



Python 程序设计

Read-Book “智能知识侦查助手”(9)

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- 3** Team member, question data collect

Abstract

In this Safehome Project Design, there are four parts : 1. Determine actors and the corresponding functions 2. For each function write story to extract actions 3. Write formal (Structured) use-cases 4. Create swimlane diagram for each use-case.

课题执行 (文档修订) 记录表

Table 1: 课题执行 (文档修订) 记录表

日期	版本	修订内容	执行人	修订人
2022.11.06	1.0	分析需求	王旭刚	韦杨婧

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1. 系统设计

1.1 概要设计

1.1.1 系统框架设计

1.1.2 系统功能设计

1.2 功能设计

1.2.1 功能 1

1.2.2 功能 2

1.3 数据库设计

Table 2: 书籍储数据存—数据库设计

Attribute	Translation	Type	Chinese Book	Foreign Book
Id	排名	int	✓	✓
Name	书名	varchar	✓	✓
Author	作者	varchar	✓	✓
Country	国家	varchar	✓	✓
Publisher	出版社	varchar	✓	✓
Year	出版日期	varchar	✓	✓
Page	页数	varchar	✓	✓
Price	定价	varchar	✓	✓
Frame	装帧	varchar	✓	✓
Category	丛书	varchar	✓	✓
Isbn	isbn 码	varchar	✓	✓
Star	评分	float	✓	✓
Comment num	评价数量	int	✓	✓
Brief	简介	varchar	✓	✓
Douban bookid	豆瓣 id	varchar	✓	✓
Link	链接	varchar	✓	✓
Name o	原作名	varchar	✗	✓
Trans	译者	varchar	✗	✓

Table 3: 用户数据储存—数据库设计

Attribute	Type	Translation
Id	int	编号
Name	varchar	姓名
Gender	char	性别
Telephone	varchar	电话
Password	varchar	密码
Brief	varchar	简介

Table 4: 问题储存—数据库设计

Attribute	Type	Translation	Note
Id	int	关联书本的 id	
Question	varchar	问题	
Type	int	类别	0-判断, 1-单选, 2-多选
Question num	int	选项数量	
C1	varchar	选项 1	
C2	varchar	选项 2	
C3	varchar	选项 3	
C4	varchar	选项 4	
Ans	varchar	正确选项	必须与某个选项完全相同
Category	varchar	问题内容的类别	如: 问作者, 书中人物, 情节

2. 系统实现

2.1 前端实现

2.2 后端实现

3. 结束语

3.1 总结

3.2 不足与展望

In this project design, we need to design a *SafeHome System* applying the **Scenario-Based Modeling**. Using which if you want to understand how users want to interact with a system⁽¹⁾. In all, the whole project can be devided into four parts:

1. Determine actors and the corresponding functions
2. For each function write story to extract actions
3. Write formal (Structured) use-cases
4. Create swimlane diagram for each use-case

4. Actors and Functions

4.1 Actors

Actors are those individuals or systems that will interact with the application⁽²⁾. When defining the actors, one may just think of the perspective from the *C-S* structure, that is, client(Homeowner) and server(Administrator). But there are several other actors that interact with the system from not just a software perspective, but also from an external software and hardware perspective. In addition, these actors should be broken down into two categories, primary and secondary. The primary actor is the actor that is directly interacting with the system to achieve a goal. The secondary actor is the actor is external to the system, but is called upon to help complete a goal. So here are my design for Safehome actors:

- Primary Actor:
 - Administrator
 - Homeowner
- Secondary Actor:
 - Camera
 - Sensor

4.2 Functions

After we determined the Actors, we need to consider what functions does these actors need to perform. And from those actions, we can derive Use-Cases. So here are my design for Safehome functions:

- Administrator:
 1. Register new Homeowner

2. Delete Homeowner
3. Add/Remove Camera
4. Add/Remove Sensor
5. Contact Homeowner/Emergency service when Emergency
- Homeowner:
 - Information Security Related:
 6. Login (Validate user ID and password)
 7. Logout
 8. Modify profile
 - House Safety Related:
 9. View Cameras
 10. Zoom selected Camera
 11. Show thumbnails of all Cameras
 12. Record and Replay Camera video
 13. Activate/Deactivate Cameras
 14. Activate/Deactivate Sensors
 15. View history records
- Camera:
 16. Activate/Deactivate
 17. Zoom in/out
 18. Record Video
- Sensor:
 19. Activate/Deactivate
 20. Gather data
 21. Send data to Homeowner/Administrator

5. User Scenario

The scenario approach is a high level description with the key components listed out in a stepwise manner⁽²⁾. To better illustrate the Use-Cases of the actors, we need to come up with a narrative scenario for each Use-Case, a lateral description, without side interactions. After that, all we need to do is conduct a step-by-step analysis of the scenario to extract the actions.

5.1 Scenario 1: Login to the system

Actor:Homeowner

Scenario story:

If I want to check the status of my house, I need to login to the system. I may choose to login using my PC or my mobile phone with the application or a browser to the *SafeHome Products* website. After I input my user ID and password, the system will validate my user ID and password. If the user ID and password are correct, I will be able to login to the system. If the user ID and password are incorrect, I will be prompted to re-enter my user ID and password. And once I login to the system, I will be able to view the status of my house and will have access to all functionality my installed *SafeHome* system.

Actions:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.
2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.

5.2 Scenario 2: Modify Profile

Actor:Homeowner

Scenario story:

If I want to change my user ID, password, or personal information, I may need to modify the profile. I may choose to modify my profile using my PC or my mobile phone with the application or a browser to the *SafeHome Products* website. After I login to the system, I will be able click on my avatar to check my profile. And in that new page, I can click on the "Modify Profile" to change my user ID, password, or personal information. And once I modify my profile, I will be able to login to the system with the new user ID and password.

Actions:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.
2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.
4. The homeowner clicks on his avatar to check his profile.
5. The system displays the profile page.
6. The homeowner clicks on the "Modify Profile" button.
7. The system displays the modify profile page.
8. The homeowner click on the field he wants to modify and input.
9. The homeowner click on the "Save" button.

5.3 Scenario 3: Access Camera Surveillance

Actor:Homeowner

Scenario story:

If I'm at a remote location and want to check the status of my house, I may need to access the camera Surveillance. I can use my PC or my mobile phone with the application or a browser to the *SafeHome Products* website. After I successfully logged in, I will be able to view the status of my house and will have access to all functionality my installed *SafeHome* system. And in the *SafeHome* system, I can click on the "Surveillance" button to look at the thumbnail snapshots from all cameras simultaneously by default. And I can click on any camera window to watch the live video from that camera. And I can also click on the "zoom in" or "zoom out" button to zoom in or zoom out the camera. If I want to switch to another camera, I can choose to press "go back" button to go back to previous window of thumbnail snapshots display or to click the left or right button to go through the cameras one by one.

Actions:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.

2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.
4. The homeowner clicks on the "Surveillance" button.
5. The system displays the thumbnail snapshots from all cameras simultaneously by default.
6. The homeowner clicks on any camera window to watch the live video from that camera.
7. The homeowner clicks on the "zoom in" or "zoom out" button to zoom in or zoom out the camera.
8. The homeowner clicks on the "go back" button to go back to previous window of thumbnail snapshots display. Or clicks on the left or right button to go through the cameras one by one.

5.4 Scenario 4: Activate and Deactivate the Cameras and Sensors

Actor:Homeowner

Secondary Actor:Cameras, Sensors

Scenario story:

If I'm currently in home, I may need to deactivate Cameras and Sensors out of privacy or energy-saving purpose. And when I left home, I may need to activate the Cameras and Sensors for security purpose. I can use my PC or my mobile phone with the application or a browser to the *SafeHome Products* website. After I successfully logged in, I can click the "Back Home" button to deactivate Cameras and Sensors, and click the "Leave Home" button to activate Cameras and Sensors.

Actions:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.
2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.
4. The homeowner clicks the "Back Home" button.
5. The system deactivates Cameras and Sensors.

6. The homeowner clicks the "Leave Home" button.
7. The system activates Cameras and Sensors.

5.5 Scenario 5: Register new Homeowner/Delete Homeowner

Actor: Administrator

Scenario story:

If the Homeowner want to add new family member to the system, the Administrator can register new Homeowner. If the homeowner want to remove a family member from the system, the Administrator can delete the Homeowner. The Administrator can use his PC to open the *SafeHome Products* Software. After he successfully logged in, he can click on the "Homeowner" button to check the list of all Homeowners. And he can click on the "Add Homeowner" button to add new Homeowner. He then need to input the new Homeowner's user ID, password, and personal information. And he can click on the "Delete Homeowner" button and select the Homeowner he want to delete to delete a Homeowner.

Actions:

1. The Administrator opens the *SafeHome Products* Software on his PC.
2. The Administrator click on the "Homeowner" button.
3. The system displays the list of all Homeowners.
4. The Administrator click on the "Add Homeowner" button.
5. The system displays the "Add Homeowner" page.
6. The Administrator inputs the new Homeowner's user ID, password, and personal information.
7. The Administrator click on the "Save" button.
8. The system adds the new Homeowner to the system.
9. The Administrator click on the "Delete Homeowner" button.
10. The system displays the "Delete Homeowner" page.
11. The Administrator selects the Homeowner he wants to delete.
12. The Administrator click on the "Delete" button.
13. The system deletes the selected Homeowner from the system.

5.6 Scenario 6: Add/Remove Camera or Sensor

Actor:Administrator

Secondary Actor:Cameras, Sensors

Scenario story:

If the Homeowner bought a new Camera or Sensor, the Administrator can add the new Camera or Sensor to the system. If the current Camera or Sensor broken down, the Administrator can remove the Camera or Sensor from the system. The Administrator can use his PC to open the *SafeHome Products* Software. After he successfully logged in, he can click on the "Camera" button to check the list of all Cameras. And he can click on the "Add Camera" button to add new Camera. He then need to input the new Camera's ID, location, and type. And he can click on the "Delete Camera" button and select the Camera he want to delete to delete a Camera. The same procedure applies to the Sensors.

Actions:

1. The Administrator opens the *SafeHome Products* Software on his PC.
2. The Administrator click on the "Camera" button.
3. The system displays the list of all Cameras(Camera contents are not included).
4. The Administrator click on the "Add Camera" button.
5. The system displays the "Add Camera" page.
6. The Administrator inputs the new Camera's ID, location, and type.
7. The Administrator click on the "Save" button.
8. The system adds the new Camera to the system.
9. The Administrator click on the "Delete Camera" button.
10. The system displays the "Delete Camera" page.
11. The Administrator selects the Camera he wants to delete.
12. The Administrator click on the "Delete" button.
13. The system deletes the selected Camera from the system.
14. The same Actions applies to the Sensors.

5.7 Scenario 7: Contact Homeowner or Emergency service when Emergency occurs

Actor:Administrator

Secondary Actor:Homeowner, Sensors, Cameras

Scenario story:

If the Sensor detected an Emergency or the Homeowner pressed the Emergency button, the Administrator will be notified. Then the Administrator will check the Surveillance video to determine if the Emergency is real. If the Emergency is real, the Administrator will contact the Homeowner and the Emergency service.

Actions:

1. The Sensors detected an Emergency or the Homeowner pressed the Emergency button.
2. The Administrator opens the *SafeHome Products* Software on his PC.
3. The Administrator receives an "Emergency" notification.
4. The Administrator clicks on the "Check" button.
5. The system displays the Surveillance video.
6. The Administrator checks the Surveillance video to determine if the Emergency is real.
7. The Administrator clicks on the "Contact" button.
8. The system displays the "Contact" page.
9. The Administrator clicks on the "Call" button.
10. The system calls the Homeowner and the Emergency service.

6. Formal Use Case

6.1 Use Case 1: Login to the System

Use Case 1: Login to the System

Primary Actor: Homeowner

Goal in context: To login to the system.

Preconditions: System must be fully configured; Homeowner must have a valid user ID and password.

Trigger: Homeowner wants to login to the system.

Scenario:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.
2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.

Exception:

1. If the user ID or password is incorrect, the system will display an error message and ask the user to input again.

2. Surveillance function not configured for this system.

3. An alarm condition is encountered.

Priority: Moderate priority, to be implemented after basic functions

When available: Second increment

Frequency of use: Frequently

Channel to actor: Via the *SafeHome Products* website or the *SafeHome* application

Open issues:

1. Is security sufficient?
2. Maybe we can add a captcha(Completely Automated Public Turing test to tell Computers and Humans Apart) to the login page.
3. When client communicating with server, the ID and password should be encrypted.

6.2 Use Case 2: Modify Profile

<i>Use Case 2: Modify Profile</i>	
Primary Actor: Homeowner	Exception:
Goal in context: To modify Homeowner's password or personal information.	<ol style="list-style-type: none"> 1. If the user ID or password is incorrect, the system will display an error message and ask the user to input again.
Preconditions: System must be fully configured; Homeowner must have a valid user ID and password.	<ol style="list-style-type: none"> 2. If the new password does not meet the requirement of password, then the system will display an error message and ask the user to input again.
Trigger: Homeowner wants to modify his or her password or personal information out of security reason.	<ol style="list-style-type: none"> 3. If the new password is the same as the old password, then the system will display an error message and ask the user to input again.
Scenario:	<ol style="list-style-type: none"> 4. If the Homeowner forgets his password, he can click on the "Forget Password" button to reset his password.
	Priority: Moderate priority, to be implemented after basic functions
	When available: Second increment
	Frequency of use: infrequently
	Channel to actor: Via the <i>SafeHome Products</i> website or the <i>SafeHome</i> application
	Open issues:
	<ol style="list-style-type: none"> 1. Is security sufficient? 2. Maybe we can add a captcha(Completely Automated Public Turing test to tell Computers and Humans Apart) to avoid brute force attack.

6.3 Use Case 3: Access Camera Surveillance

Use Case 3: Access Camera Surveillance

Primary Actor: Homeowner

Goal in context: To access the Surveillance camera.

Preconditions: System must be fully configured; Homeowner must have a valid user ID and password.

Trigger: Homeowner wants to check the status of his or her house.

Scenario:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.
2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.
4. The homeowner clicks on the "Surveillance" button.
5. The system displays the thumbnail snapshots from all cameras simultaneously by default.
6. The homeowner clicks on any camera window to watch the live video from that camera.
7. The homeowner clicks on the "zoom in" or "zoom out" button to zoom in or zoom out the camera.

8. The homeowner clicks on the "go back" button to go back to previous window of thumbnail snapshots display. Or clicks on the left or right button to go through the cameras one by one.

Exception:

1. If the user ID or password is incorrect, the system will display an error message and ask the user to input again.
2. If the camera are deactivated, the system will display an error message; see use case **Activate and Deactivate the Cameras and Sensors**.
3. If the selected camera is broken or not connected(maybe during a balckout), the system will display an error message.
4. An alarm condition is encountered.

Priority: High priority

When available: First increment

Frequency of use: High frequency

Channel to actor: Via the *SafeHome Products* website or the *SafeHome* application

Open issues:

1. Is security sufficient?
2. Maybe can add a backup camera or backup battery to ensure the camera can work normally.

6.4 Use Case 4: Activate / Deactivate the Cameras and Sensors

Use Case 4: Activate / Deactivate the Cameras and Sensors

Primary Actor: Homeowner

Secondary Actor: Cameras, Sensors

Goal in context: To activate and deactivate the Surveillance Cameras.

Preconditions: System must be fully configured; Homeowner must have a valid user ID and password.

Trigger: When Homeowner is at home, may need to deactivate Cameras and Sensors out of privacy or energy-saving purpose. And when Homeowner left home, may need to activate the Cameras and Sensors for security purpose.

Scenario:

1. The homeowner logs onto the *SafeHome Products* website on his PC or opens the *SafeHome* application on his mobile phone.
2. The homeowner inputs his user ID and password.
3. The system displays all major functionalities of the *SafeHome* system.
4. The homeowner clicks the "Back Home" button.
5. The system deactivates Cameras and Sensors.
6. The homeowner clicks the "Leave Home" button.
7. The system activates Cameras and Sensors.

Exception:

1. If the user ID or password is incorrect, the system will display an error message and ask the user to input again.

2. If the camera are deactivated, the system will display an error message; see use case **Activate and Deactivate the Cameras and Sensors**.

3. An alarm condition is encountered.

Priority: Moderate priority, to be implemented after basic functions

When available: Second increment

Frequency of use: High frequency

Channel to actor: Via the *SafeHome Products* website or the *SafeHome* application

Channel to Secondary Actor: via the Sensor and Camera wireless interface

Open issues:

1. If the Homeowner left home without activating the Cameras and Sensors, there might be a risk of burglary. So we can add detection of the Homeowner's leaving home to activate the Cameras and Sensors automatically.
2. Maybe we can add a captcha(Completely Automated Public Turing test to tell Computers and Humans Apart) to the login page.
3. When client communicating with server, the ID and password should be encrypted.

6.5 Use Case 5: Register new Homeowner/Delete Homeowner

Use Case 5: Register new Homeowner/Delete Homeowner

Primary Actor: Administrator

Goal in context: To register and delete Homeowner.

Preconditions: System must be fully configured;

Trigger: Homeowner wants to add new family member to the system or to remove family member from the system.

Scenario:

1. The Administrator opens the *SafeHome Products* Software on his PC.
2. The Administrator click on the "Homeowner" button.
3. The system displays the list of all Homeowners.
4. The Administrator click on the "Add Homeowner" button.
5. The system displays the "Add Homeowner" page.
6. The Administrator inputs the new Homeowner's user ID, password, and personal information.
7. The Administrator click on the "Save" button.
8. The system adds the new Homeowner to the system.
9. The Administrator click on the "Delete Homeowner" button.

10. The system displays the "Delete Homeowner" page.

11. The Administrator selects the Homeowner he wants to delete.

12. The Administrator click on the "Delete" button.

13. The system deletes the selected Homeowner from the system.

Exception:

1. If the user ID are replicated, the system will display an error message and ask the Administrator to input again.
2. If the Administrator want to delete the last Homeowner, the system will display an error message and ask the Administrator to add a new Homeowner first.

Priority: High priority

When available: First increment

Frequency of use: Infrequently

Channel to actor: Via the *SafeHome Products* software on the Administrator's PC

Open issues:

1. Maybe we can add a captcha(Completely Automated Public Turing test to tell Computers and Humans Apart) to the login page.
2. When client communicating with server, the ID and password should be encrypted.

6.6 Use Case 6: Add/Remove Camera or Sensor

Use Case 6: Add/Remove Camera or Sensor

Primary Actor: Administrator

Secondary Actor: Cameras, Sensors

Goal in context: To add and remove Cameras and Sensors.

Preconditions: System must be fully configured;

Trigger: Homeowner wants to add new Cameras and Sensors to the system or to remove Cameras and Sensors from the system.

Scenario:

1. The Administrator opens the *SafeHome Products* Software on his PC.
2. The Administrator click on the "Camera" button.
3. The system displays the list of all Cameras(Camera contents are not included).
4. The Administrator click on the "Add Camera" button.
5. The system displays the "Add Camera" page.
6. The Administrator inputs the new Camera's ID, location, and type.
7. The Administrator click on the "Save" button.
8. The system adds the new Camera to the system.
9. The Administrator click on the "Delete Camera" button.
10. The system displays the "Delete Camera" page.
11. The Administrator selects the Camera he wants to delete.
12. The Administrator click on the "Delete" button.
13. The system deletes the selected Camera from the system.
14. The same Actions applies to the Sensors.

Exception:

1. If the Camera ID are replicated, the system will display an error message and ask the Administrator to input again.
2. If the Administrator want to delete the last Camera, the system will display an error message and ask the Administrator to add a new Camera first.

Priority: High priority

When available: First increment

Frequency of use: Infrequently

Channel to actor: Via the *SafeHome Products* software on the Administrator's PC

Channel to Secondary Actor: via the Sensor and Camera wireless interface

Open issues:

1. None

6.7 Use Case 7: Contact Homeowner or Emergency service when Emergency occurs

Use Case 7: Contact Homeowner or Emergency service when Emergency occurs

Primary Actor: Administrator

Secondary Actor: Homeowner, Cameras, Sensors

Goal in context: To contact Homeowner or Emergency service when Emergency occurs.

Preconditions: System must be fully configured; The Administrator must have the Homeowner's contact information;

Trigger: Emergency occurs.

Scenario:

1. The Sensors detected an Emergency or the Homeowner pressed the Emergency button.
2. The Administrator opens the *SafeHome Products* Software on his PC.
3. The Administrator receives an "Emergency" notification.
4. The Administrator click on the "Check" button.
5. The system displays the Surveillance video.
6. The Administrator checks the Surveillance video to determine if the Emergency is real.
7. The Administrator click on the "Contact" button.
8. The system displays the "Contact" page.

9. The Administrator click on the "Call" button.

10. The system calls the Homeowner and the Emergency service.

Exception:

1. If the Administrator does not have the Homeowner's contact information, the system will only call the Emergency service.
2. If the Administrator determines that the Emergency is not real, the Administrator can click on the "Cancel" button to cancel the call.

Priority: Moderate priority

When available: Second increment

Frequency of use: Infrequently

Channel to actor: Via the *SafeHome Products* software on the Administrator's PC

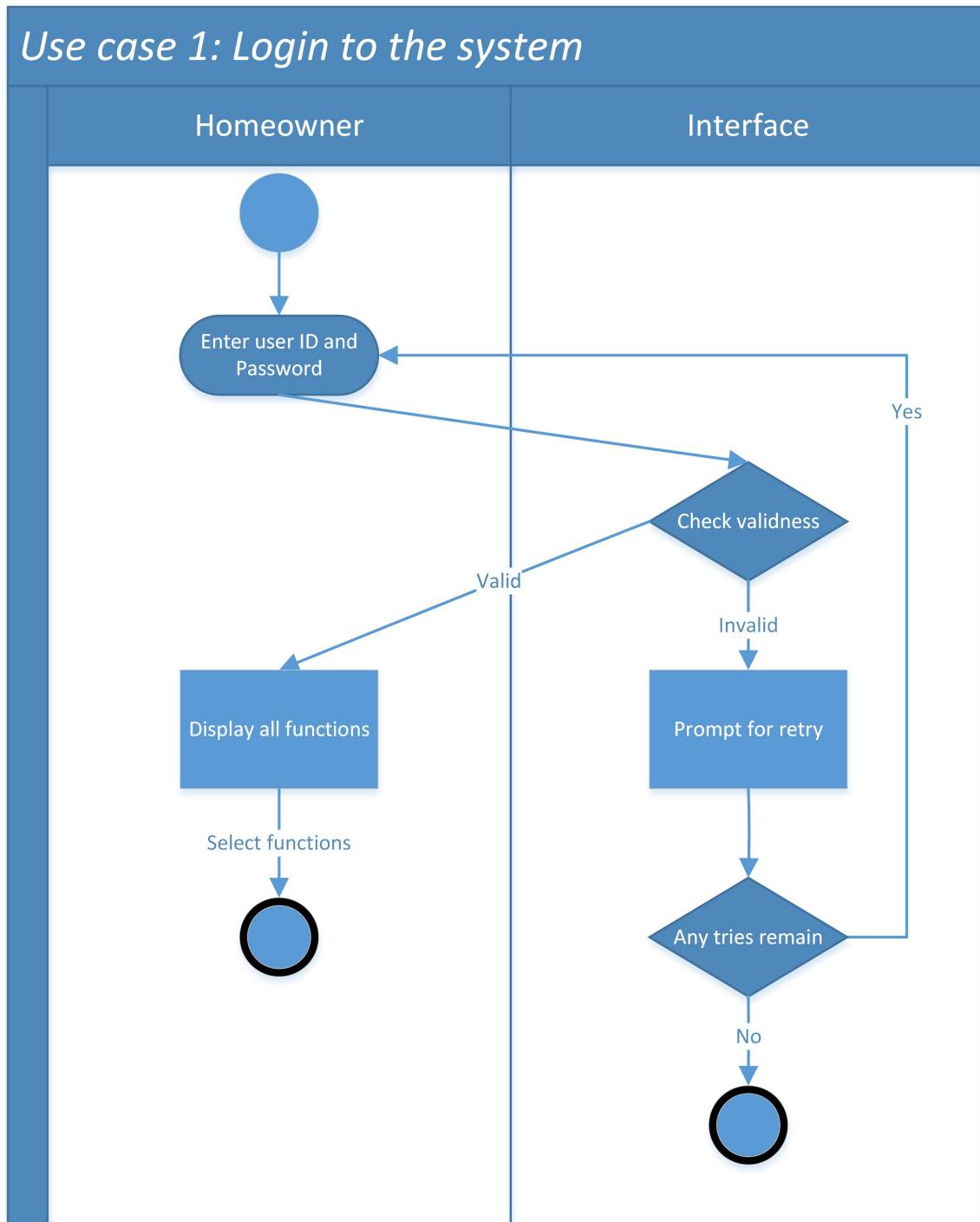
Channel to secondary actor: via the Sensor and Camera wireless interface, and the Homeowner's devices

Open issues:

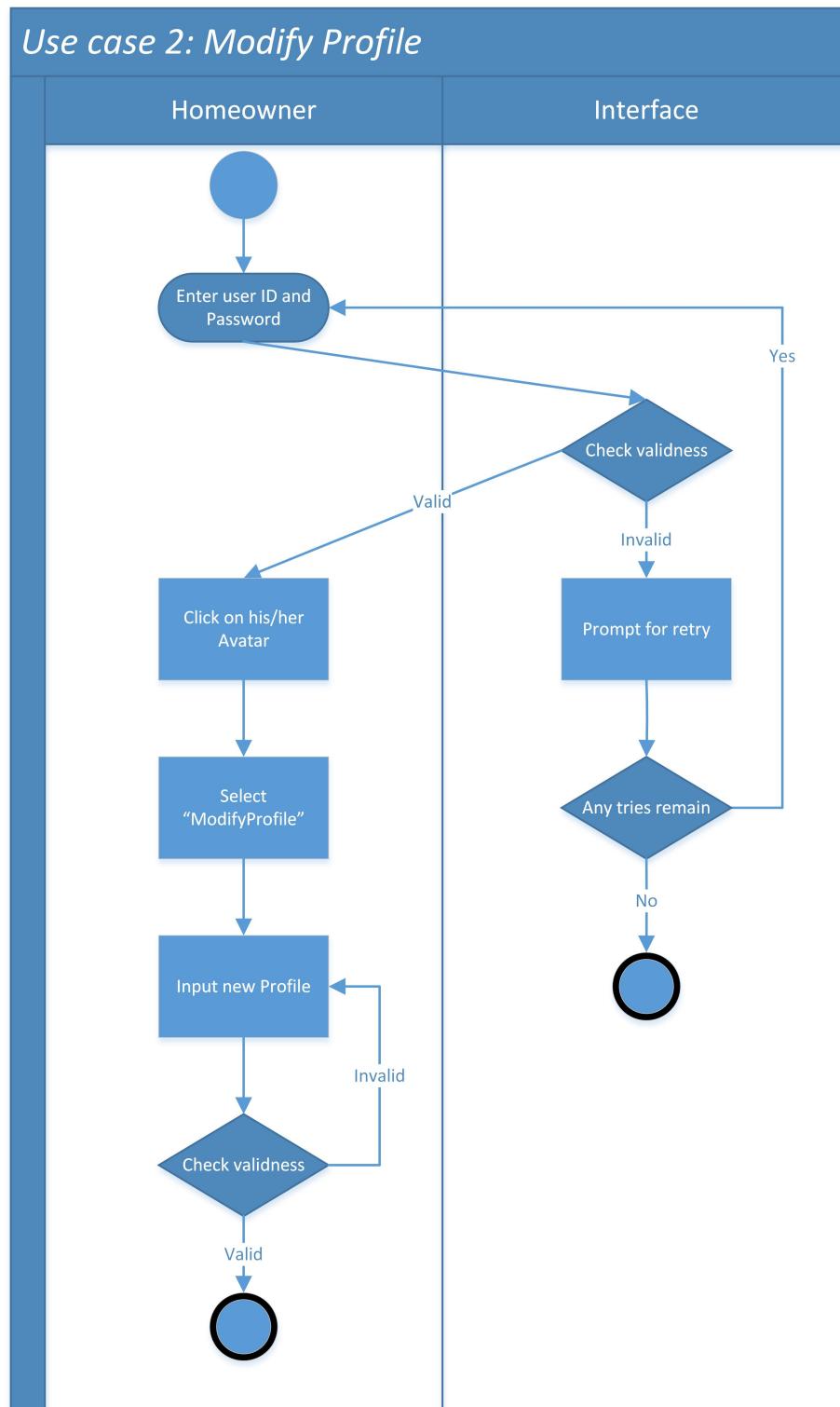
1. What if the Administrator didn't receive the "Emergency" notification? Maybe we can add a timer to the notification.
2. What if the Emergency alarm was stopped by the bad guy? Maybe we need to start recording once the Emergency alarm is triggered.

7. Swimlane Diagram

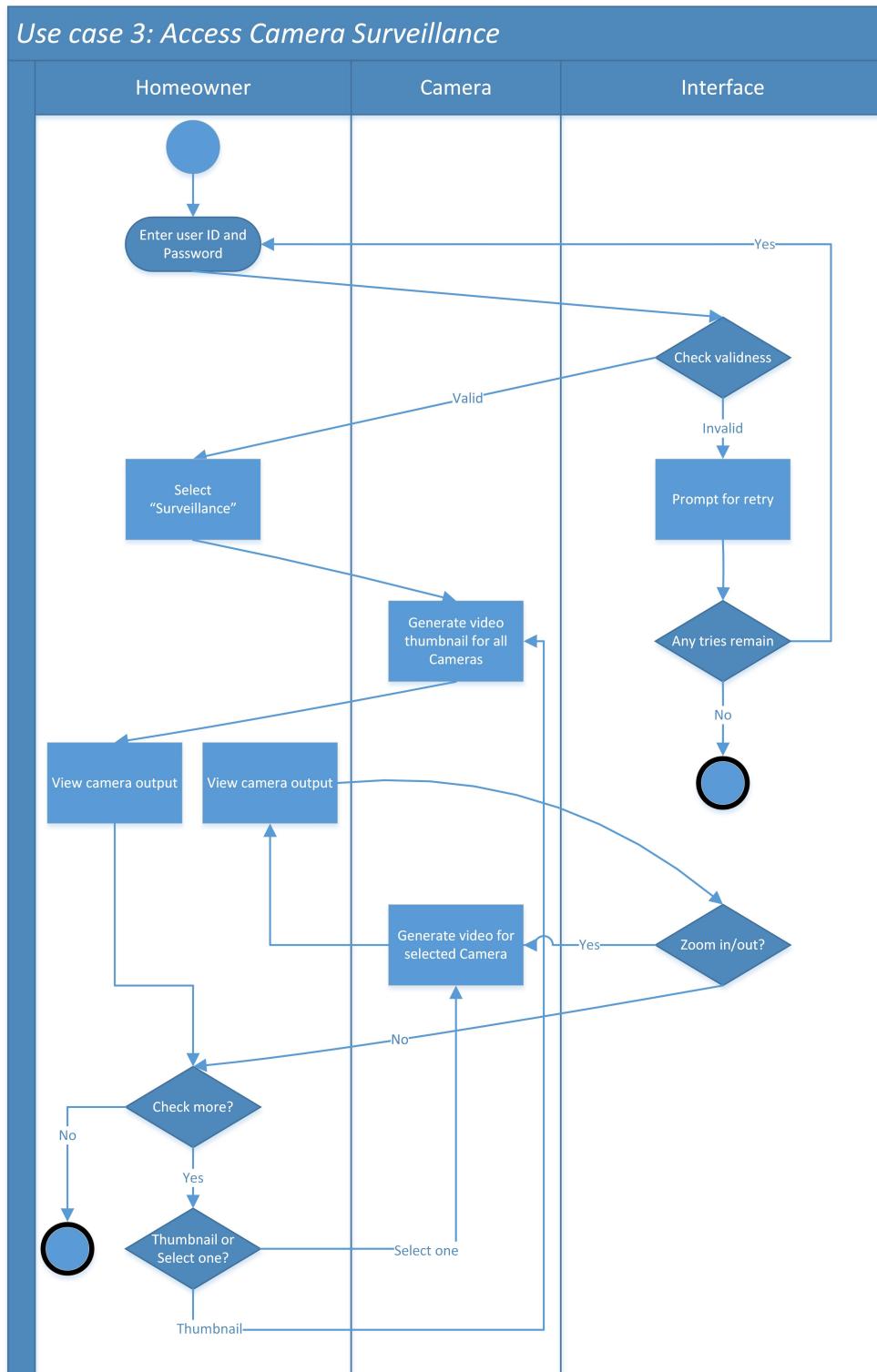
7.1 Diagram 1: Login to the System



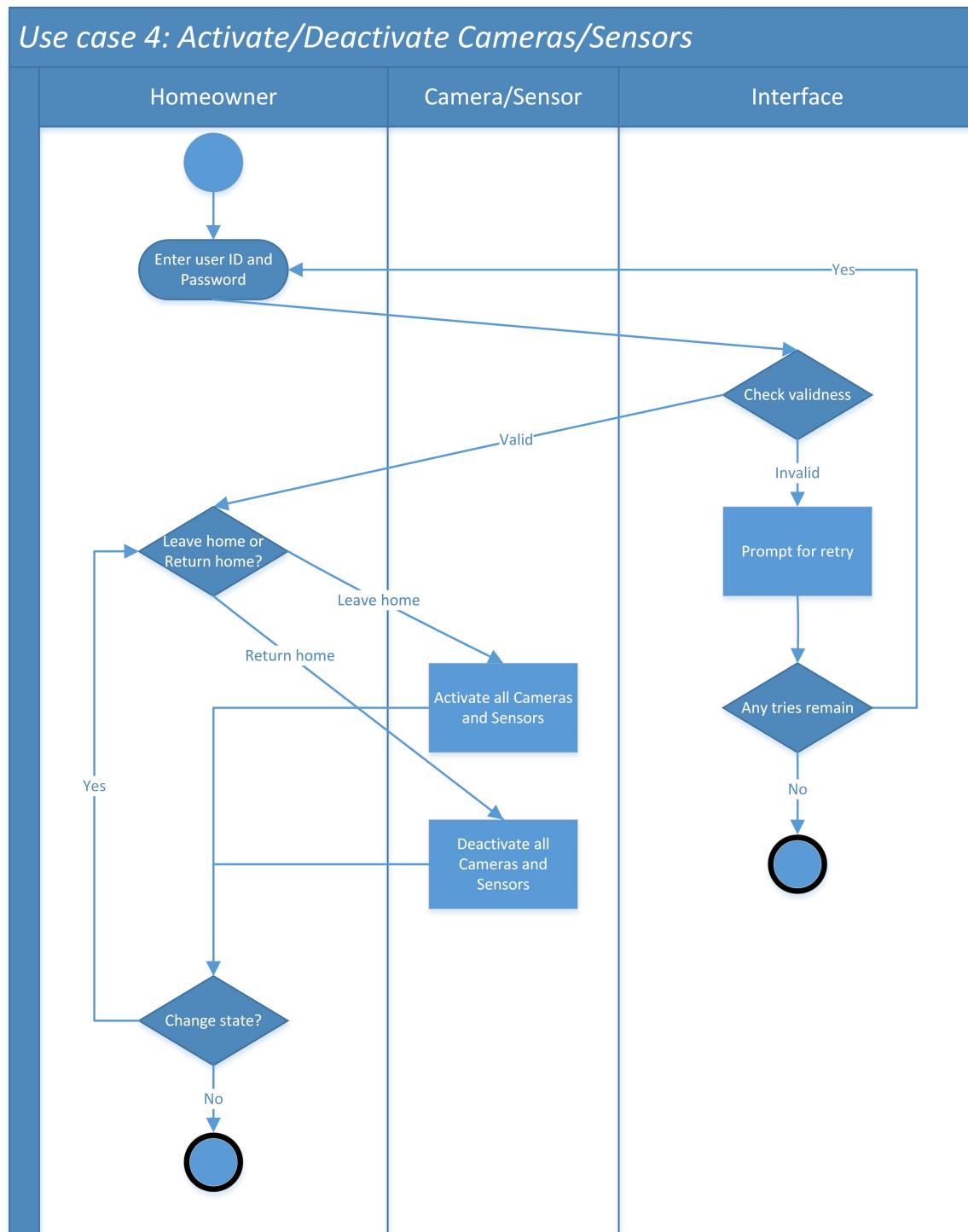
7.2 Diagram 2: Modify Profile



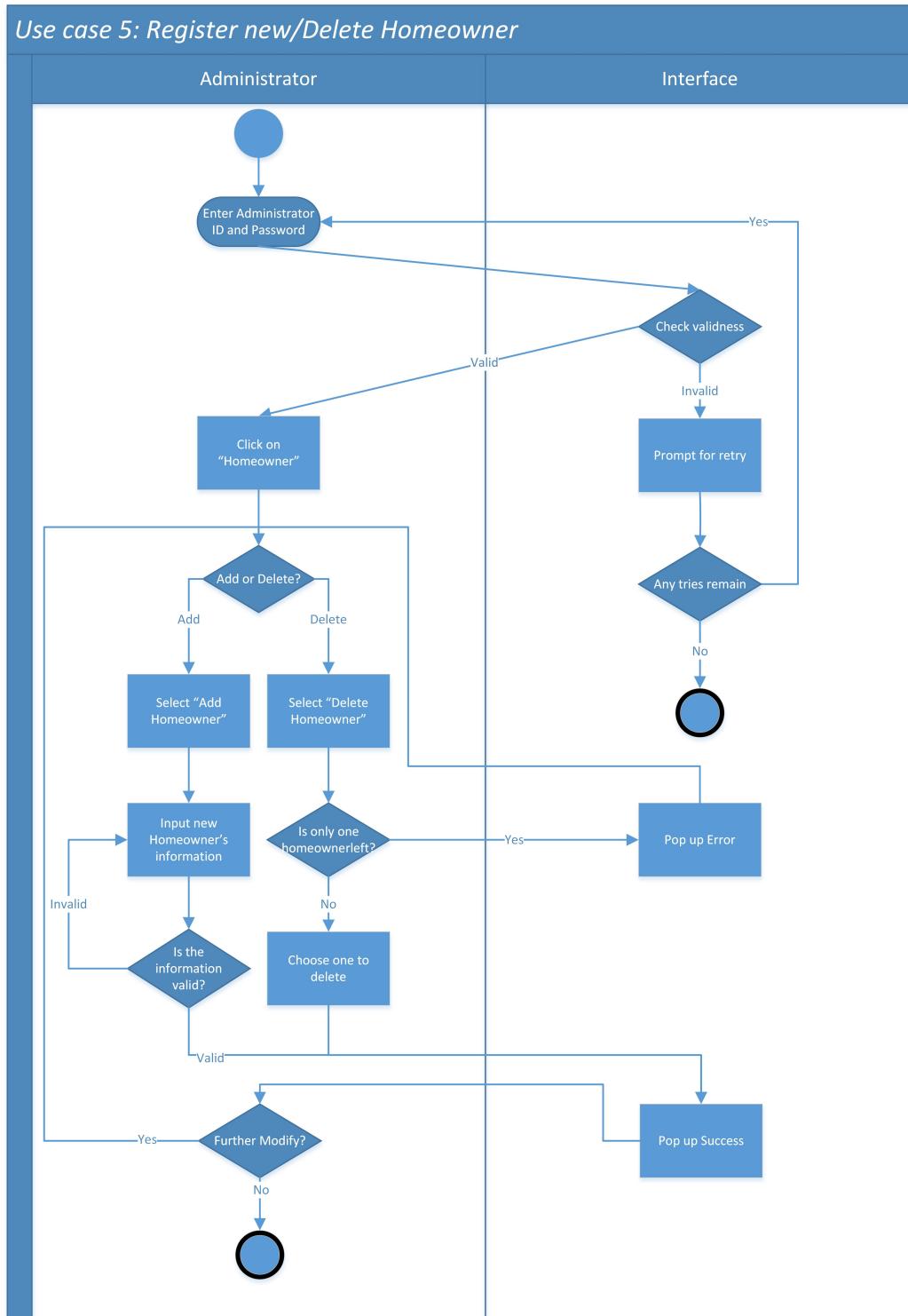
7.3 Diagram 3: Access Camera Surveillance



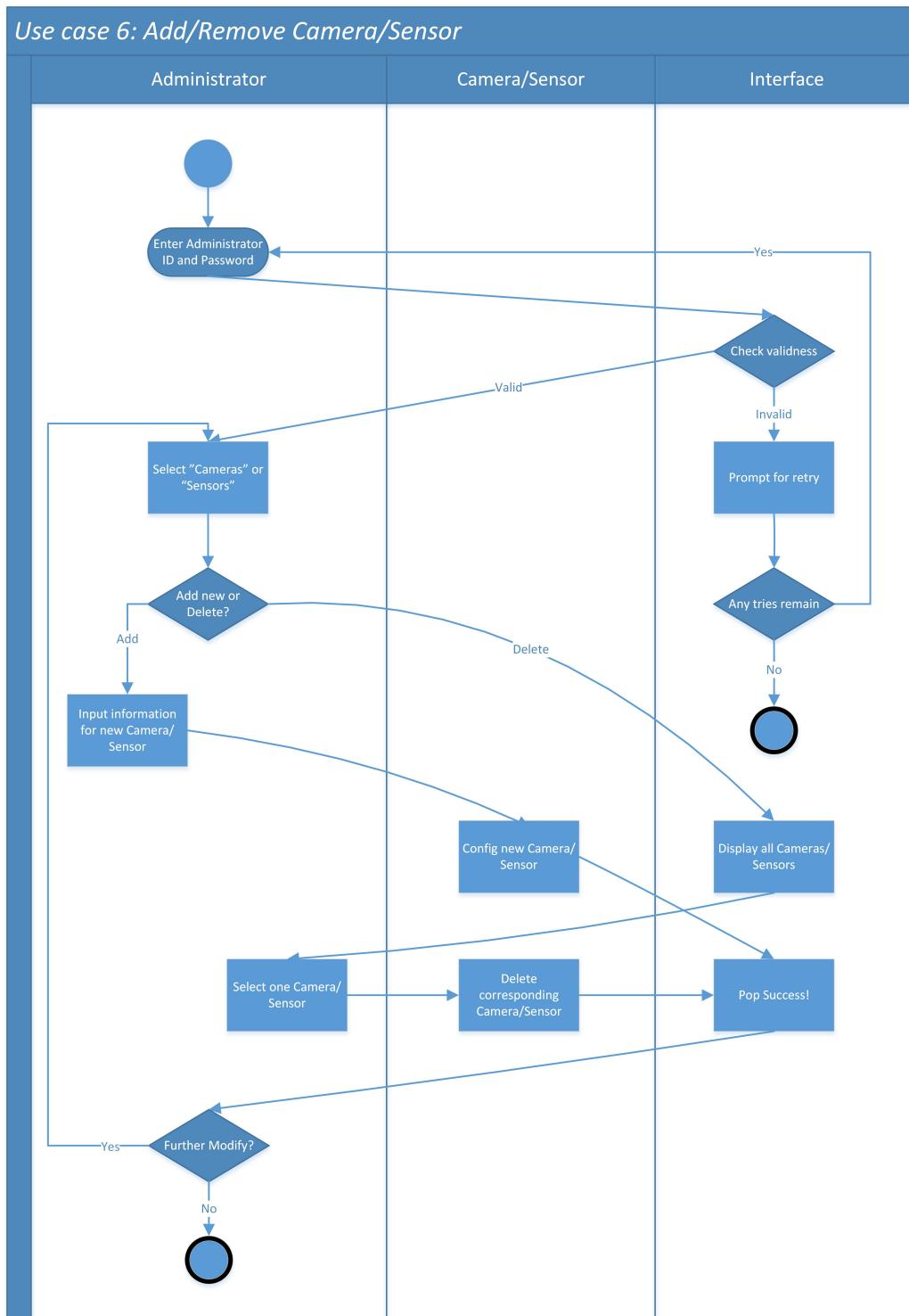
7.4 Diagram 4: Activate / Deactivate the Cameras and Sensors



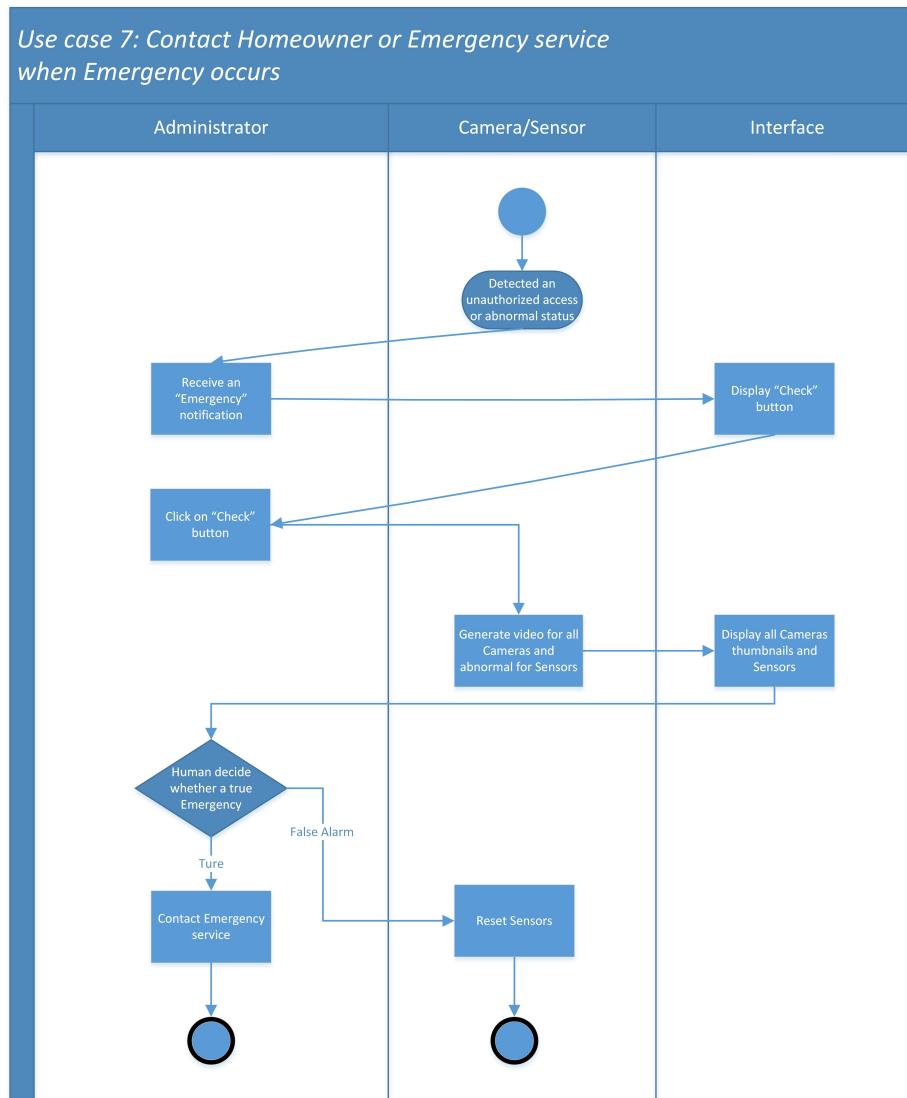
7.5 Diagram 5: Register new Homeowner/Delete Homeowner



7.6 Diagram 6: Add/Remove Camera or Sensor



7.7 Diagram 7: Contact Homeowner or Emergency service when Emergency occurs



References

- [1] S Pressman Roger and R Maxin Bruce. *Software engineering: a practitioner’s approach*. McGraw-Hill Education, 2015.
- [2] Lance Keene. Creating Your Software Requirements. URL <https://www.keenesystems.com/blog/creating-your-software-requirements>. (2018, Feb 13).