmation of changes
  5.4.   Confirm changes
  5.5.   jump to   2. SYSTEM Display the function...
6.    else if   Select Update
  6.1.   SYSTEM   Ask the record ID
  6.2.   Enter the record ID
  6.3.   SYSTEM   Display the rental record found
  6.4.   Update the rental information in the record
  6.5.   SYSTEM   Ask confirmation of the changes
  6.6.   Confirm changes
  6.7.   jump to   2. SYSTEM Display the function...
7.    else if   Select Logout
  7.1.   jump to   1. Enter username and p...
      end if
```

Sequence Diagram

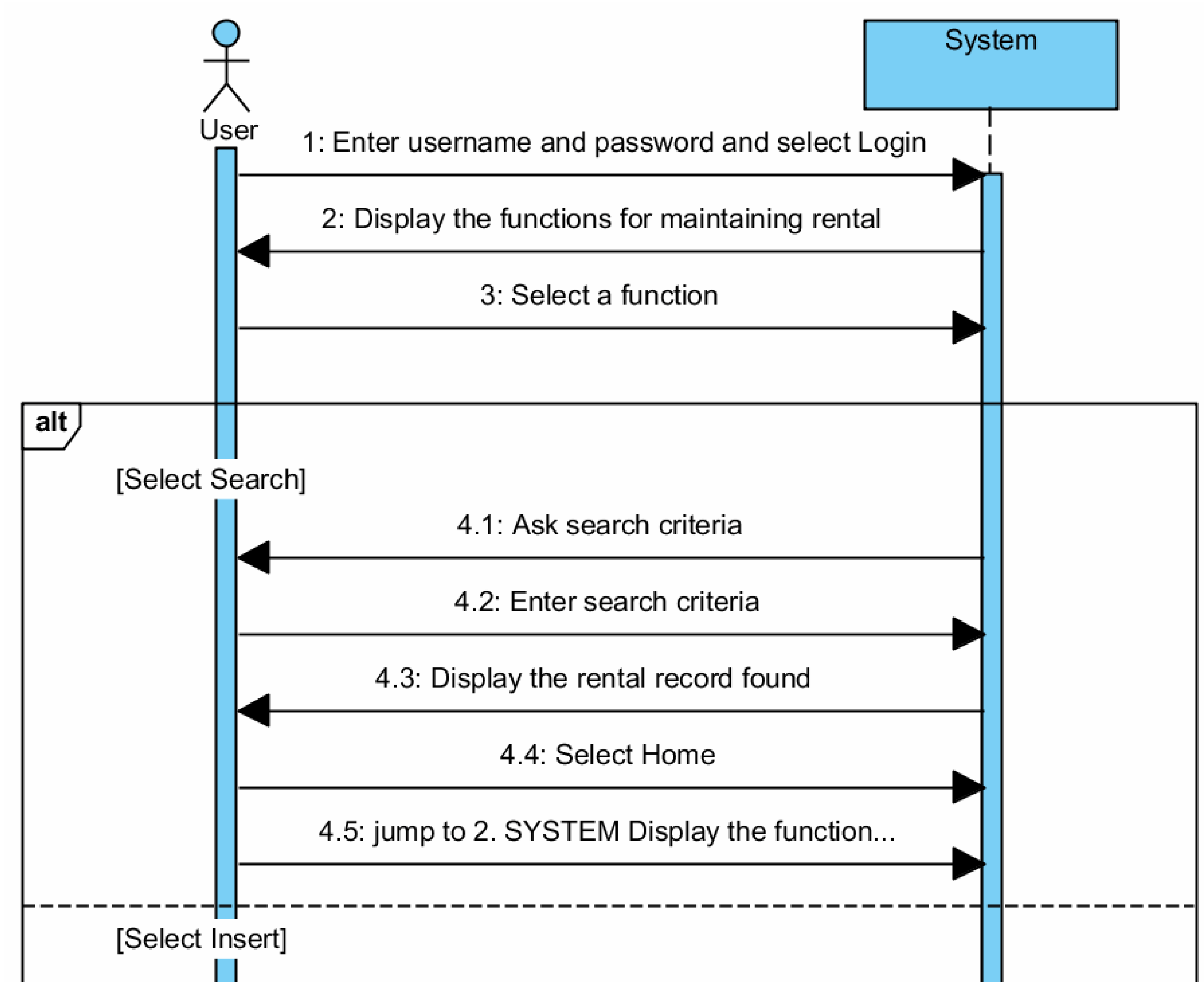
1. Create a sequence diagram related to the *MaintainRental* use case.
2. Tab *Flow of events* → button *Synchronize to Sequence Diagram*



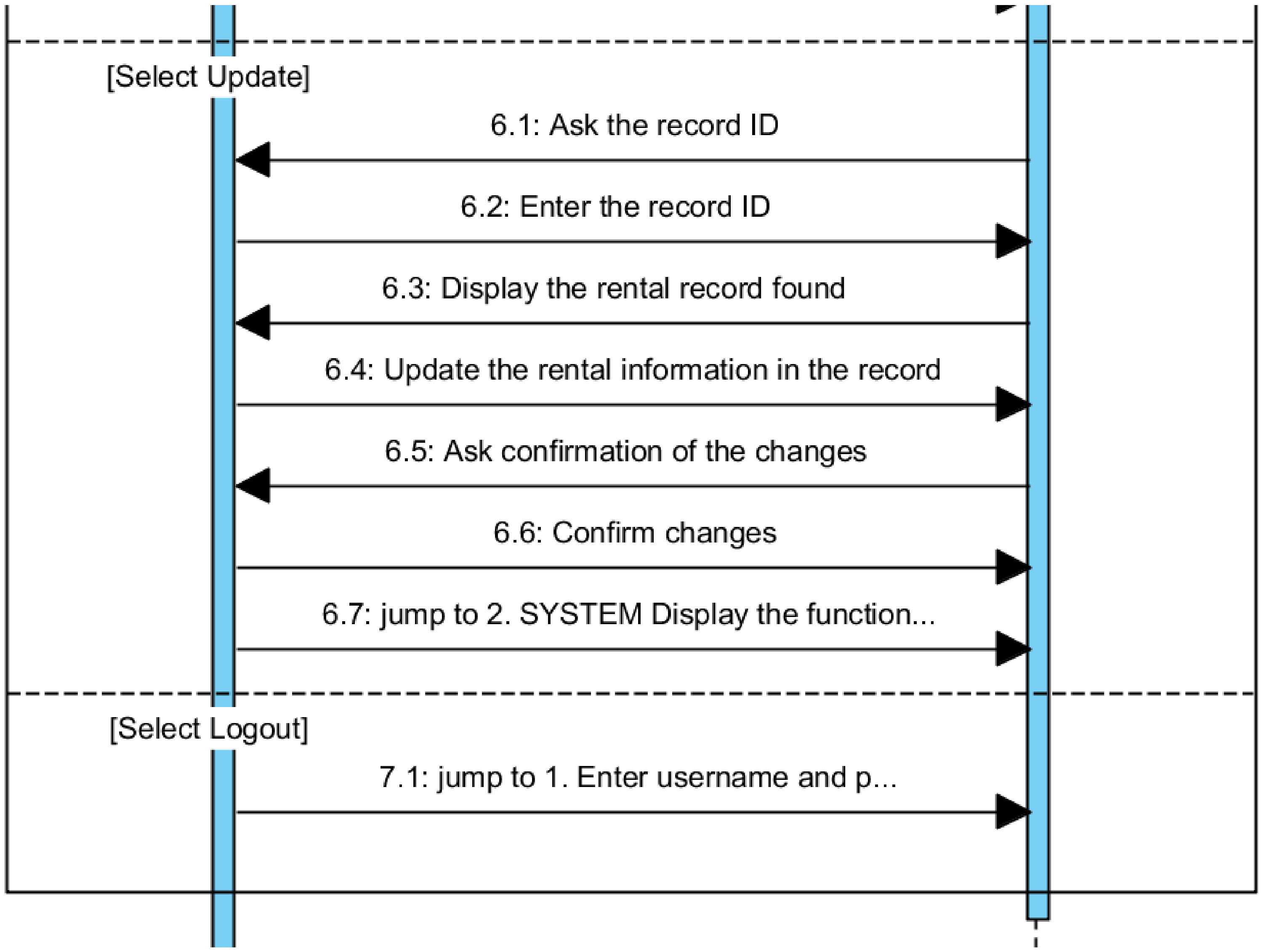
Flow of Events
Details
Requirements
Diagrams
Test Plan
References
Description
Synchronize to Activity Diagram (Ctrl+Alt+S)
Synchronize to Sequence Diagram (Ctrl+Alt+Q)

1. Enter username and password and select **Login**
2. SYSTEM Display the functions for maintaining r
3. if Select **Search**
   3.1. SYSTEM Ask search criteria
   3.2. Enter search criteria
   3.3. SYSTEM Display the rental record found

3. The sequence diagram is created and shown.


System
User
1: Enter username and password and select Login
2: Display the functions for maintaining rental
3: Select a function
alt
[Select Search]
4.1: Ask search criteria
4.2: Enter search criteria
4.3: Display the rental record found
4.4: Select Home
4.5: jump to 2. SYSTEM Display the function...
[Select Insert]

...


[Select Update]
6.1: Ask the record ID
6.2: Enter the record ID
6.3: Display the rental record found
6.4: Update the rental information in the record
6.5: Ask confirmation of the changes
6.6: Confirm changes
6.7: jump to 2. SYSTEM Display the function...
[Select Logout]
7.1: jump to 1. Enter username and p...