C. Report No.3 Software Requirement Specification

1. User Requirement Specification

Nowadays, there are many reports about the unhealthy side-effects found in the foods we buy and eat. Large food which is introduced by chemical to grow food quicker and use pesticides to prevent loss from being destroyed by worms. In this country, it’s cheaper for a family to eat fast food or meats than it is to eat organically grown fruits and vegetables. In addition to the foods, we are developing industry and modern too fast with a lot of harmful effects for environment, air quality as poor as less space to relax after work at home. A small garden in house which is not only makes your house look good but they also keeps you healthy with fresh air and safe fruit or vegetables; this is also the best place to reduce stress and lighten mind which cannot be done being inside four walls. But we have to face too much pressure and differences works in day, this make us have less time to take care a garden day by day. Come from real needs, users want a system which help them to take care a small garden in house less time, smarter and flexibility. The system should meet the below needs:

1.1. Monitoring the status of garden

Users can tracking indexes of garden through sensors.

Users can monitor the status of garden from anywhere in anytime.

**1.2. Response with expected problems**

User can be notified when unexpected problems occurred of weather with their garden (rain, high temperature ...).

System can automatically react with problems which is harmful for garden.

**1.3. Manage the system**

Users can control one or multi devices to solve some specific tasks such as limit volume water for some kind of plant in blooming lately.

Users can manage all devices, tracking reliability and durability of devices; add, remove or configure a specific devices.

Users can start or stop any automatically actions in their garden

**1.4. Schedule**

Users can create a plan which using time of each device in the system such duration time of sensor measurements by manually or automatically.

Users will be received auto schedule after processing indexes on server.

Users need to be notified some reminder with situations which meet plant’s requirement or auto actions deadline nearly

**1.5. Consumption and durability**

All sensors which used in the system, have to a long battery life.

All sensors have a great durability when usually contact with water day by day.

**1.6. High security**

Users have to be authenticated before using the system

A user can only manipulate their own device (có phân chia user trong 1 khu vườn không?)

Data and commands which transmit in system via RF and Wi-Fi should be protected.

**1.7. Interoperability**

New end devices can be added to the system and interact with other ones regardless of manufacturing origin.

2. System Requirement Specification

2.1 External Interface Requirement

2.1.1. User interface

The interface must be designed to be satisfied the following requirement:

The interface is divided by tabs, which will allow users to easily switch between different parts of the program.

Be simple and user-friendly.

Meet all the main functions and easily to identify each of functions.

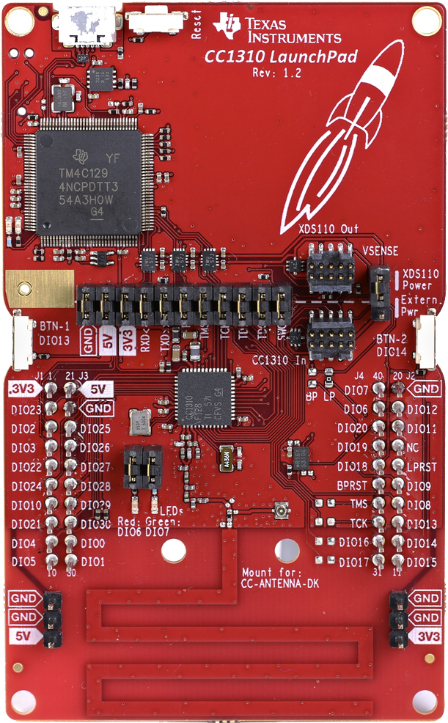
Use obvious icons to avoiding misunderstanding.

2.1.2. Hardware interface

The system use variety sensors which must transmit data via RF or Bluetooth to Controller to process and update via Wi-Fi to Internet where users can tracking system with mobile. So the hardware interface that the system using must be designed to be satisfied the following requirement:

* Low cost hardware sensors module which have reliability data and long endurance.
* Strong MCU have multi communication with sensors like I2C, SPI, UART; multi connection in system via RF, Bluetooth and Wi-Fi.
* Easy replace a node or a parts that not affect other parts in system

2.1.2.1. Device MCU – CC1310 Launchpad (Texas Instruments)



* ***Microcontroller***

- ARM Cortex M3

- EEMBC CoreMark Score: 142\*

- EEMBC ULPBench Score: 158\*

- Up to 48MHz Clock Speed

- 128KB of In-System Programmable Flash

- 8KB of SDRAM for Cache

- 20KB of Ultralow Leakage SRAM

- 2-Pin cJTAG and JTAG Debugging

- Supports Over-the-Air Upgrade (OTA)

* ***Ultralow Power Sensor Controller***

- Can Run Autonomous From the Rest of the System

- 16-bit Architecture

- 2KB of Ultralow Leakage SRAM for Code and Data

* ***Peripherals***

- All Digital Peripheral Pins Can Be Routed to Any GPIO

- Four General-Purpose Timer Modules (Eight 16-Bit or Four 32-Bit Timers, PWM Each)

- 12-Bit ADC, 200 ksamples/s, 8-Channel Analog MUX

- Continuous Time Comparator

- Ultralow Power Clocked Comparator

- Programmable Current Source

- UART – 2× SSI (SPI, MICROWIRE, TI) – I2C – I2S

- Real-Time Clock (RTC)

- AES-128 Security Module

- True Random Number Generator (TRNG)

- Support for Eight Capacitive Sensing Buttons

- Integrated Temperature Sensor for ARM

* ***Low Power***

- Wide Supply Voltage Range: 1.8 to 3.8 V

- Active-Mode RX: 5.5 mA

- Active-Mode TX at +10 dBm: 12.9 mA

- Active-Mode MCU 48 MHz Running Coremark: 2.5 mA (51 µA/MHz)

- Active-Mode MCU: 48.5 CoreMark/mA

- Active-Mode Sensor Controller at 24 MHz: 0.4 mA + 8.2 µA/MHz

- Sensor Controller, One Wake Up Every Second Performing One 12-Bit ADC Sampling: 0.85 µA

- Standby: 0.6 µA (RTC Running and RAM and CPU Retention)

- Shutdown: 185 nA (Wakeup on External Events)

* ***RF Section***

- Excellent Receiver Sensitivity –124 dBm using Long-Range Mode, –110 dBm at 50 kbps

- Excellent Selectivity: 52 dB

- Excellent Blocking Performance: 90 dB

- Programmable Output Power up to +14 dBm

- Single-Ended or Differential RF Interface

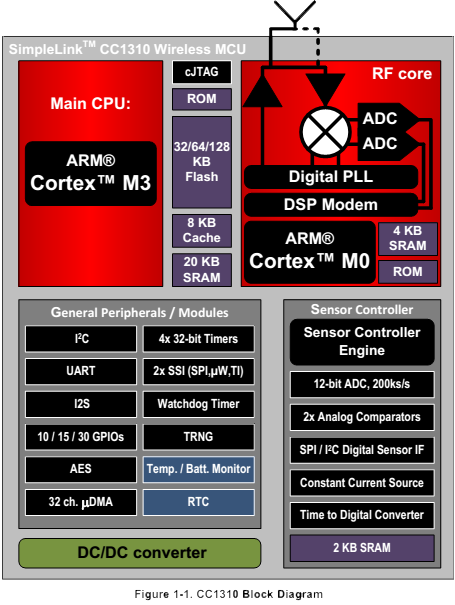
- Suitable for Systems Targeting Compliance with Worldwide Radio Frequency Regulations

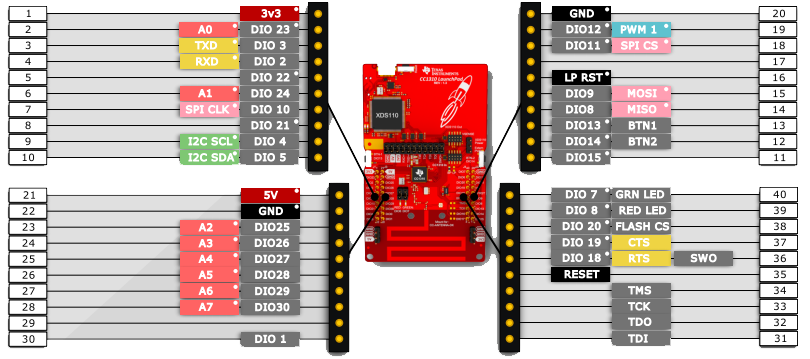
• ETSI EN 300 220, EN 303 131, EN 303 204 (Europe)

• FCC CFR47 Part 15 (US)

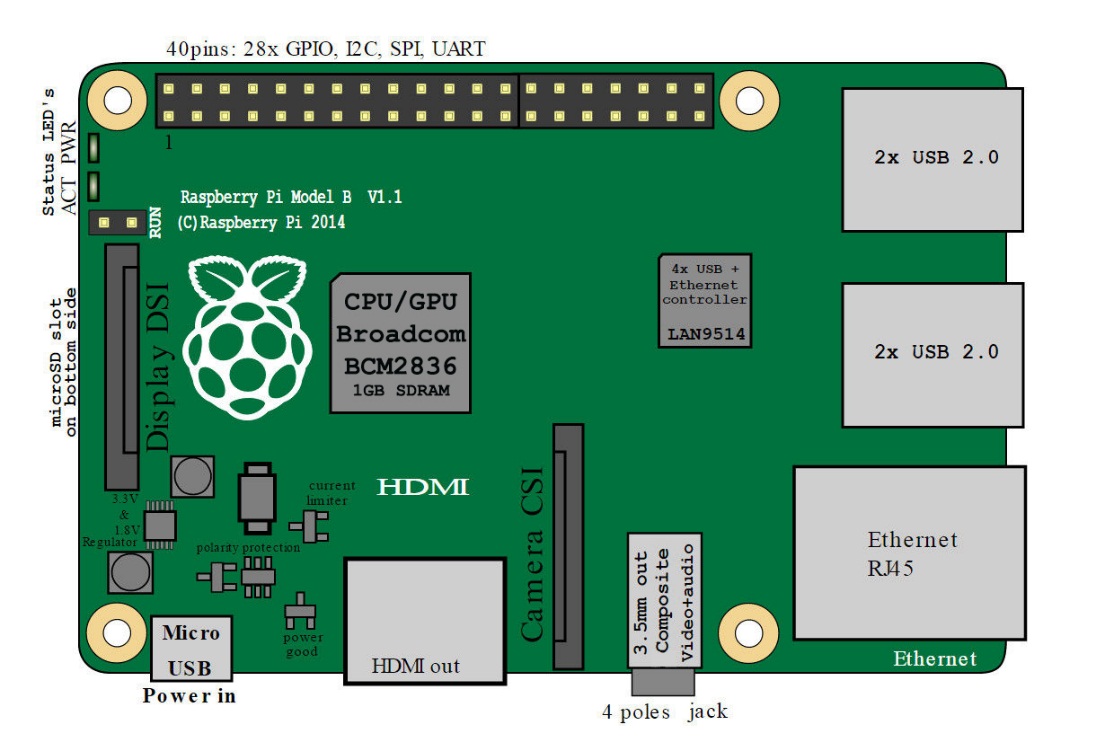
• ARIB STD-T108 (Japan)

- Wireless M-Bus and IEEE 802.15.4g PHY

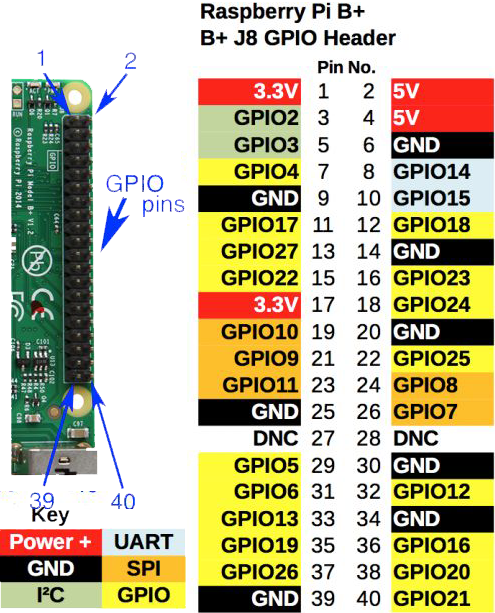




2.1.2.2. Device MCU – Raspberry Pi 3 Mode B

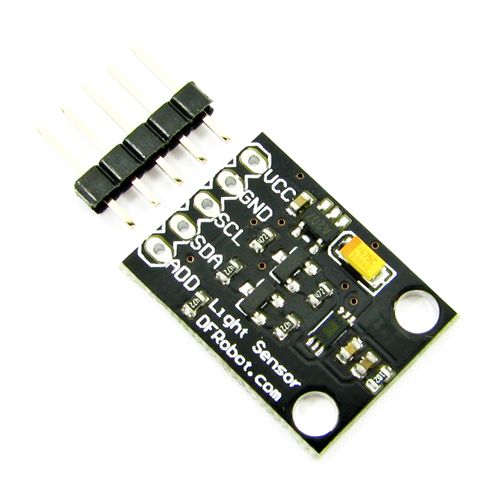


* ***A 1.2GHz 64-bit quad-core ARMv8 CPU***
* ***802.11n Wireless LAN***
* ***1GB RAM***
* ***4 USB ports***
* ***40 GPIO pins***
* ***Ethernet port***
* ***Micro SD card slot (now push-pull rather than push-push)***

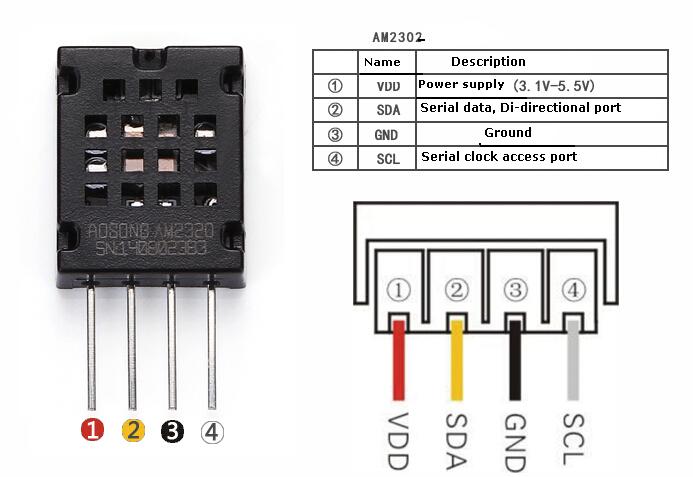


2.1.2.3. Sensors

*+ Light sensor:* which can get intensity of light around in a zone. Recommend: module BH1750 FVI

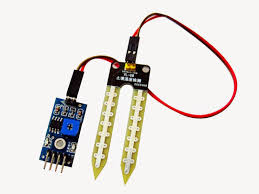
* Power input:
* Protocol: I2C

+ *Temperature and Humidity sensor:* get indexes of temperature and humidity in air. Recommend: AM2320



* Power input:
* Protocol: I2C

+ *Soil moisture sensor:* get index about humidity, water in soil

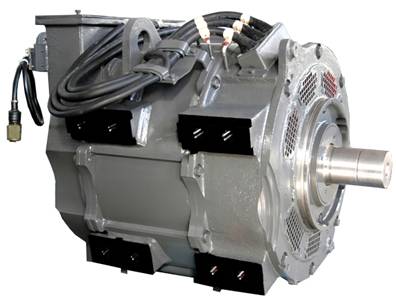


* Power input:
* Output: Analog, Digital

+ *PH sensor:* get index of pH degree in water

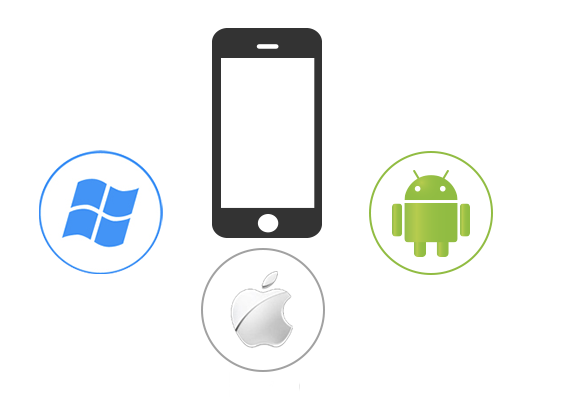
2.1.2.4. Actuators

The system must control actuators such as water pump, traction motor, and nebulizer which are used with 220V AC with relay.



2.1.2.5. Device users

The system is managed by user via mobile, so hardware interface for users is most popular in mobile market such as mobile using android, iOS or windows phone. We are recommend android mobile.



2.1.3. Software Interface

- Mobile Application: Android OS (v4.0 or above)

- Java Web server: Springs & Hibernate

- Database: MySQL

2.1.4. Communication Protocol

The system will applied to variety kinds of garden, small or large garden; it must satisfied distance communication in a garden. Users need a simple system which not affect too much garden’ space so electric wired between devices, so a wireless system is recommend with Wi-Fi and RF waves.

The device MCU in system have many kinds of protocol such as I2C, SPI, and UART to communicate with sensors. We recommend use I2C protocol to control easily and add more sensors to the systems.

2.2 System Overview Use Case

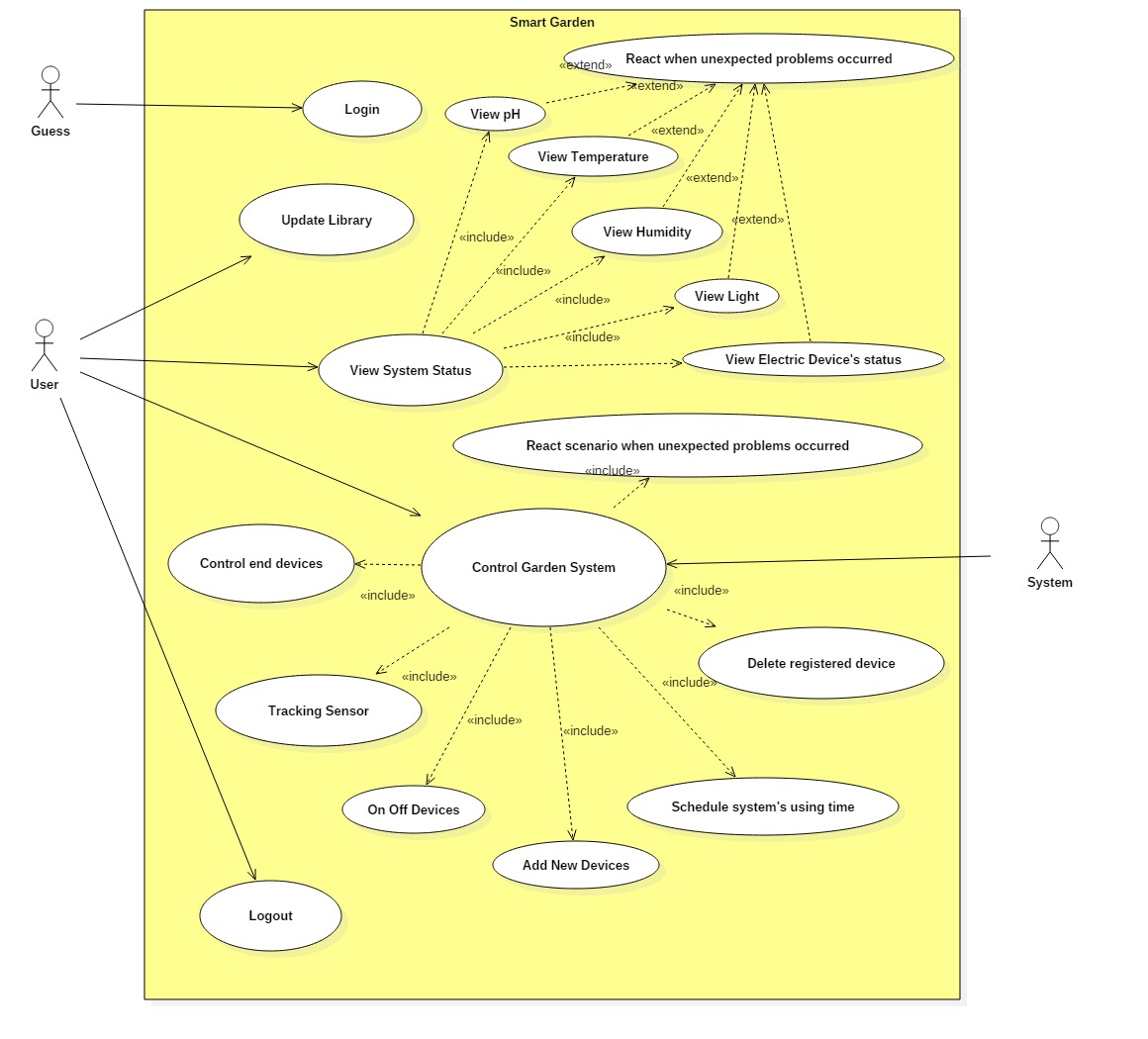


Figure 16. System overview use case

2.3. List of Use Case

2.3.1. <Member>,<Home owner> Overview Use Case

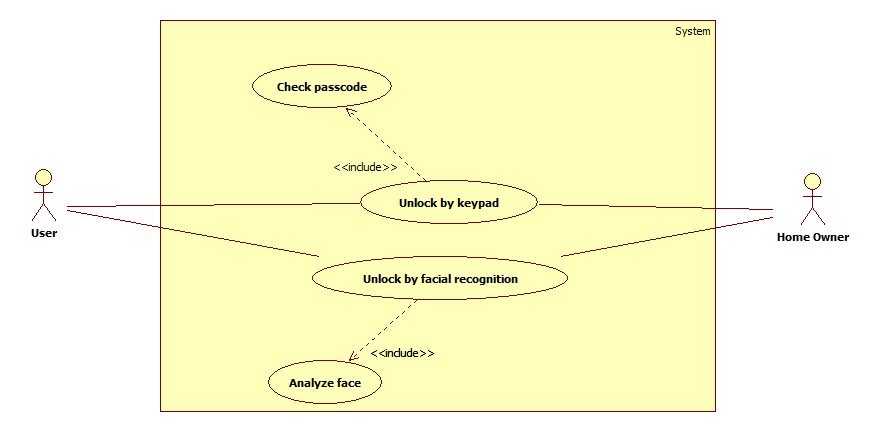


Figure 17 . <Member>,<Home owner> Overview use case

2.3.1.1. Unlock by keypad

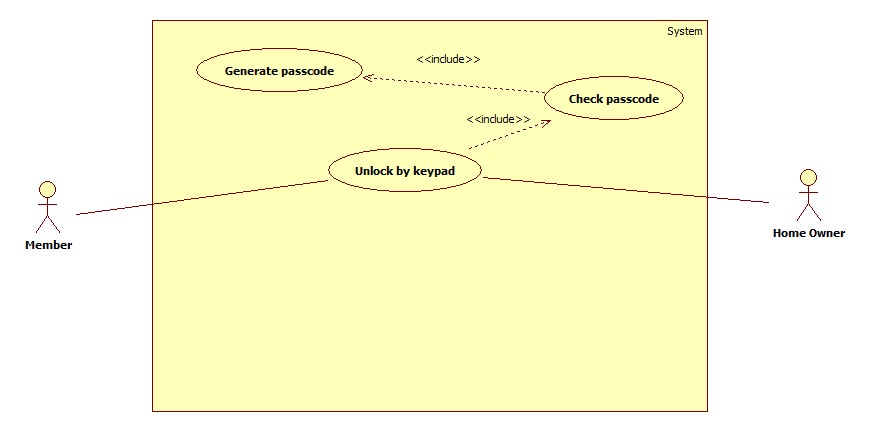


Figure 18. “Unlock by keypad” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – UUC01** | | | |
| **Use Case No.** | **UUC01** | **Use Case Version** | 2.0 |
| **Use Case Name** | Unlock by keypad | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Member  - Home owner  **Summary:**  - In case user can not unlock by facial recognition, user will use unlock by keypad mod to unlock. After switch mode, user will enter the passcode which is received by registered phone number.  **Goal:**  - User will unlock successfully.  **Triggers:**  - Press “2” button on keypad to open unlock keypad screen.  **Preconditions:**  - User entered “Unlock by keypad” screen.  **Post Conditions:**  - Success: User opens lock successfully. Lock will be opened.  - Fail: User can not unlock. Dialog will show message base on exception.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “2” button on keypad  [Alternative Scenario] | LCD will show screen with contains the following information  - Phone number: label  - Password: label | | 2 | Press “1” button on keypad | Phone number will be selected for user entered his phone number | | 3 | Press “\*” button on keypad | System will be exchange no line is selected to wait next action. | | 4 | Press “2” button on keypad | Password will be selected for user entered password | | 5 | Press “\*” button on keypad | System will be exchange no line is selected to wait next action. | | 6 | Press “A” button on keypad  [ Exception 1] | System will generate passcode and open “Enter passcode” screen. | | 7 | Press “0..9” button on keypad | Entered number of passcode | | 8 | Press “A” button on keypad  [ Exception 2]  [ Exception 3] | System check passcode and lock will be opened. |   **Alternative Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “C” button on keypad | Open “Enter passcode” screen. | | 2 | Press “0..9” button on keypad | Entered number of passcode | | 3 | Press “A” button on keypad | System check passcode and lock will be opened. |   **Exceptions:**   |  |  |  | | --- | --- | --- | | No | Actor Action | System Response | | 1 | User entered phone number which is not registered by home owner or invalid password | Dialog will show “Số điện thoại chưa được đăng kí hoặc mật khẩu không đúng” message. | | 2 | Press invalid passcode | Dialog will show “Mã khóa không đúng.” message. | | 3 | Press expired passcode | Dialog will show “Mã khóa đã hết hạn.” message. |   **Relationships:**  - Have <<include>> relationship with “Check passcode” use case.  **Business Rules:**  - Users will use unlock by keypad in case they are guests or they do not have permission to unlock by facial recognition.  - Users must have a phone number which is registered by home owner to receive the passcode.  - User will enter the passcode which is received to unlock.  - The expired time of the passcode is one hour after this is generated by system. And the passcode is one time passcode. | | | |

Table 9. ”Unlock by keypad” specification.

2.3.1.2. Unlock by facial recognition

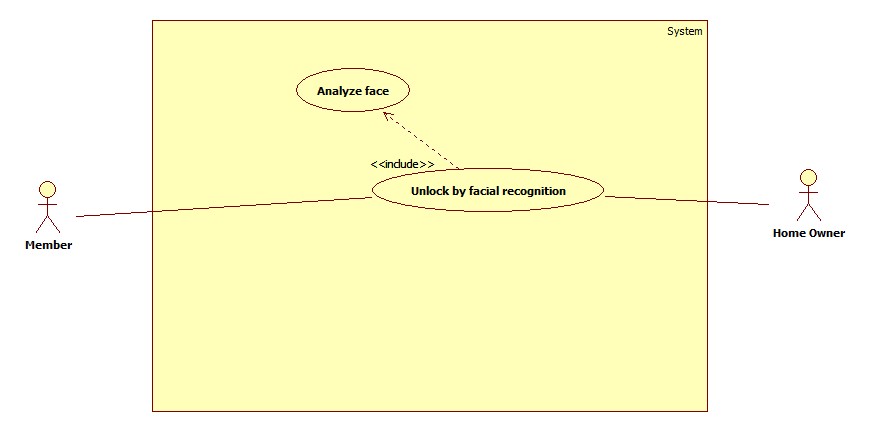


Figure 19. “Unlock by facial recognition” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – UUC02** | | | |
| **Use Case No.** | **UUC02** | **Use Case Version** | 2.0 |
| **Use Case Name** | Unlock by facial recognition | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Member  - Home owner  **Summary:**  - User will be opened lock by using face. User will stand in front of camera for system recognize, if system recognize successfully, lock will be opened.  **Goal:**  - User will unlock successfully.  **Triggers:**  - Press “1” button on keypad in “Menu” screen  **Preconditions:**  - User use mode unlock by facial recognition.  **Post Conditions:**  - Success: Lock will be opened.  - Fail: User can not unlock. Dialog will show message base on exception.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “1” button on keypad | Face of user will be shown in screen | | 2 | Stand in front of camera about 3-5 seconds and look at the camera.  [ Exception 1]  [ Exception 2] | Lock will be opened if system recognize successfully. |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | System can not recognize face | Dialog will show “Mở khóa không thành công” message. | | 2 | User is blocked | Dialog will show “Người dùng đã bị khóa” message. |   **Relationships:**  - Have <<include>> relationship with “Analyze face” use case.  **Business Rules:**  - Users will press “1” to active system and camera then stand front of the camera and check in LCD the position of their face and adjust for system easy recognition. | | | |

Table 10.”Unlock by facial recognition” specification.

2.3.2. <Home Owner> Overview Use Case

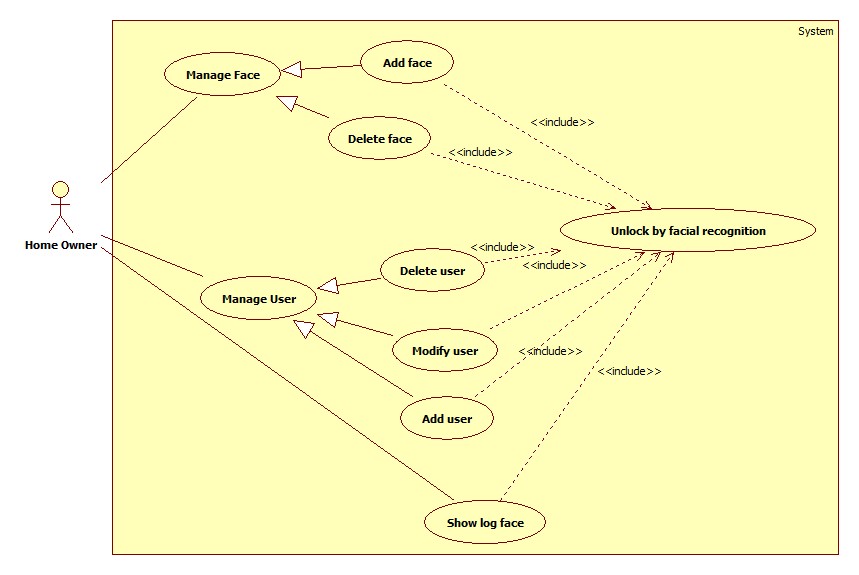


Figure 20. <Home owner> Overview use case

2.3.2.1. Add face

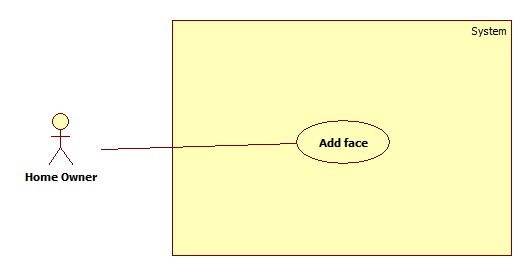


Figure 21. “Add face” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC01** | | | |
| **Use Case No.** | **HUC01** | **Use Case Version** | 2.0 |
| **Use Case Name** | Add face | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner will add list of face using when system recognize face. System will base on list of face to recognize and unlock if the user has face in database.  **Goal:**  - New face will be added into database.  **Triggers:**  - Press “1” button on keypad in “Face management” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  - Go to “Face management” screen  **Post Conditions:**  - Success: Add new face in database successfully. Message will be shown in LCD screen  “Thêm khuôn mặt thành công”  - Fail: User can not add new face in database. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “C” button to up and “D” button to down on keypad.  [ Exception 1] | Name of member will be changed base on user scroll the list | | 2 | Press “A” button on keypad | Select user will be added face | | 3 | Stand in front of camera then press “1” button on keypad. | System will capture new face and save it to database. After capture 10 pictures, dialog will show “Thêm khuôn mặt mới thành công.” message. | | 4 | Press “A” button to back “Face management” screen. | “Face management” screen will be shown. |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | User press “1” button on keypad | Dialog will show “Vui lòng chọn người dùng cần thêm khuôn mặt” message. |   **Relationships:**  - N/A  **Business Rules:**  **-**This face will belong user which is added so before add new face you need to add new user, this user will has attribute to let system know that user has not have face. Then system will show the name of users who have not face in table.  - 10 pictures will be captured then executed after save into database. | | | |

Table 11.”Add face” specification.

2.3.2.2. Delete face

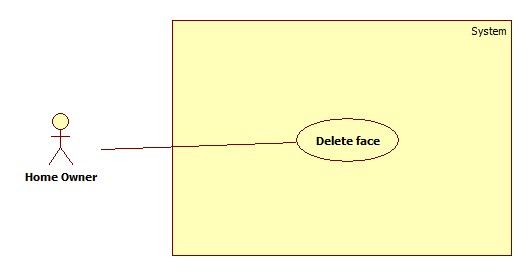


Figure 22. “Delete face” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC02** | | | |
| **Use Case No.** | **HUC02** | **Use Case Version** | 2.0 |
| **Use Case Name** | Delete face | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner will delete face in database when user wants to add new face into database. System will base on list of face to recognize and unlock if the user has face in database.  **Goal:**  - New face will be added into database.  **Triggers:**  - Press “2” button on keypad in “System management” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  **Post Conditions:**  - Success: Delete face in database successfully. Message will be shown in LCD screen “Xóa khuôn mặt thành công”.  - Fail: User can not delete face in database. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “C” button to up and “D” button to down on keypad. | Name of member will be changed base on user scroll the list | | 2 | Press “2” button on keypad  [Exception 1] | Confirm dialog will show”Bạn muốn xóa khuôn mặt này?” message. | | 3 | Press “A” button on keypad | Face will be deleted in database |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | Press “B” button on keypad | Face will not be deleted in database |   **Relationships:**  **-** N/A  **Business Rules:**  **-** Table will list all users who have existed face in database. After user delete face, user can use add face to add new face. If user does not have any face in database this user will not appear in table. | | | |

Table 12.”Delete face” specification.

2.3.2.3. Add user

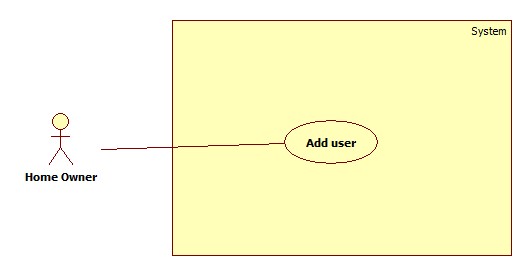


Figure 23. “Add user” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC03** | | | |
| **Use Case No.** | **HUC03** | **Use Case Version** | 2.0 |
| **Use Case Name** | Add user | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner will add new user into database that means new user can unlock by using facial recognition or unlock by keypad.  **Goal:**  - New user will be added into database.  **Triggers:**  - Press “1” button on keypad in “User management” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  - Go to “User management” screen.  **Post Conditions:**  - Success: Add new user in database successfully. Message will be shown in LCD screen “Thêm người dùng thành công”  - Fail: New user can not be added in database. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “1” button on keypad  [ Exception 1]  [ Exception 2] | Phone number will be selected for user entered his phone number | | 2 | Press “\*” button on keypad | System will be exchange no line is selected to wait next action. | | 3 | Press “2” button on keypad  [ Exception 2] | Role will be selected for user choose role | | 4 | Press “\*” button on keypad | System will be exchange no line is selected to wait next action. | | 5 | Press “3” button on keypad  [ Exception 1]  [ Exception 2] | Password will be selected for user entered password | | 6 | Press “\*” button on keypad | System will be exchange no lie is selected to wait next action. | | 7 | Press “A” button on keypad | New user will be added into database |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | Press character | Dialog will show “Vui lòng nhập số” message. | | 2 | Press “A” button | Dialog will show “Vui long điền đầy đủ thông tin” message. |   **Relationships:**  **-** N/A  **Business Rules:**  **-** User has home-owner or member role when add user.  - After add new user, user can add new face. | | | |

Table 13.”Add user” specification.

2.3.2.4. Modify user

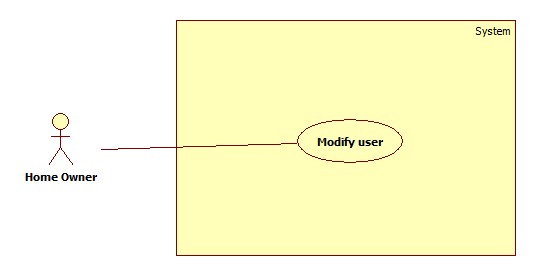


Figure 24. “Modify user” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC04** | | | |
| **Use Case No.** | **HUC04** | **Use Case Version** | 2.0 |
| **Use Case Name** | Modify user | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner will update user’s information includes phone number, password, status of user into database.  **Goal:**  - New information of user will be updated into database.  **Triggers:**  - Press “2” button on keypad in “User management” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  - Go to “User management” screen, select user to update by press “C” button to up and “D” button to down.  **Post Conditions:**  - Success: Update user in database successfully. Message will be shown in LCD screen “Cập nhật người dùng thành công”.  - Fail: New user can not be added in database. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “1” button on keypad  [ Exception 1]  [ Exception 2] | Phone number will be selected for user entered his phone number | | 2 | Press “\*” button on keypad | System will be exchange no line is selected to wait next action. | | 3 | Press “2” button on keypad  [ Exception 2] | Role will be selected for user choose role | | 4 | Press “\*” button on keypad | System will be exchange no line is selected to wait next action. | | 5 | Press “3” button on keypad  [ Exception 1]  [ Exception 2] | Password will be selected for user entered password | | 6 | Press “\*” button on keypad | System will be exchange no lie is selected to wait next action. | | 7 | Press “A” button on keypad | Update new information of user into database. |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | Press character | Dialog will show “Vui lòng nhập số” message. | | 2 | Press “A” button | Dialog will show “Vui long điền đầy đủ thông tin” message. |   **Relationships:**  **-** N/A  **Business Rules:**  **-** User who is blocked can not unlock by using facial recognition or unlock by keypad | | | |

Table 14.”Update user” specification.

2.3.2.5. Delete user

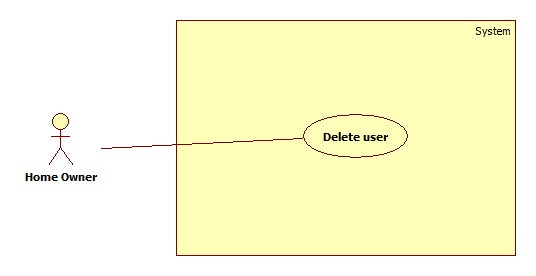


Figure 25. “Delete user” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC05** | | | |
| **Use Case No.** | **HUC05** | **Use Case Version** | 2.0 |
| **Use Case Name** | Delete user | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner will delete face in database when user wants to add new face into database. System will base on list of face to recognize and unlock if the user has face in database.  **Goal:**  - New face will be added into database.  **Triggers:**  - Press “3” button on keypad in “User management” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  - Go to “User management” screen, select user to delete by press “C” button to up and “D” button to down.  **Post Conditions:**  - Success: Delete user in database successfully. Message will be shown in LCD screen. “Xóa người dùng thành công”.  - Fail: User can not delete user in database. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 3 | Press “A” button on keypad | User will be deleted in database |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “C” button to up and “D” button to down on keypad. | Name of member will be changed base on user scroll the list | | 2 | Press “3” button on keypad | Confirm dialog will show”Bạn muốn xóa người dùng?” message. | | 3 | Press “B” button on keypad | Face will be deleted in database |   **Relationships:**  **-** N/A  **Business Rules:**  **-** Table will list all users who have existed face in database. After user delete face, user can use add face to add new face. If user do not have any face in database this user will not appear in table. | | | |

Table 15.”Delete user” specification.

2.3.2.6. Show log face

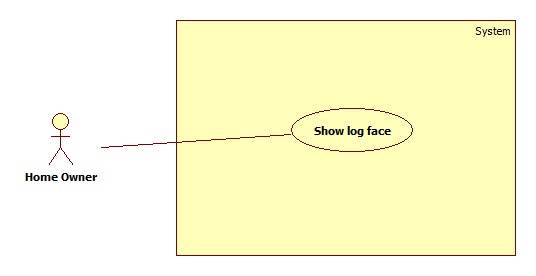


Figure 26. “Show log face” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC06** | | | |
| **Use Case No.** | **HUC06** | **Use Case Version** | 2.0 |
| **Use Case Name** | Show log face | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner can view history of face, user who used to use facial recognition mode.  **Goal:**  - Show image of who used to use facial recognition mode.  **Triggers:**  - Press “A” button on keypad  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  - Go to “Show Log Face” screen, then select face want to see by press “C” button to up and “D” button to down.  **Post Conditions:**  - Success: Show face in view  **Main Success Scenario:**  **-** N/A  **Alternative Scenario:**  **-** N/A  **Exceptions:**  - N/A  **Relationships:**  **-** N/A  **Business Rules:**  **-** Face in system will be shown with nearly date. This log face can be removed if the storage of SD card is full. | | | |

Table 16.”Show log face” specification.

2.3.2.7. Delete all information

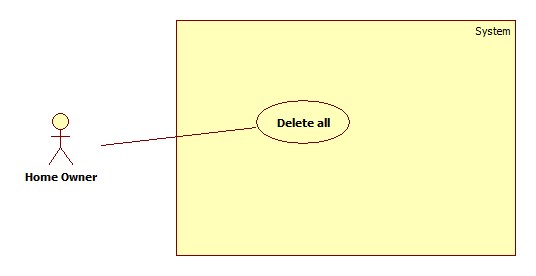


Figure 27. “Delete all information” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC07** | | | |
| **Use Case No.** | **HUC07** | **Use Case Version** | 2.0 |
| **Use Case Name** | Delete all information | | |
| **Author** |  | | |
| **Date** | 21/05/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner will delete all data in database in case he/she wants to renew system.  **Goal:**  - All data will be deleted.  **Triggers:**  - Press “1” button on keypad in “Modifying setting” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  **Post Conditions:**  - Success: Delete all data in database succesfully. Message will be shown in LCD screen “Xóa thông tin thành công”.  - Fail: User can not delete data in database. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “A” button on keypad | Confirm dialog will show”Bạn muốn xóa tất cả dữ liệu?” message. | | 3 | Press “A” button on keypad | Data will be deleted in database |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | Press “B” button on keypad | Data will not be deleted in database |   **Relationships:**  **-** N/A  **Business Rules:**  **-** All information of system include information of user, information of face, information of log face will be deleted. The system is renew after this user case | | | |

Table 17.”Delete all information” specification.

2.3.2.8. Set threshold for SD card

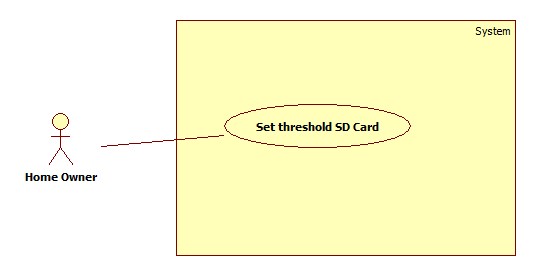


Figure 28. “Set threshold SD Card” use case

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – HUC08** | | | |
| **Use Case No.** | **HUC08** | **Use Case Version** | 2.0 |
| **Use Case Name** | Set threshold SD Card | | |
| **Author** |  | | |
| **Date** | 21/05/2015 | **Priority** | High |
| **Actor:**  - Home owner  **Summary:**  - Home owner can set threshold for system when log face data will be deleted. If size which is used to store log face is increase and equal with threshold user will be notified to delete all log faces in database.  **Goal:**  - Log faces will be deleted when the used size of SD card is caught the threshold.  **Triggers:**  - Press “2” button on keypad in “Modifying setting” screen  **Preconditions:**  - Using facing recognition to unlock with “Home owner” role.  **Post Conditions:**  - Success: Set threshold successfully. Message will be shown in LCD screen “Cài đặt thành công”.  - Fail: User can not set threshold. Warning message will be shown in LCD screen “Bị lỗi trong quá trình thực thi. Vui lòng thực hiện lại sau”.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “1” button on keypad  Press “2” button on keypad  Press “3” button on keypad | “3GB” will be selected.  “6GB” will be selected.  “8GB” will be selected | | 3 | Press “A” button on keypad | Setting will be saved in configuration file. |   **Alternative Scenario:**  **-** N/A  **Exceptions:**   |  |  |  | | --- | --- | --- | | No. | Actor Action | System Response | | 1 | Press “B” button on keypad | Setting will not be saved in configuration file. |   **Relationships:**  **-** N/A  **Business Rules:**  **-** The ability to store data of SD card is limited. In case too much log faces are saved can me the storage full. This use case can help use set threshold which they want all log faces will be deleted if the used size is caught the threshold. | | | |

Table 18.”Set threshold of SD Card” specification.

2.3.3. <System> Overview Use Case

2.3.3.1. Analyze face

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – SUC01** | | | |
| **Use Case No.** | **SUC01** | **Use Case Version** | 2.0 |
| **Use Case Name** | Analyze face | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | High |
| **Actor:**  - System  **Summary:**  - System will analyze the face of user at real time and compare it with other faces in database to determine that which user can unlock and can not.  **Goal:**  - Provide result about the face of user at real time that does he/she has permission to unlock.  **Triggers:**  **-** Press “1” button on keypad in “Menu” screen.  **Preconditions:**  -N/A  **Post Conditions:**  - Success: return result that means lock can open or not.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Press “1” button on keypad | Camera is active to capture face. | | 2 | Stand in front of camera from 3 to 5 seconds for system analyze the face  [ Exception 1] | System will return result for lock system |   **Alternative Scenario:**  **-** N/A  **Exceptions:**  **-** N/A  **Relationships:**  **-** Have <<include>> relationship with “Unlock facial recognition” use case  **Business Rules:**  - Analyze face can be executed a lots of process base on face recognition algorithm. Face of user will be detected by the system then his face can be prepare with data in database to check this face is existed in database. | | | |

Table 19.”Analyze face” specification.

2.3.3.2. Generate passcode

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – SUC02** | | | |
| **Use Case No.** | **SUC02** | **Use Case Version** | 2.0 |
| **Use Case Name** | Generate passcode | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | Normal |
| **Actor:**  - System  **Summary:**  - If user use unlock by keypad, system will generate passcode which is available in one hour and send it to the phone number.  **Goal:**  - System will generate passcode to send to phone number which is entered by user.  **Triggers:**  - Press “A” button after fill in all required information in “Keypad mode” screen.  **Preconditions:**  - N/A  **Post Conditions:**  - Success: Passcode will be generated successfully and send to phone number through SMS.  - Fail: Passcode can not generate.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Generate random passcode | Passcode will be saved | | 2 | Send passcode to phone number |  |   **Alternative Scenario:**  - N/A  **Exceptions:**  **-** N/A  **Relationships:**  **-** Have <<include>> relationship with “Check passcode” use case  **Business Rules:**  - Passcode will be generated random by the system. This passcode will be saved and valid in one hour after generated time. | | | |

Table 20.“Generate passcode” specification.

2.3.3.3. Check passcode

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – SUC03** | | | |
| **Use Case No.** | **SUC03** | **Use Case Version** | 2.0 |
| **Use Case Name** | Check passcode | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | Normal |
| **Actor:**  - System  **Summary:**  - If user use unlock by keypad, system will check passcode which user entered with passcode that system generate and send to the phone number. If the passcode is valid the lock will be opened.  **Goal:**  - User unlock successfully after entered valid passcode.  **Triggers:**  - Press “A” button to check passcode in “Enter passcode” screen.  **Preconditions:**  - User uses mode unlock by keypad.  **Post Conditions:**  - Success: User can unlock.  - Fail: User can not unlock. LCD will show warning message.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Check passcode with system | - Valid passcode: unlock  - Invalid passcode: dialog will show “Mã khóa không đúng.” message.  - Expired passcode: dialog will show “Mã khóa đã hết hạn.” message. |   **Alternative Scenario:**  **-** N/A  **Exceptions:**  **-** N/A  **Relationships:**  **-** Have <<include>> relationship with “Unlock by keypad” use case  **Business Rules:**  - Passcode is valid for one hour after it was generated by the system. After one hour passcode will expired and user must generate again to use “Unlock by keypad” feature. | | | |

Table 21. “Check passcode” specification.

2.3.4. <GSM 900> Overview Use Case

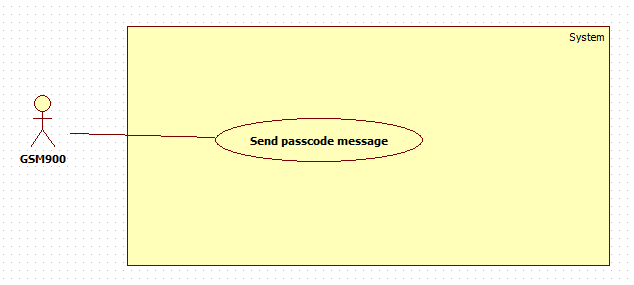


Figure 29.<GSM 900> Overview use case

2.3.4.1. Send passcode

|  |  |  |  |
| --- | --- | --- | --- |
| **USE CASE – GUC01** | | | |
| **Use Case No.** | **GUC01** | **Use Case Version** | 2.0 |
| **Use Case Name** | Send passcode | | |
| **Author** |  | | |
| **Date** | 30/1/2015 | **Priority** | Normal |
| **Actor:**  - GSM SIM 900  **Summary:**  - GSM SIM 900 will send passcode to phone number which is entered after passcode has generated.  **Goal:**  - Passcode will be sent to phone number which is entered.  **Triggers:**  - Press “A” button on keypad in “Keypad Mode” screen after fill in required information.  **Preconditions:**  -N/A  **Post Conditions:**  - Success: return result that means lock can open or not.  **Main Success Scenario:**   |  |  |  | | --- | --- | --- | | Step | Actor Action | System Response | | 1 | Generate passcode | Save passcode | | 2 | Send passcode |  |   **Alternative Scenario:**  **-** N/A  **Exceptions:**  - N/A  **Relationships:**  **-** Have <<include>> relationship with “Generate passcode” use case  **Business Rules:**  - N/A | | | |

Table 22.”Send passcode” specification.

3. Software System Attribute

3.1 Usability

The system is expected to apply for garden of users who has a garden in home but they don’t have enough time to take care or tracking usually. There are many plant’ indexes which gardener are tracking to get higher productivity in agriculture but the system has some basic sensors which can help users keep plants live and limit harmful weather with their garden.

System provide friendly GUI for users on their mobile which is closely with people in nowadays.

3.2 Reliability

3.3 Availability

3.4 Security

3.5 Maintainability

3.6 Portability

3.7 Performance

3.1. Reliability

- The system use biometric method to recognition so the ability to be entered invalid is very minor.

- The system can work precision according to user’s behavior.

3.2. Availability

- System is related security of home so the system can be active 24/7. In case, the power is blackout system will be use backup battery which can supply power up to 8 hours. When the power comes back, backup batter will be charged.

3.3. Security

- System can cover the most of cases to protect your hour out of attack of thieves.

3.4. Maintainability

- When one of component parts is broken, it is easy to fix the problem by changing a new one.

3.5. Performance

- System can recognize face in the range from 3 to 5 seconds.

3.6. Usability

- System provides user friendly GUI with guideline.

-System provides alternative case to unlock in case facial recognition is not working.

4. Conceptual Diagram

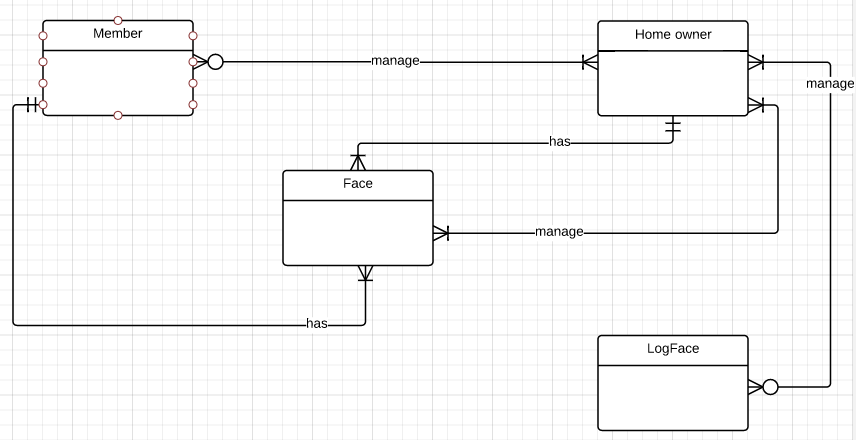


Figure 30.Conceptual diagram

|  |  |
| --- | --- |
| **Entity Data dictionary** | |
| **Entity Name** | **Description** |
| Member | - Member can is managed by one or more home owners  - Member just has one and only one face |
| Home owner | - Home owner manages zero or more members  - Home owner has one or more phone numbers  - Home owner just has one and only one face  - Home owner manages one or more faces  - Home owner manages zero or more log face. |
| Face | - Face is managed by one or more home owners  - Face just belongs one and only member.  - Face just belongs one and only home owner. |
| Log Face | - Log face is managed by one or more home owners. |

Table 23. Entity data dictionary