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# **Software Requirements Specification**

**for**

## **SafeHome project**

**Version 1.0**

**Prepared by Jinho Choi, Junsu Kim, Le Do Tuan Khanh**

**Team 4**

**Mar 11<sup>th</sup> 2009**

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## Revisions

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# 1 Introduction

## 1.1 Purpose

This SRS describes the software functional and nonfunctional requirements for the SafeHome project which is carried out by the members of Team 4 as their Software Engineering course's final project. In addition, the document also provides the perspective view of team management and project planning during the project's development as well as part of the analysis models.

## 1.2 Intended Audience and Reading Suggestions

This document is intended to be used by Team 4's members who implement the SafeHome project. The document is to help the understanding and collaboration between team members. Besides, the document is also aimed for Professor and Teaching Assistants (TAs) to evaluate the project and Team 4's performance.

The organization of the document is as follows:

- Chapter 1 provides an overview of this document and SafeHome project.
- Chapter 2 describes in detail about the project and the project's environment.
- Chapters 3, 4, 5, 6 explain the technical view of the project requirements in terms of system features, including functional, nonfunctional requirements, the interaction interfaces and the traceability between functional and nonfunctional requirements.
- Chapters 7, 8 describe the project under the management and process perspectives.

In addition, readers can make use of the Term Index (Appendix A) and Glossary (Appendix B) for a faster mining through the document. Meanwhile, Meeting Minutes (Appendix C) and Who-did-what List (Appendix D) are geared to support the supervision of Professor and TAs, as the senior managers of the project, over the team work's allocation. Interested readers can also refer to the Reference Materials (Appendix E) for more information about some specific themes.

## 1.3 Document Conventions

*DC-1:* The use case diagrams are derived from the Stimulus/Response Sequences, i.e. each stimulus is corresponding to one use case. The functional requirements are used to describe the use case scenarios in detail for the next phase.

## 1.4 Project Scope

### 1.4.1 Business Requirements

One of the flaming desires of human beings is to have a smart house which can alarm the



home owner when he/she forgets the boiling water pot, by itself detect the fire or the high level of water in the basement due to the flood or broken water heater, or furthermore provide the home owner the control and security over his/her house even in the case he/she is not at home. In fact, the list of requirements for such a smart house may be endless, but to some extent, we can categorize them into four general common categories

1. **Home security functions:** This category includes activities involving the security of the house such as detecting break-ins, fire or high water level in the basement.
2. **Home surveillance functions:** This category includes observing activities inside and outside of the house to keep track on the house status.
3. **Home management functions:** This category includes house management activities such as controlling the lights, appliances, or any other kinds of electronic devices.
4. **Communication management functions:** This category includes communication activities such as automatic response to the phone calls or voice read of email via phone access.

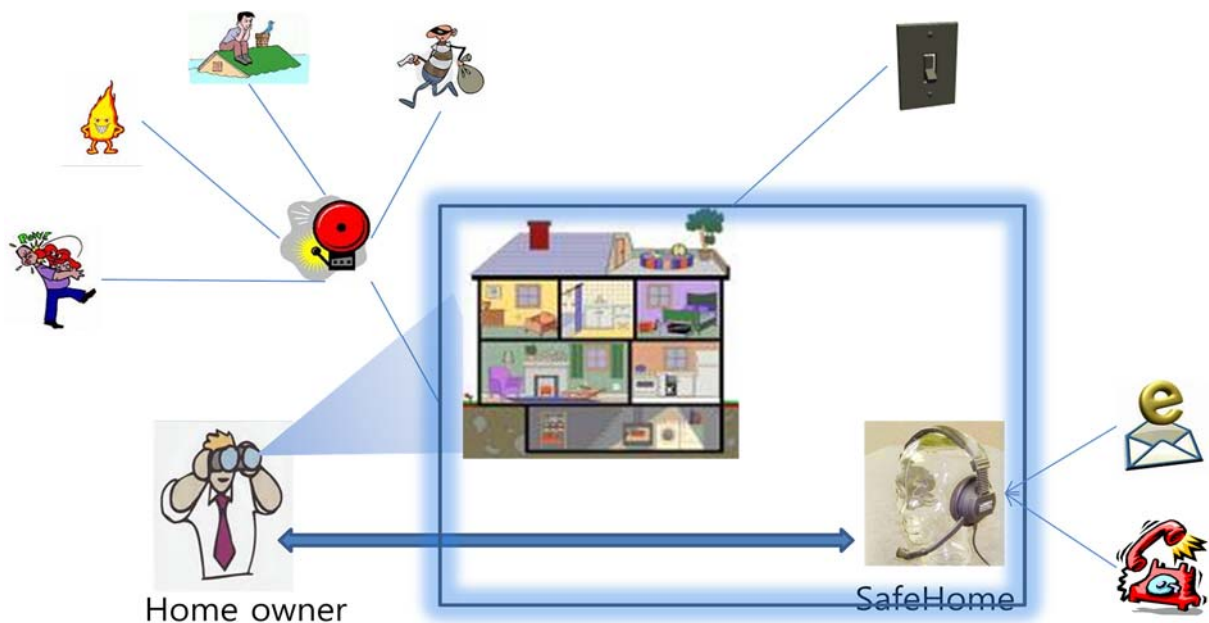


Figure 1 – Necessary features for an intelligent house

Thanks to the skyrocket development of electronics and technologies, these above functionalities are no longer imaginary. Sensors, high resolution cameras and various specialized technology devices in the amazingly small sizes can be used throughout the house to please even the fastidious home owners. Therefore, besides the operating features, this kind of business nowadays also looks for the convenience and utilities to indulge their customers. For instance, one of the convenient requirements is the system's compactness. The home owners usually expect the system to be compact, invisible to the house so that it

doesn't make their houses' appearance massive with dozens of wires or additional specialized devices around. Another important characteristic of the system that the home owners ever desire to have is a remote control over the house in the case they're not at home. This feature help the home owner not only restrict the unauthorized access but also allow some authorized people (such as their relatives, baby-sisters, or gardeners) while still being able to occasionally monitor their activities. These kinds of convenient features become much more critical in the case of big family with the appearance of playful children, strict elderly and several types of domestic helps.

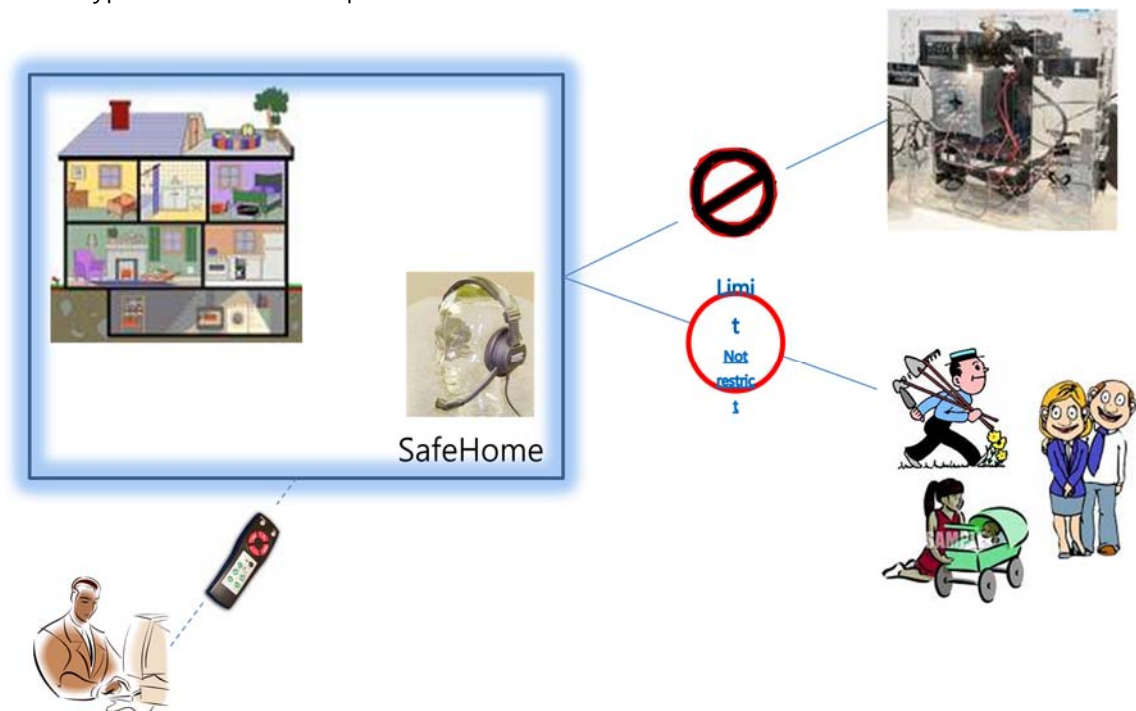


Figure 2 – Convenient features for the system's competitiveness

### 1.4.2 Scopes and Limitations

Striking on some of the operating features as well as the convenience for the customers, the goal of SafeHome project is to make up a system that automatically and dynamically facilitates the home owners in terms of the security and surveillance of their houses, either locally or remotely. All the connections among the devices are performed via the secure wireless network around the house. In general, there are three main features that SafeHome provides its customers.

1. Secure the house
  - Home owner can arm/disarm the house to protect the inside-outside house from unauthorized intruders or detect some internal accidents such as fire.
  - Home owner can allow some occasionally authorized accesses to a few parts of the house using the security zones.
  - Home owner can request for external assistance immediately in the emergency

situations such as heart attack or robbery.

- Home owner can, in advance, control the house's security functions via the simple Control Panel interface or detail Web interface, locally or remotely.

2. Observe the house

- Home owner can observe the multiple cameras, record the displays and play back the stored records.
- Home owner can set up the cameras around the house or parts of the house using the surveillance zones.
- Home owner can, in advance, locally or remotely control the house's surveillance functions via Web interface.

3. Configure the system

- Home owner can define and redefine the security and surveillance zones through the Web interface.
- Home owner can update his/her personal information and system's password through Control Panel or Web interface.
- Home owner can, in advance, perform this feature locally or remotely.

There are several limitations in this first release of the project due to the time constraint:

- Ignore the features of home management and communication management which are previously described in the business requirements.
- Ignore all matters involving the Web client-server access, e.g. the bandwidth, multi-access, Web access security or transaction problems.
- Ignore some detail device configuration such as the camera's resolutions or the level of sensor's sensitivity.
- Cursory look into the problems of unexpected interruption of power supply, local network and Internet connection.

## 2 Overall Description

### 2.1 Product Perspective

SafeHome is a novel system composing of an innovative wireless box and a central processor. The wireless boxes are attached to every hardware device to make a secure network connection around the house. The central processor contains of control software which has the responsibility to perform all the system's functions and a web server to store the information and data as well as to provide the Web interface and remote control interface. The software part of SafeHome (central processor) is the main theme of our team's project.

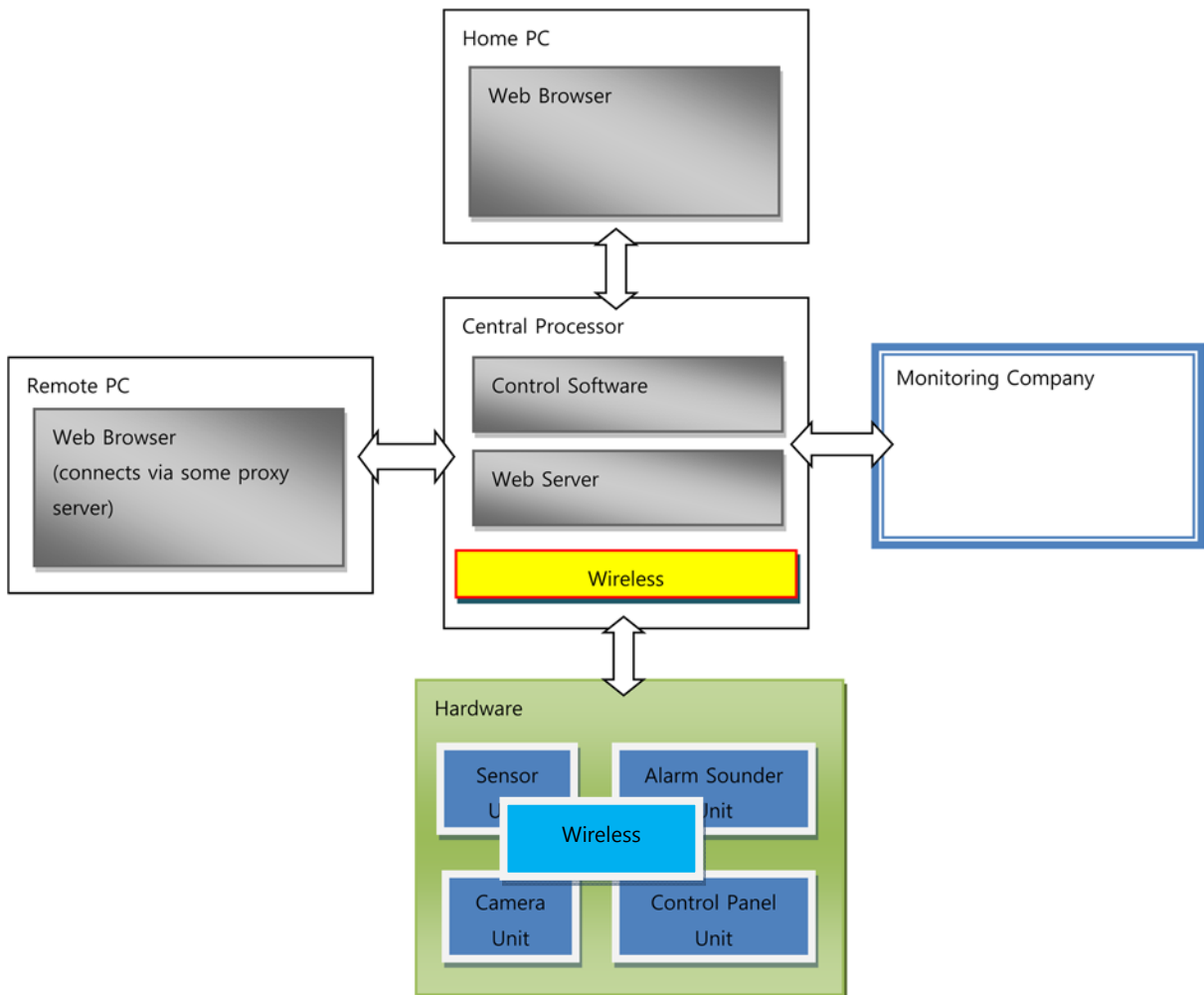


Figure 3 – SafeHome product perspective

### 2.2 User Class and Characteristics

**Home owner:** All of the security functions of the system can be performed by the home owner who has the control panel password.

**Web user:** All of the system's functions can be performed by the web user, locally in the

house or remotely from afar, who has the Web user id and password as well as control panel password. In addition, web user can play as a role of administrator to configure the SafeHome system (as described later in the feature of “Configure the system”).

**Monitoring company:** The monitoring company can receive the alarm from the user, the sensors or motion detectors as well as respond to the alarming events, such as turn off the alarming. However, in the scope of this project, it's assumed that the module supported for the monitoring company is developed by another development team and has a well-defined interface to communicate with our core system.

**Sensors and motion detectors:** The sensors and motion detectors can invoke the system's alarming functions in the case of intruder or accident detection. These devices are not really the user of the system, however, because it uses the system just to support the other users.

## 2.3 Operating Environment

**OE-1:** SafeHome's web interface shall operate with the following Web browsers: Microsoft Internet Explorer version 6.0 and Mozilla Firefox version 3.0.

**OE-2:** SafeHome's web server is MySQL versions 5.0 or above

## 2.4 Design and Implementation Constraints

**CO-1:** UML 2.0 shall be used for the system's analysis and design.

**CO-2:** Java shall be used as the programming language to be compatible to the provided devices' interfaces.

**CO-3:** In this first release, for the simplicity, web interface shall be simulated by a window application interface.

## 2.5 User Documentation

**UD-1:** The system shall provide an online hierarchical and cross-linked help system in HTML that describes and illustrates all system functions.

**UD-2:** The system shall provide an offline help system in CHM that describes and illustrates all system functions.

**UD-3:** The project shall provide a soft-copy of user manual for the home owners who buy the system.

**UD-4:** The project shall provide the user with the manuals of the hardware devices such as cameras, sensors, motion detectors, etc.

## **2.6 Assumptions and Dependencies**

**AS-1:** The wireless boxes have been well-defined and are ready to use.

**AS-2:** Except for the wireless box, other hardware devices are off-the-shelf from third party companies.

**AS-3:** The monitoring company already has an interface so as to receive the alarming messages and reply to turn off the system's alarming function.

**AS-4:** Two or more users of a house don't have the demand to access the web interface at the same time.

**DE-1:** The security of the house in the case of alarming (due to intruder or accident) is assured by either home owner or monitoring company.

**DE-2:** The performance and preciseness of the system depends on the performance and preciseness of the off-the-shelf devices.

## 3 System Features

### 3.1 Secure the House

#### 3.1.1 Descriptions

The home owner whose identity has been verified can arm/disarm the house, using control panel or Web interface, with the door sensors, window sensors, motion detectors, fire, CO, smoke level sensors and basement water level sensor. If an intruder or an accident is detected, the system shall alarm and inform the monitoring company. Home owner by his/her-self can announce the emergency cases (such as heart attack) by request the system to sound the alarm and call the police. In addition, these controls can be performed either locally or via remote devices such as mobile phone or PC using Web interface.

#### 3.1.2 Stimulus/Response Sequences

Table 1 – Stimulus/Response Sequences for “Secure the house” feature

<b>Stimulus:</b>	Home owner requests to arm the system.
<b>Response:</b>	If the house condition is normal and the user is valid, the system activates the sensors and motion detectors.
<b>Stimulus:</b>	Home owner requests help in panic cases
<b>Response:</b>	The system alarms and informs the monitoring company
<b>Stimulus:</b>	Danger is detected (intruder breaks into the house or fire, CO, smoke, basement water level is reported to be dangerous)
<b>Response:</b>	The system alarms and informs the monitoring company
<b>Stimulus:</b>	Home owner or monitoring company resolves the security alarm events and requests the alarm to be off
<b>Response:</b>	If the requesting user is valid, the system turns the alarm off.
<b>Stimulus:</b>	Home owner requests to disarm the system.
<b>Response:</b>	If the house condition is armed and the user is valid, the system deactivates the sensors and motion detectors.

### 3.1.3 Use Case Diagram

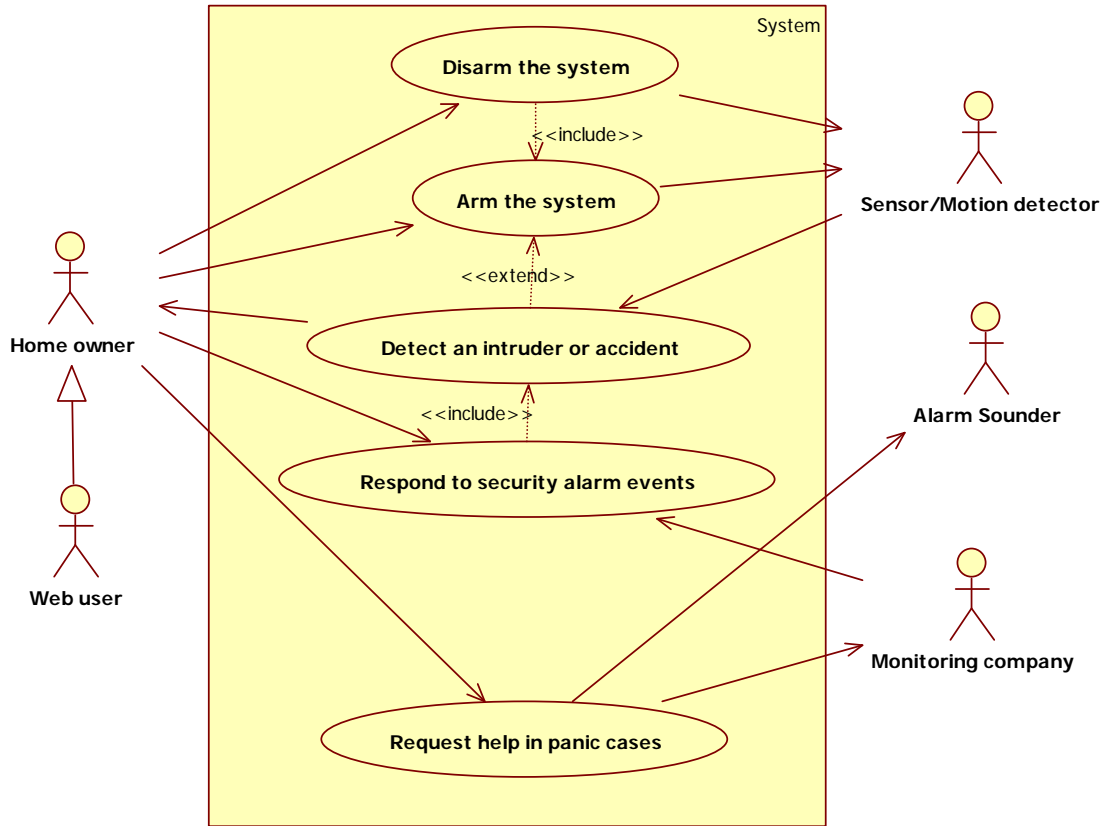


Figure 4 – Use case diagram for “Secure the house” feature

### 3.1.4 Functional Requirements

Table 2 –Functional requirements for “Secure the house” feature

Requirement	Descriptions
Secure.Operation	The system shall operate this feature’s functionalities independently with the “Observe the house” feature, but exclusively with the “Configure the system” feature.
Secure.Operation.Interface	This feature can be performed via either control panel or web interface, supported for both local network and remote control.
Secure.Operation.Number	The system shall allow multiple control panel interfaces, whereas only 1 web user can use this feature at a time.
Secure.Operation.Display	This system shall display its current status and if there is some task in operation.
Secure.Operation.Ready	When powered or disarmed, the system shall check if the connection status with the sensor-attached devices and cameras is ready.



Requirement	Descriptions
Secure.Check	The system shall check the house condition whenever a sensor or detector activating/deactivating task is requested.
Secure.Check.Error.Repeat	If a house error condition is met, periodically, the system shall automatically check the house condition until all errors are resolved.
Secure.Check.Error.Inform	System shall clearly inform the user what condition error is. In addition, only one error is displayed in control panel, whereas all of the errors can be displayed via web interface
Secure.Password	With the control panel interface, a 4-digit password will be asked. With the Web interface, there are 2 levels of passwords, the web user id and password, and the control panel password.
Secure.Password.ControlPanel	The system shall ask the password for every request from the control panels, except for panic function
Secure.Password.WebInterface	The system shall ask the password only once. Tasks can be performed without any password request again. The session time-out is set to be 10 minutes.
Secure.Password.CPWrong	With the control panel password, the system shall allow only five continuous wrong passwords in 15 minutes. If the condition is broken, the system shall alarm and inform the monitoring company.
Secure.Password.WIWrong	With the web interface password, the system shall allow only five continuous wrong passwords. The session will be blocked for 15 minutes if this condition is broken, and the failure log will be saved to server as well as sent to the monitoring company.
Secure.Password.Store	In the case of web interface, the system shall only allow to save the web user id and password to the browser's cookie. The control panel password shall be asked for every log-in.
Secure.Mode	The system shall support two standard modes: Stay mode for home owner staying at home and Away mode for home owner who is going to go out.
Secure.Mode.ControlPanel	In the case of control panel access, the system shall only allow the home owner to arm/disarm the sensors by the Stay/Away modes.

Requirement	Descriptions
Secure.Mode.WebInterface	In the case of web interface access, the system shall allow the home owner to arm/disarm the sensors according to the predefined security zones as well as arm/disarm the sensors individually.
Secure.Mode.Change	In the case of control panel access, the system shall ask the password whenever the user wants to change the modes.
Secure.Mode.Disarm	In the case of control panel access, the system shall ask the control panel password before allowing home owner to disarm and let the system at the waiting (ready) state.
Secure.Mode.CPAway	In the case of control panel access, the system shall suspend for 2 minutes before actually activating the system in the away mode to allow user to get out of the house.
Secure.Mode.WIAway	In the case of web interface access, the system shall ask the user to suspend for 2 minutes or not, since maybe user is being away and wants to immediately arm the system.
Secure.Task.Conflict	The system shall restrict a request to perform a task when it is in operation to do another task.
Secure.Task.Timeout	In the case of control panel, the system shall cancel an unfinished multiple-input task after no input has been detected for 5 seconds.
Secure.Detect.Alarm	In the case of alarming, both control panel and web interface only receive the control panel password to turn off the alarming sounder unit. No other task can be requested.
Secure.Detect.Alarm.Info	In the case of alarming, the reason and source/origin of alarming shall be displayed.
Secure.Detect.Alarm.Suspend	In the case of alarming, the alarm sounder unit is invoked first, and an emergency message is sent to the monitoring company after 10 seconds.
Secure.Detect.Alarm.Turnoff	In the case of alarming, the system shall send "solved" message to the monitoring company when the home owner turns off the alarm in around 1 minute.
Secure.Panic	The system shall allow one-press (one-click) panic function in case home owner reports an emergency accident.

Requirement	Descriptions
Secure.Panic.Alarm	The alarm of panic function shall follow the same functional requirements to the detect alarming.
Secure.Disarm	The system shall ask for the control panel password to disarm the system.
Secure.Remote.Connection	The system shall be used with a proxy server to make up a connection with remote user.
Secure.Remote.Data	In the case of remote control, the system shall encrypt all the data and communication on the Internet.

## 3.2 Observe the House

### 3.2.1 Descriptions

The home owner whose identity has been verified can observe the inside and outside of the house received from the wireless connected cameras via Web interface. The home owner can choose the camera(s) to view as well as zoom or pan the displays. In addition, the home owner can also record the scenes that he/she wants and play back the stored records. Similar to the "Secure the house" feature, this feature can be controlled locally or remotely.

### 3.2.2 Stimulus/Response Sequences

Table 3 – Stimulus/Response Sequences for "Observe the house" feature

<b>Stimulus:</b>	Home owner requests to view the inside/outside of the house.
<b>Response:</b>	The system queries home owner for choosing the cameras to be displayed from the list of wireless-connected cameras around the house.
<b>Stimulus:</b>	Home owner requests to turn on/off some cameras
<b>Response:</b>	The system queries home owner for choosing the cameras to be turned on or turned off.
<b>Stimulus:</b>	Home owner requests to pan the viewed camera.
<b>Response:</b>	The system pans the camera accordingly corresponding to the requests.
<b>Stimulus:</b>	Home owner requests to zoom in/out the display.
<b>Response:</b>	The system zooms in/out the current display.

<b>Stimulus:</b>	Home owner requests to send an emergency message to the monitoring company when discovering a danger.
<b>Response:</b>	The system informs the monitoring company about the situation with the identities of the camera being viewed.
<b>Stimulus:</b>	Home owner requests to record the current display.
<b>Response:</b>	If the storage is available, system starts to record current display and saves to the web server in the central processor.
<b>Stimulus:</b>	Home owner requests to play back a record.
<b>Response:</b>	System queries the home owner to choose the record to be played.

### 3.2.3 Use Case Diagram

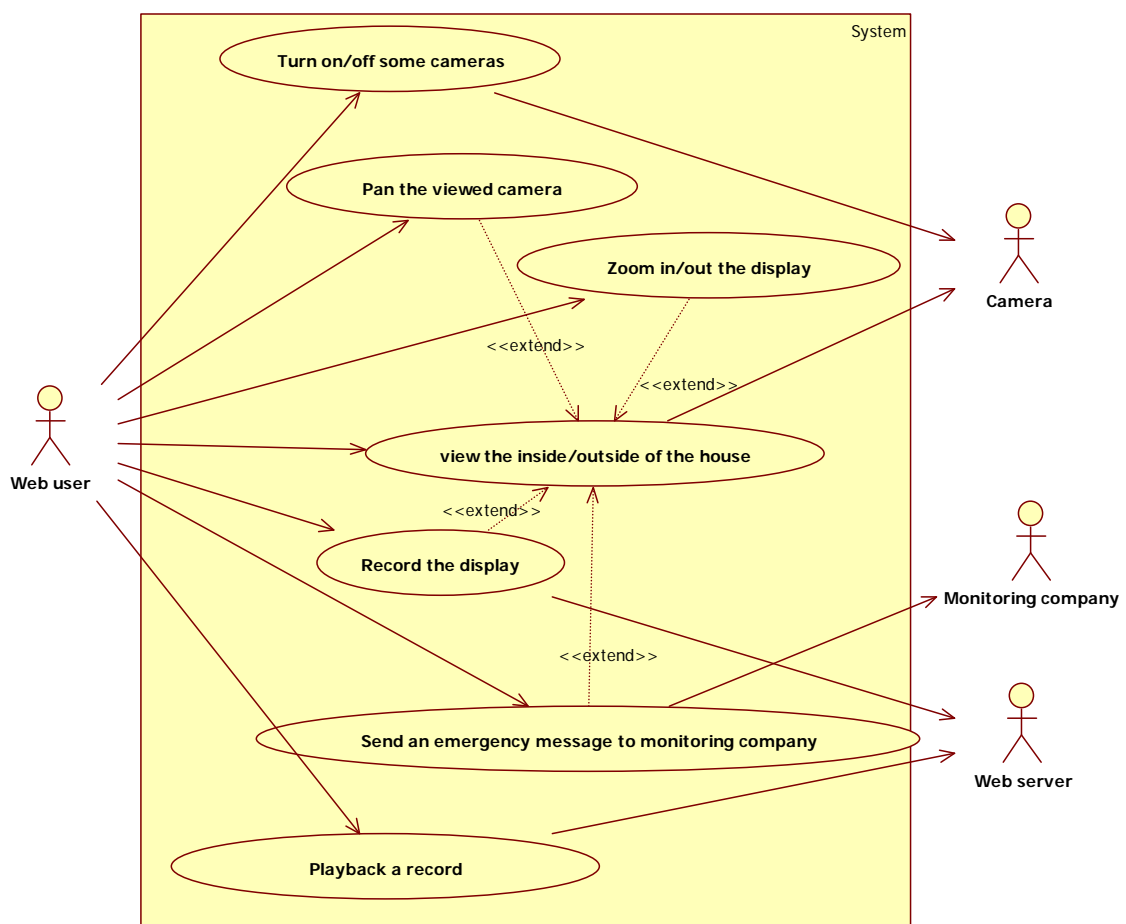


Figure 5 – Use case diagram for “Observe the house” feature

### 3.2.4 Functional Requirements

Table 4 – Functional requirements for “Observe the house” feature

Requirement	Descriptions
Observe.Operation	The system shall operate this feature’s functionalities independently with the “Secure the house” feature, but exclusively with the “Configure the system” feature.
Observe.Operation.Number	The system shall allow only one web user operating on this feature at a time.
Observe.Password	There are 2 levels of passwords, the web user id and password, and the control panel password.
Observe.Password.WebInterface	The system shall ask the password only once. Tasks can be performed without any password request again. The session time-out is set to be 10 minutes.
Observe.Password.WIWrong	The system shall allow only five continuous wrong passwords. The session will be blocked for 15 minutes if this condition is broken, and the failure log will be saved to server as well as sent to the monitoring company.
Observe.Password.Store	The system shall only allow to save the web user id and password to the browser’s cookie. The control panel password shall be asked for every log-in.
Observe.Display.Number	The system shall allow the user to observe several cameras at the same time.
Observe.Display.Image	The system shall display the moving image to reduce the data amount and increase the security.
Observe.Display.Image.Encrypt	The system shall encrypt the images during transference.
Observe.Display.Reconnect	In the case of losing signal from a camera, the system shall automatically reconnect the camera for 5 times before clearly informing the user about the problem and setting the camera’s status as off.
Observe.Emergency	The system shall allow the user with a one-click function to report an emergency situation with the identities of the viewed cameras.

Requirement	Descriptions
Observe.Emergency.Cancel	The system shall allow the user to send a message to cancel an emergency request that he/she has sent before. However, the system shall ask the user for the control panel password before cancelling the emergency request.
Observe.Camera	The system shall automatically detect the status of all the cameras whenever the user starts this feature. If there are some connection errors, the system shall clearly inform the user.
Observe.Camera.Zones	The system shall allow the home owner to turn on/off the cameras according to the predefined surveillance zones as well as the cameras individually.
Observe.Camera.Off	The system shall ask for a confirmation if the user wants to turn off a camera being in operation. If yes, the display of the camera is closed first, then the camera is turned off.
Observe.Record	The system shall allow the home owner to record multiple displays separately and concurrently.
Observe.Record.Time	The system shall allow the user to record for at most 24 hours at once. When the time condition is met, the system shall ask the user if he/she wants to continue recording. If there is no response from user for 1 minute, the recording is automatically stopped.
Observe.Record.Before	The system shall check for the availability of the central processor space before allowing the user to record. If there is not enough storage, the system shall move some oldest records into secondary storage to get enough space for a 24 hour record. If the secondary storage is not available, the system shall deny the recording request.
Observe.Record.Key	The system shall ask the user to assign some keywords to the record for easier finding it later.
Observe.Playback	The system shall allow the user to look for the records by the recorded date or by the keywords.
Observe.Remote.Display	The system shall limit the number of viewing screens in order according to the Internet bandwidth's limitation.

Requirement	Descriptions
Observe.Remote.Interrupt	In the case of remote surveillance, if the Internet connection is interrupted, the system shall automatically stop viewing and playing back operations, but keep the recording operations.
Observe.Remote.Data	In the case of remote control, the system shall encrypt all the data and communication on the Internet.

### 3.3 Configure the system

#### 3.3.1 Descriptions

The home owner whose identity has been verified can dynamically reconfigure the floor plan of the house as well as define/redefine the security/surveillance zones. In addition, the home owner can also manage his/her account information and passwords, including web password and control panel password. Control panel password can be changed via either control panel interface or web interface. The other activities can be performed only via Web interface, either locally or remotely.

#### 3.3.2 Stimulus/Response Sequences

Table 5 – Stimulus/Response Sequences for “Configure the system” feature

<b>Stimulus:</b>	Home owner requests to configure the security zones
<b>Response:</b>	System displays the security zones and corresponding sensors to be edited
<b>Stimulus:</b>	Home owner requests to configure the surveillance zones
<b>Response:</b>	System displays the security zones and corresponding cameras to be edited
<b>Stimulus:</b>	Home owner requests to manage his/her account
<b>Response:</b>	System displays the user’s information to be edited
<b>Stimulus:</b>	Home owner requests to change the floor plan of the house
<b>Response:</b>	System displays the current floor plan to be changed by home owner

### 3.3.3 Use Case Diagram

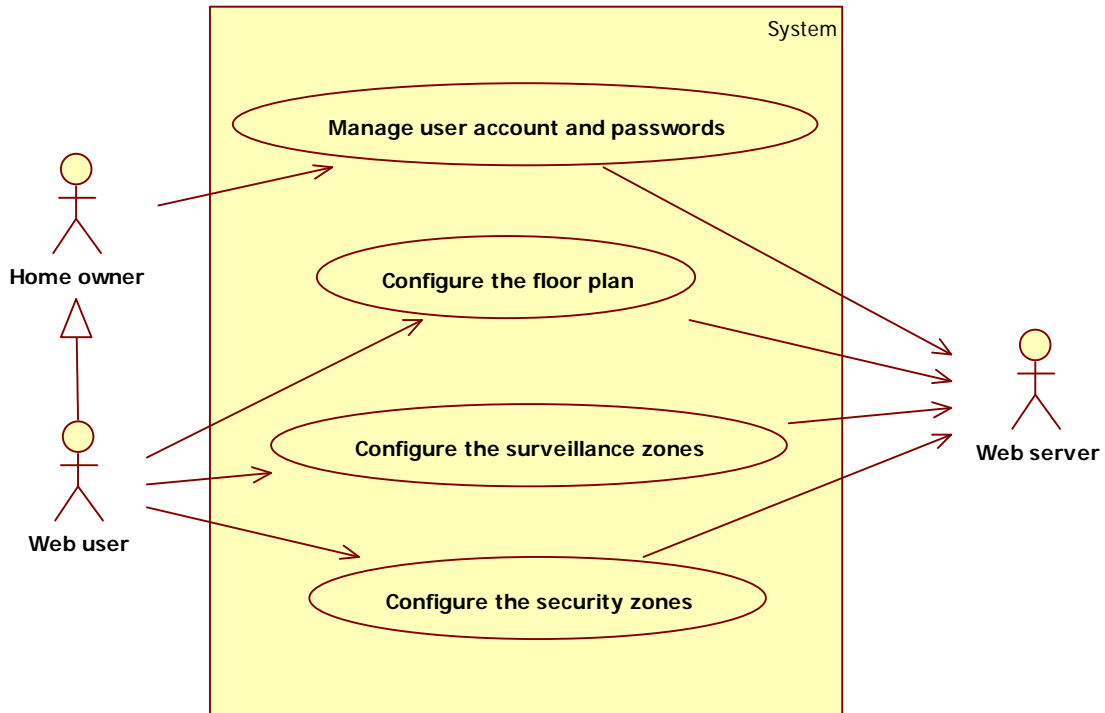


Figure 6 – Use case diagram for “Configure the system” feature

### 3.3.4 Functional Requirements

Requirement	Descriptions
Configure.Operation	The system shall operate this feature’s functionalities exclusively with the other features.
Configure.Operation.Number	The system shall allow only one web user operating on this feature at a time.
Configure.Password.WebInterface	The system shall ask the password only once. Tasks can be performed without any password request again. The session time-out is set to be 10 minutes.
Configure.Password.WIWrong	The system shall allow only five continuous wrong passwords. The session will be blocked for 15 minutes if this condition is broken, and the failure log will be saved to server as well as sent to the monitoring company.
Configure.Password.Store	The system shall only allow to save the web user id and password to the browser’s cookie. The control panel password shall be asked for every log-in.
Configure.Security.Sensors	The system shall only allow 1 security zone with at least 1 or more sensors or motion detectors.



Requirement	Descriptions
Configure.Security.Zones	The system shall allow the security zones to be overlapped to each other without any limitation to the number of zones.
Configure.Surveillance.Camera	The system shall only allow 1 surveillance zone with at least 1 or more cameras.
Configure.Surveillance.Zones	The system shall allow the surveillance zones to be overlapped to each other without any limitation to the number of zones.
Configure.Info	System shall not allow the user to change the web user identity, but the 2 levels of password.
Configure.Info.WebPassword.Length	System shall only allow the password of the web interface with at least 6 characters.
Configure.Info.CPPassword.Length	System shall only allow the password of the control panel with exactly 4 digits number.
Configure.Info.Password	The system shall allow the user to change his/her password from the control panel or web interface.
Configure.Info.Password.Change	To change to the new password, the system shall ask the user for the old password and confirm for the new password.
Configure.FloorPlan.Devices	System shall allow user to move the sensors, motion detectors, and cameras around the floor plan.
Configure.Save	The system shall always ask for confirmation before saving the configuration. In the case the connection is interrupted before confirmation, the configuration change will not be valid to the system.
Configure.Remote.Data	In the case of remote control, the system shall encrypt all the data and communication on the Internet.

## 4 External Interface Requirements

### 4.1 User Interfaces

The user of SafeHome can use both software interface and hardware interface. The user of SafeHome uses this software interface through web page. First, user clicks the access menu in menu bar. The menu bar is indicated by ①.

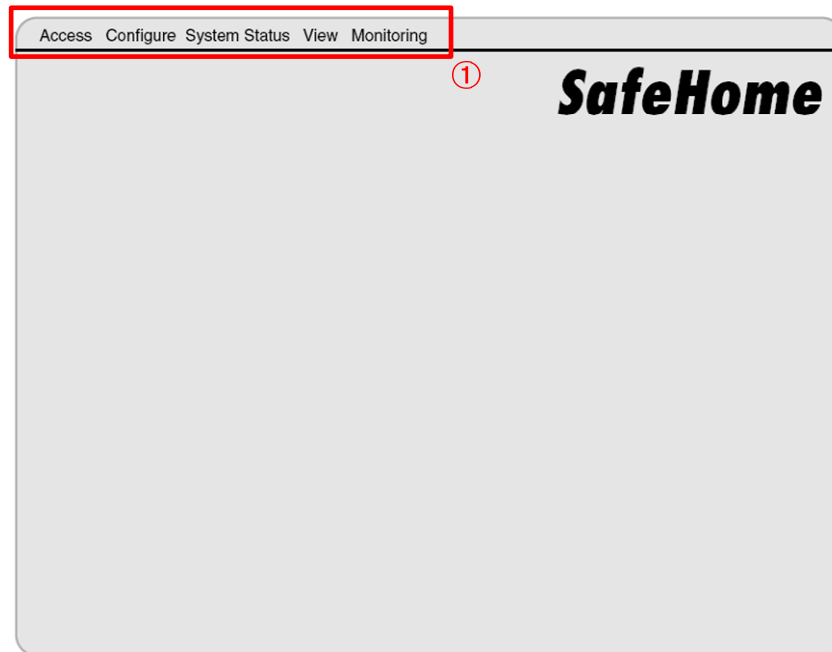


Figure 7 – Initial screen of web interface

And then, the pop-up window open and required to enter the ID and password. It is indicated by ②. If user enters the valid ID and password, another popup window open and required to enter the control panel password. It is a kind of log-in procedure.



Figure 8 – Login window

If user enters the valid control panel password, he or she can connect to the SafeHome system, otherwise web-interface of SafeHome requires to enter ID and password again. After connecting the SafeHome system, user can use provided functions by SafeHome.

If user pushes the monitoring menu, the monitoring window open and user can see the

sensor locations, camera locations, and floor plan. It is indicated by ③.

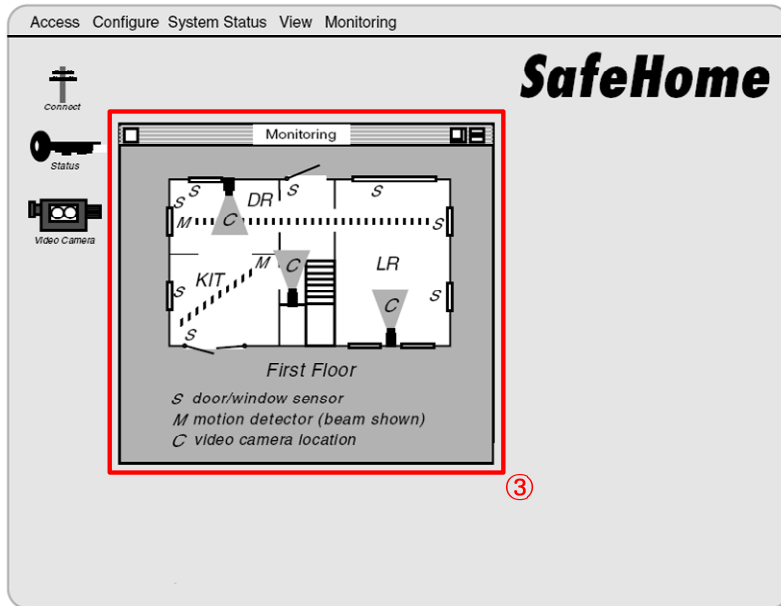


Figure 9 – Monitoring window

If user pushes the view menu and select one video camera, the window that contains the video display open. The User can watch the surveillance zone and it is indicated by ④.

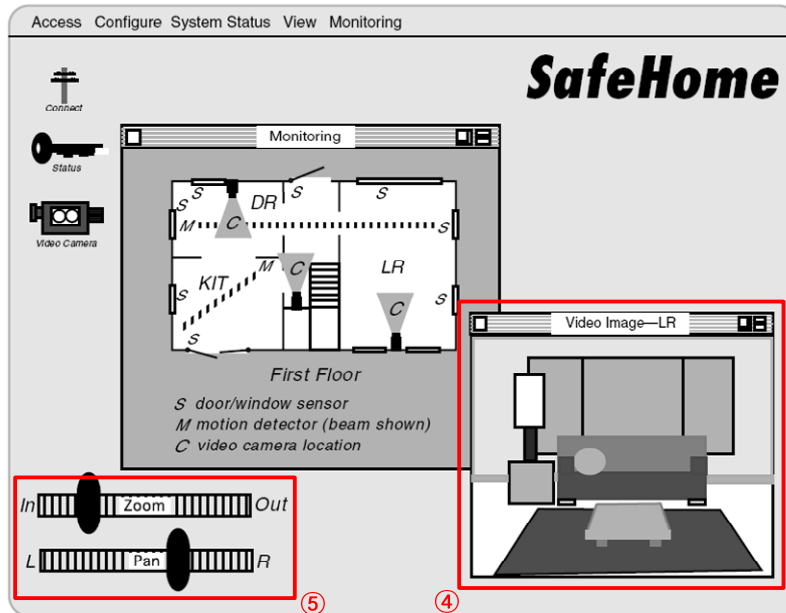


Figure 10 – Video camera window

The controllers of camera to pan and zoom are placed in the box that indicated by ⑤. The user can watch the whole display of camera simultaneously by another item of view menu.

User also can arm and disarm several sensors through web interface. The states of sensors

easily change by toggle. The red sensors are set to arm and other sensors are set to disarm. This is indicated by ⑥.

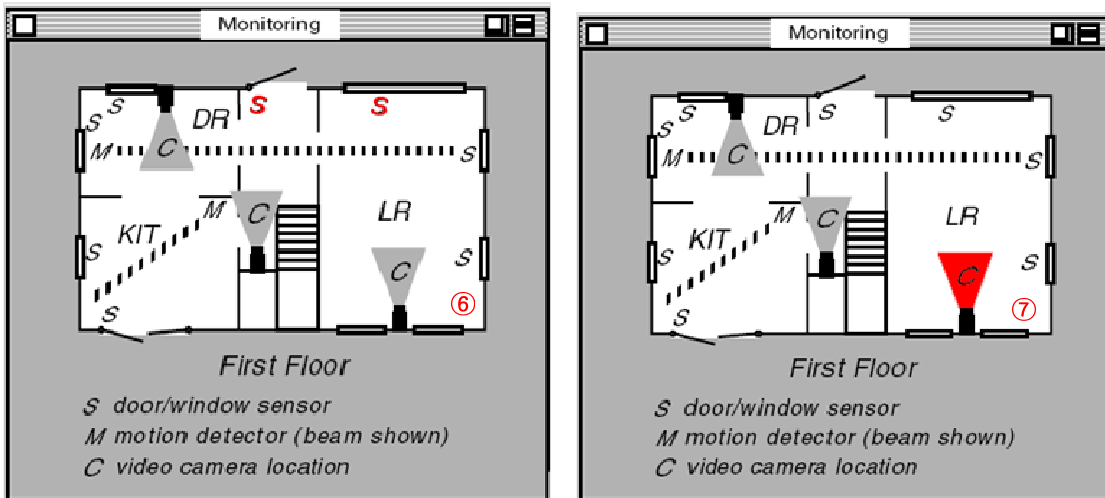


Figure 11 – Setting the sensor and camera to operate

Furthermore, user can turn on/off cameras by toggle. The red camera is turned on camera and other camera is turned out cameras. It is indicated by ⑦.

User can select some sensors or deselect some sensors so that make configure security zone. The security zone can also include cameras for surveillance. User can also delete the security zone.

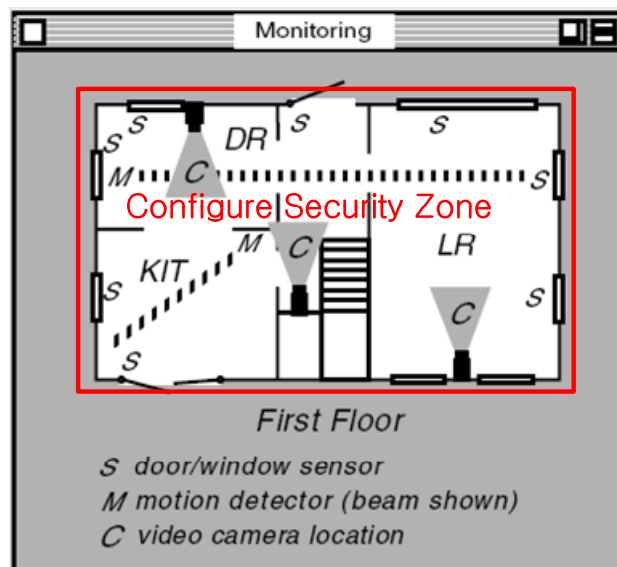


Figure 12 – Configuration of security zone

## 4.2 Hardware Interfaces

The hardware interface looks like [Fig 13] that placed below. There is small LCD display that indicated by ① to display information of SafeHome. Keypad to control the SafeHome system

is placed in box that indicated by ②. The states of system such as armed, power are showed in box ③.

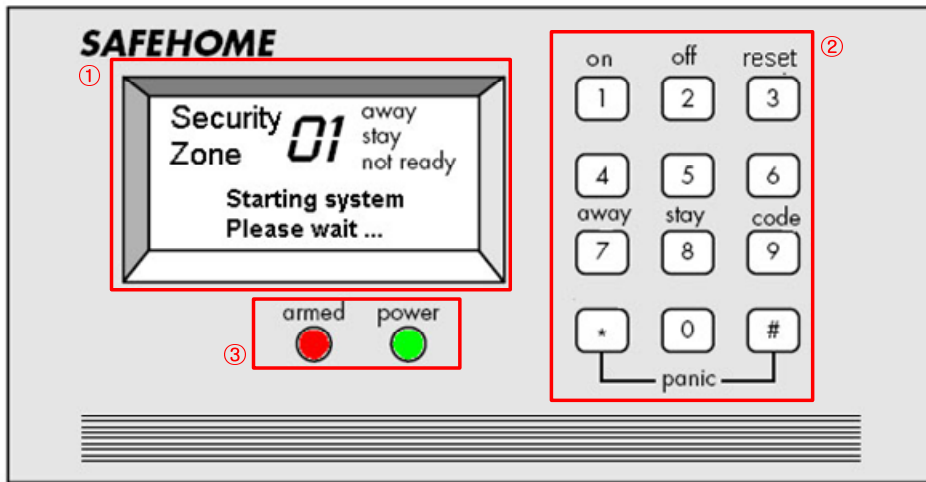


Figure 13 – Hardware interface of SafeHome system

The homeowner observes the SafeHome control panel to determine if the system is ready for input. If the system is not ready a *not ready* message is displayed on the LCD display, and the homeowner must physically close windows/doors so that the *not ready* message disappear.

The homeowner uses the keypad to key in a four-digit password. The password is compared with the valid password stored in the system. If the password is incorrect, the control panel will beep once and reset itself for additional input. If the password is correct, the control panel awaits further action.

The homeowner selects and keys in stay or away to activate the system. Stay activates only perimeter sensors (inside motion detecting sensors are deactivated). Away activates all sensors.

When activation occurs, a red alarm light can be observed by the homeowner.

### 4.3 Communication Interfaces

The SafeHome system uses 802.11b standard to communicate with sensor and central processor. The information of 802.11b are listed below.

Table 6 – Information of 802.11b

Frequency band	Throughput (typical)	Net bit rate	Range (indoor)
2.4 GHz	4.5 Mbit/s	11 Mbit/s	~38 m

802.11b has a maximum raw data rate of 11 Mbit/s and uses the same media access method defined in the original standard. 802.11b products appeared on the market in early 2000, since 802.11b is a direct extension of the modulation technique defined in the original standard. The dramatic increase in throughput of 802.11b (compared to the original standard) along with simultaneous substantial price reductions led to the rapid acceptance of 802.11b as the definitive wireless LAN technology. 802.11b devices suffer interference from other products operating in the 2.4 GHz band. Devices operating in the 2.4 GHz range include: microwave ovens, Bluetooth devices, baby monitors and cordless telephones.

## 5 Other Nonfunctional Requirements

### 5.1 Performance Requirements

**PR-1:** All Web pages generated by the system shall be fully downloadable in no more than 10 seconds over a 40KBps modem connection.

**PR-2:** With the local network, the system should reply the user's requests within at most 3 seconds. With the remote control, the system should reply the user's requests within at most 5 seconds.

**PR-3:** Cameras' displays should be no more than 3 seconds later than the real-time.

**PR-4:** In the ideal case (no network or power interruption), the system shall be able to run 24 hours a day, 7 days a weeks.

**PR-5:** The time between detecting an intruder or an accident and alarming the case shall be within 1 second.

**PR-6:** Security tasks have the highest priority to other tasks. That means whenever there is a detection event, the event shall be reported immediately regardless of what feature the user is operating.

### 5.2 Safety Requirements

**SaR-1:** The system shall have UPS (Uninterruptible Power Supply) in the case electric stoppage happens. If camera pictures are recording, user must stop recording the picture and turn the PC off. The UPS shall be able to keep the system running for 24 continuous hours.

**SaR-2:** The system shall back up the camera records every month to the secondary storage. The secondary storages are then kept in the company and used if necessary.

### 5.3 Security Requirements

**SeR-1:** Security protocols shall be used in communications in networking.

**SeR-2:** Connection from remote control shall be lead through a proxy server provided by a reliable company/organization.

**SeR-3:** Information on web access to system shall be stored and monitored by the monitoring company to detect web hacking.

*SeR-4:* With the web interface, data shall be encrypted before transferring on the network line.

## **5.4 Software Quality Attributes**

*SQA-1:* User can request service for any hardware/software errors and malfunctions at any time. Company will respond by telephone or visit customer to fix the customer request when request is received.

*SQA-2:* Control panels are installed anywhere inside the house, but one shall be installed in front of the main door since the user will have enough time when leaving and getting back the house.

*SQA-3:* Web interface shall be easy to use and provide an as convenient and easy to use as the control panel provides.

*SQA-4:* When the Internet connection is broken, the system shall ask the home owner for changing to telephone line.

*SQA-5:* Regardless of the user's IT capability, drawing of the house's floor plan shall be serviced.

## **5.5 Storage Requirements**

*StR-1:* The system shall be able to store at least 1000 hours of camera record.

*StR-2:* Secondary storage shall always be available for moving out the old records.



## 6 Traceability Matrix

Table 7 – Functional requirements and system features traceability matrix

Use cases by system features	Secure the house					Observe the house							Configure the system			
	Functional requirements															
	Arm the system	Disarm the system	Detect an intruder or accident	Respond to security alarm events	Request help in panic cases	Turn on/off some cameras	Pan the viewed camera	Zoom in/out the display	View the inside /outside of the house	Record the display	Send an emergency message to monitoring company	Playback a record	Manage user account and passwords	Configure the floor plan	Configure the surveillance zones	Configure the security zones
Secure.Operation	√	√	√	√	√											
Secure.Operation.Interface																

	Arm the system	Disarm the system	Detect an intruder or accident	Respond to security alarm events	Request help in panic cases	Turn on/off some cameras	Pan the viewed camera	Zoom in/out the display	View the inside /outside of the house	Record the display	Send an emergency message to monitoring company	Playback a record	Manage user account and passwords	Configure the floor plan	Configure the surveillance zones	Configure the security zones
Secure.Operation.Number	√	√	√	√	√											
Secure.Operation.Display																
Secure.Operation.Ready	√	√														
Secure.Check	√	√														
Secure.Check.Error.Repeat																
Secure.Check.Error.Inform																
Secure.Password	√	√		√												
Secure.Password.ControlPanel	√	√		√												
Secure.Password.WebInterface	√	√		√												
Secure.Password.CPWrong	√	√		√												
Secure.Password.WIWrong	√	√		√												
Secure.Password.Store																
Secure.Mode	√	√														
Secure.Mode.ControlPanel	√	√														
Secure.Mode.WebInterface	√	√														
Secure.Mode.Change	√	√														
Secure.Mode.Disarm		√														

	Arm the system	Disarm the system	Detect an intruder or accident	Respond to security alarm events	Request help in panic cases	Turn on/off some cameras	Pan the viewed camera	Zoom in/out the display	View the inside /outside of the house	Record the display	Send an emergency message to monitoring company	Playback a record	Manage user account and passwords	Configure the floor plan	Configure the surveillance zones	Configure the security zones
Secure.Mode.CPAway	√															
Secure.Mode.WIAway	√															
Secure.Task.Conflict	√	√	√	√												
Secure.Task.Timeout	√	√	√													
Secure.Detect.Alarm				√												
Secure.Detect.Alarm.Info			√													
Secure.Detect.Alarm.Suspend			√													
Secure.Detect.Alarm.Turnoff				√												
Secure.Panic					√											
Secure.Panic.Alarm					√											
Secure.Disarm		√														
Secure.Remote.Connection																
Secure.Remote.Data																
Observe.Operation						√	√	√	√	√	√	√				
Observe.Operation.Number						√	√	√	√	√	√	√				
Observe.Password						√	√	√	√	√	√	√				

	Arm the system	Disarm the system	Detect an intruder or accident	Respond to security alarm events	Request help in panic cases	Turn on/off some cameras	Pan the viewed camera	Zoom in/out the display	View the inside /outside of the house	Record the display	Send an emergency message to monitoring company	Playback a record	Manage user account and passwords	Configure the floor plan	Configure the surveillance zones	Configure the security zones
Observe.Password.WebInterface						√	√	√	√	√	√	√				
Observe.Password.WIWrong						√	√	√	√	√	√	√				
Observe.Password.Store																
Observe.Display.Number						√	√	√	√							
Observe.Display.Image						√	√	√	√							
Observe.Display.Image.Encrypt																
Observe.Display.Reconnect																
Observe.Emergency											√					
Observe.Emergency.Cancel											√					
Observe.Camera						√	√	√	√							
Observe.Camera.Zones						√	√	√	√							
Observe.Camera.Off						√	√	√	√							
Observe.Record										√						
Observe.Record.Time										√						
Observe.Record.Before										√						
Observe.Record.Key										√						

	Arm the system	Disarm the system	Detect an intruder or accident	Respond to security alarm events	Request help in panic cases	Turn on/off some cameras	Pan the viewed camera	Zoom in/out the display	View the inside /outside of the house	Record the display	Send an emergency message to monitoring company	Playback a record	Manage user account and passwords	Configure the floor plan	Configure the surveillance zones	Configure the security zones
Observe.Playback										√						
Observe.Remote.Display						√	√	√	√	√	√	√				
Observe.Remote.Interrupt						√	√	√	√	√	√	√				
Observe.Remote.Data						√	√	√	√	√	√	√				
Configure.Operation													√	√	√	√
Configure.Operation.Number													√	√	√	√
Configure.Password.WebInterface													√			
Configure.Password.WIWrong													√			
Configure.Password.Store													√			
Configure.Security.Sensors																√
Configure.Security.Zones																√
Configure.Surveillance.Camera															√	
Configure.Surveillance.Zones															√	
Configure.Info													√	√	√	√
Configure.Info.WebPassword.Length													√			

	Arm the system	Disarm the system	Detect an intruder or accident	Respond to security alarm events	Request help in panic cases	Turn on/off some cameras	Pan the viewed camera	Zoom in/out the display	View the inside /outside of the house	Record the display	Send an emergency message to monitoring company	Playback a record	Manage user account and passwords	Configure the floor plan	Configure the surveillance zones	Configure the security zones
Configure.Info.CPPassword.Length													√			
Configure.Info.Password													√			
Configure.Info.Password.Change													√			
Configure.FloorPlan.Devices														√		
Configure.Save													√	√	√	√
Configure.Remote.Data																

## 7 Management Structure & Planning

### 7.1 Project Lifecycle

This SafeHome project follows the waterfall model. The evolutionary models are unable to use because the period of project is relatively short. The stages of waterfall model are described in below figure [Fig. 14].

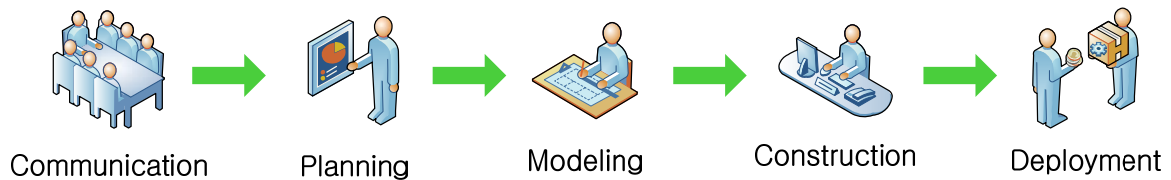


Figure 14 – Project life cycle

There are required works for each stage. The below [Table 8] shows this kind of works.

Table 8 – Works in each stage

Stage	Work to do
Communication	Project initiation, requirement gathering
Planning	Scheduling, tracking
Modeling	Analysis, design
Construction	Coding, testing
Deployment	Delivery, feedback

This SafeHome project does not have real customer so the feedback from customer will not exist.

### 7.2 Roles and Responsibilities

Table 9 –Role and Responsibility

Role	Responsibility
Project Manager	Manage the whole project
Planning and Tracking Lead	Make a plan for project and investigation
Requirements Lead	Extracting customer requirements
Analysis Lead	Analysis requirements
Design Lead	Design whole system
Implementation Lead	Manage development of subprograms Manage integrating of subprograms
Development Engineer	Developing program

Table 10 – period of role

Role	Staff Member	Start Date	End Date
Project Manager	Jinho	Feb. 16	Apr. 28
Planning and Tracking Lead	Jun Su	Feb. 18	Mar. 10
Requirements Lead	Jinho	Feb. 18	Mar. 10
Analysis Lead	Khanh	Mar. 11	Mar. 24
Design Lead	Jun Su	Mar. 25	Apr. 12
Implementation Lead	Khanh	Apr. 13	Apr. 28

### 7.3 Communication

Table 11 – How to communicate

	Member	Date	Remarks
<b>Off-line Meeting</b>	All team members	Twice a week (Wed, Fri)	Notice the place Previously
<b>On-line Meeting</b>	Members who need to discuss	At any time	Use Messenger
<b>Sharing Documents</b>	All team members	At any time	Thorough e-mail Use totoiseSVN

### 7.4 Risk Management

Table 12 – Risk Management

Risk	Probability	Impact	RMMM
<b>Lack of Available time</b>	0.2	Impossible to submit the results by due date	Another team member who has available time support
<b>Demotivation</b>	0.3	Impossible to submit the results by due date	Having a time for a change of air
<b>Absent to off-line meeting</b>	0.3	Hard to understand details of project	Deliver the meeting minutes to absent person






## 7.5 Resources Identification

### 7.5.1 Staffs

This SafeHome project has 3 team members. The below [Table. 13] shows the picture and profile of each team members

Table 13 – profile of team members

Picture	Profile	
	Department	Computer Science
	Name	Kim Jun Su
	Course	Master
	E-mail	<a href="mailto:unikei@gmail.com">unikei@gmail.com</a>
	C.P.	010-2025-1217
	Department	Computer Science
	Name	Le Do Tuan Khanh
	Course	Master
	E-mail	<a href="mailto:khanh@se.kaist.ac.kr">khanh@se.kaist.ac.kr</a>
	C.P.	010-4386-0623
	Department	Computer Science
	Name	Jinho Choi
	Course	PhD
	E-mail	<a href="mailto:jhchoi@se.kaist.ac.kr">jhchoi@se.kaist.ac.kr</a>
	C.P.	010-5076-3544

The change of team member does not happen.

### 7.5.2 Times

Table 14 – evaluation day of each work

	Work to do	Evaluation Day
1st	Extract Requirement	Mar. 2
2nd	Make Use-Cases	Mar 9
3rd	<b>Complete SRS</b>	<b>Mar. 9</b>
4th	Requirement Analysis	Mar. 15
5th	Build Analysis Model	Mar. 22
6th	<b>Complete Analysis</b>	<b>Mar. 23</b>
7th	Design Core Functions	Apr. 3

	Work to do	Evaluation Day
8th	Design remain Functions	Apr. 9
9th	<b>Complete Design</b>	<b>Apr. 11</b>
10th	Implement Modules	Apr. 20
11th	Integrate Modules	Apr. 24
12th	Test and refactoring	Apr. 27
13th	<b>Complete Implementation</b>	<b>Apr. 27</b>

### 7.5.3 Materials

Table 15 - Materials

Equipment	Quantity	Purpose	How to supply
PC	3	Development/ Documentation	Use a personal computer
Labtop	1	Meeting	Lend one
Beam Projector	1	Presentation	Already placed in lecture room
Printer	1	Printing document	Use the one in CS department

## 7.6 Resources Allocation

### 7.6.1 Milestones

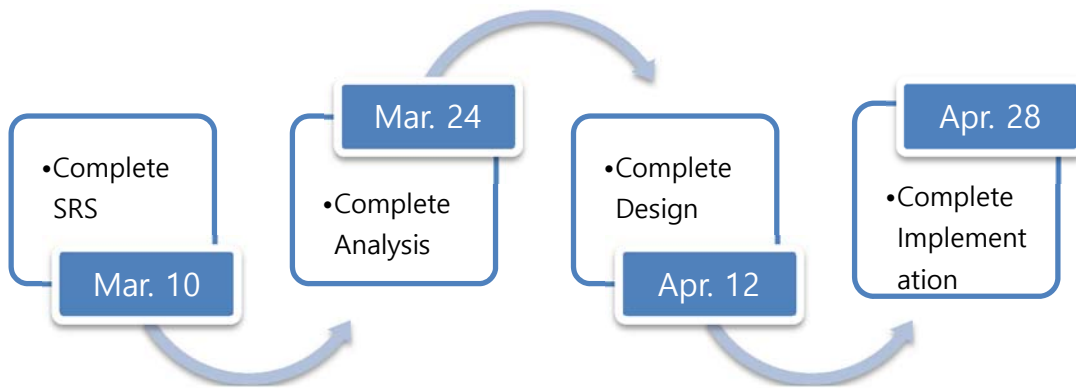


Figure 15 - Milestones



## 8 Technical Process

### 8.1 Environments

Table 16 – Environment to develop

Environment	
Operating System	Microsoft Windows XP
Language	Java
Library	TBD
GUI	TBD

### 8.2 Methods, Tools, and Techniques

#### 8.2.1 Methods and Techniques

Table 17 – Method, Technique & Purpose

Methods & Techniques	Purpose
Unified Modeling Language	To make Use-Case Diagram, Design
SVN (googlecode server)	Project resource and artifacts management
Meeting	Discuss complex problems and make decisions

#### 8.2.2 Tools

Table 18 – Tool & Purpose

Tools	Purpose
Microsoft Word 2007	Word processing
Microsoft PowerPoint 2007	Presentation
Microsoft Visio 2007	Drawing diagrams
Eclipse	Development IDE
StarUML	Make UML
Adobe Photoshop CS2	Modifying Image
Microsoft Windows Live Messenger	On-line meeting
TortoiseSVN	SVN client

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## Appendix B: Glossary

- **Home security:** the activities to maintain the safety of the house such as protecting the house from the unauthorized intruders, restricting the house access from authorized visitors and detecting the unexpected dangers (fire) or accidents (heart attack)
- **Home surveillance:** the activities to keep track of the house's status via the cameras placed inside and outside
- **Control panel:** the electronic panel attached on the main door of the house, composing of a small status monitor and a number of control buttons to perform the security functions around the house. A visual illustration of control panel is shown in Chapter 4.2.
- **Web interface:** the user-system's interaction interface that accepts input and provides output by generating web pages which are transmitted via the (Internet or local) network and viewed by the user using a web browser program [Wikipedia].
- **Security zone:** Some of the sensors and motion detectors are grouped together to define a security zone. The security zones regulate the authority and restriction to parts of the house and may overlap each other.
- **Surveillance zone:** Some of the cameras are grouped together to define a surveillance zone. The surveillance zones regulate the home owner's observation to parts of the house and may overlap each other.
- **"Stay"/"Away" modes:** The "Stay"/"Away" modes are the system's configurations in which some of the security zones are enabled and some of the surveillance zones are enabled. Literally, the "Stay" mode provides barely enough security and surveillance to comfort the staying home owner, while "Away" mode provides a standard high level of security and surveillance around the house when the home owner is away.
- **Sensor:** A device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument [Wikipedia].
- **Motion detector:** A device that contains a physical mechanism or electronic sensor that quantifies motion that can be either integrated with or connected to other devices that alert the user of the presence of a moving object within the field of view [Wikipedia].

- ***Arm/disarm:*** The activities to activate/deactivate some predefined sensors and motion detectors in/out-side of the house. Arm has an abstract meaning which can be set as "Stay" mode, "Away" mode or a complex mode. Whereas, disarm has a single meaning of deactivate all the in-operation sensors and motion detectors.
- ***House condition:*** The condition of the devices or parts of the houses which are sensor-attached. An opened door or window may cause the house condition an error condition when the home owner wants the system to arm the house.
- ***Central processor:*** The central processor encompasses the control software (the main part of SafeHome project), which can be accessed via control panel interface or web interface, and a web server to support the wireless network over the house as well as the remote control far away from the house.



## Appendix C: Meeting Minutes

### 1<sup>st</sup> Meeting – Requirement Specification

**Minutes**                      **Feb 27<sup>th</sup> 2009**                      **4:00pm-6:00pm**

NOTE TAKER	Le Do Tuan Khanh
ATTENDEES	Jinho Choi, Junsu Kim, Le Do Tuan Khanh

### Agenda topics

4:00PM-6:00PM                      Work Allocation

DISCUSSION		
	1. Introduction	
	2. Overall description	
	3. Management structure and planning	
CONCLUSIONS		
	1. Introduction	
	1.1. Purpose	
	1.1.1. Purpose of the SRS document	
	1.1.2. Targeted audience	
	1.2. Definitions and Acronyms	
	1.3. Overview: story of the need of product	
	1.4. Scope: limit to Home Security & Home Surveillance (detailed explanation)	
	1.5. Deliverables	
	1.5.1. Control processor	
	1.5.2. Supplementary devices	
	1.5.3. Manuals	
	1.5.4. Control panel (software & hardware)	
	1.5.5. Administration GUI	
	1.5.6. Remote control GUI	
	1.6. Assumptions	
	1.6.1. Story assumptions	
	1.6.2. Construction assumptions	
	2. Overall description	
	3. Management Structure and Planning	
	Detail of these parts is described in the "SRS for SafeHome.docx" file on SVN/trunk	
ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
1.1, 1.5, 2.1.1-2.1.4	Jinho Choi	Tue, Mar 3 <sup>rd</sup> 2009

1.3, 1.6, 2.1.5, 2.1.8	Khanh	Tue, Mar 3 <sup>rd</sup> 2009
1.4, 2.1, 4	Junsu Kim	Tue, Mar 3 <sup>rd</sup> 2009

6:00PM-6:00PM                      Next Meeting

<b>DISCUSSION</b>	NEXT MEETING WILL BE HELD : Tue, Mar 3 <sup>rd</sup> 2009, 10:00am ---- DURATION: 2 hours
1. Review assigned work	
2. Discuss detail functional & non-functional requirements	
3. Allocate work and make plan	

<b>SPECIAL NOTES</b>	SRS documents (individual works) should be done in separate files in order to not contaminate the original version. Merge later!
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## 2<sup>nd</sup> Meeting – Requirement Specification

**Minutes**

**Mar 2<sup>nd</sup> 2009**

**9:00pm-  
11:00pm**

<b>NOTE TAKER</b>	Jinho Choi
<b>ATTENDEES</b>	Jinho Choi, Junsu Kim, Le Do Tuan Khanh

### Agenda topics

9:00PM-11:00PM                      Work Allocation

<b>DISCUSSION</b>	
1. Change of the contents table	
2. Elaborate the system's business	
<b>CONCLUSIONS</b>	

1. Introduction
  - 1.1. Purpose
  - 1.2. Definitions and Acronyms
  - 1.3. Intended Audience and Reading Suggestions
  - 1.4. Project Scope
  - 1.5. Definitions and Acronyms
2. Overall description
3. System Features
4. External Interface Requirements
5. Other Nonfunctional Requirements

- 6. Other Requirements
- 7. Manage Structure and Planning
- 8. Technical Process

Detail of this format included system's business discussion will be uploaded to the SVN server.

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
Ch 1 , 2, 3	Jinho Choi, Khanh	Tue, Mar 6 <sup>th</sup> 2009
Ch 7, 8	Junsu Kim	Tue, Mar 6 <sup>th</sup> 2009
Ch 4, 5, 6	Jinho Choi, Khanh, Junsu Kim	Tue, Mar 9 <sup>th</sup> 2009

11:00PM- Next Meeting

DISCUSSION	NEXT MEETING WILL BE HELD : Tue, Mar 6 <sup>th</sup> 2009, 7:00pm
1. Review the assigned work (Ch1, 2, 3)	
2. Allocate new work	

SPECIAL NOTES	SRS documents (individual works) should be done in separate files in order to not contaminate the original version. Merge later!
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### 3<sup>rd</sup> Meeting – Requirement Specification

**Minutes**                      **Mar 6<sup>th</sup> 2009**                      **7:00pm-9:00pm**

NOTE TAKER	Le Do Tuan Khanh
ATTENDEES	Jinho Choi, Junsu Kim, Le Do Tuan Khanh

#### Agenda topics

**7:00PM-9:00PM**                      **Work Allocation**

DISCUSSION	
1. Review the system features	
2. Discuss about security zones and the sample questions from professor	
CONCLUSIONS	
1. Zones are separated into <ul style="list-style-type: none"> <li>1.1. Security zones : contains only sensors and motion detectors</li> <li>1.2. Surveillance zones : contains only cameras (this means the system allows to turn on/off the cameras)</li> </ul>	

2. Stay/Away modes are combination of several security zones and surveillance zones.
3. Floor plan shall be dynamically reconfigured by user.
4. Multiple control panels will be placed around the house
5. When a connection between control panel or web interface and central processor is established for a task, no other connection can be established.
6. The system uses moving pictures for small data transference and storing.
7. Web interface serves only one user (for a house) at a time.
8. Three main system features are decided

8.1. Secure the house

This feature is to correspond to the security function of the SafeHome system

8.2. Observe the house

This feature is to correspond to the surveillance function of the SafeHome system

8.3. Configure the house

This feature is to provide a means to configure such system's parameters as

- Security zones
- Surveillance zones
- User accounts and 2 levels of password
- Floor plan

Table of contents has been modified a little bit, and detail of the work done has been uploaded on SVN server.

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
Review system features	Jinho Choi, Junsu Kim, Khanh	Tue, Mar 9 <sup>th</sup> 2009
External interface requirements	Junsu Kim	Tue, Mar 9 <sup>th</sup> 2009
Nonfunctional requirements	Jinho Choi	Tue, Mar 9 <sup>th</sup> 2009
Use case draft	Jinho Choi, Junsu Kim	Tue, Mar 10 <sup>th</sup> 2009
SRS presentation preparation	Khanh	Tue, Mar 11 <sup>th</sup> 2009

**9:00PM- Next Meeting**

DISCUSSION	NEXT MEETING WILL BE HELD : Tue, Mar 9 <sup>th</sup> 2009, 8:00pm
4. Review assigned work	
5. Synthesize and review the document	

SPECIAL NOTES	Next meeting will not be recorded because there will be no significant theme. Document will be completely synthesized on Mar 10 <sup>th</sup> 2009.
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## Appendix D: Who did what List

Table 19 – Who did what table

Task	Jinho Choi	Junsu Kim	Le Do Tuan Khanh
Making template		✓	✓
Technical preparation	✓		
Project scope definition	✓	✓	✓
Feature construction	✓		✓
Chapter 1 - Introduction			✓
Chapter 2 - Overall Description			✓
Chapter 3 - System Features	✓	✓	✓
Chapter 4 - External Interface Requirements		✓	
Chapter 5 - Other Nonfunctional Requirements	✓	✓	
Chapter 6 – Traceability Matrix	✓		
Chapter 7 – Management Structure & Planning		✓	
Chapter 8 – Technical Process		✓	
Appendix A – Term Index		✓	
Appendix B – Glossary			✓
Appendix C – Meeting Minutes	✓		✓
Appendix D – Who-did-what List			✓
Appendix E – Reference Materials	✓		
Document Review	✓	✓	✓
SRS presentation			✓
Use case scenario – Draft	✓	✓	

## Appendix E: Reference Materials

*Managing Software Requirements A Unified Approach*, Dean Leffingwell, Don Widrig, Addison-Wesley, 1999.

*Software Requirements: Styles and Techniques*, Soren Lauesen, Addison-Wesley, 2002.

*Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development - 3<sup>d</sup> Edition*, Craig Larman, Prentice Hall, 2005.

*UML Distilled 3<sup>d</sup> Edition: A Brief Guide to The Standard Object Modeling Language*, Martin Fowler, Addison Wesley, 2003.