Use case: Safehome System

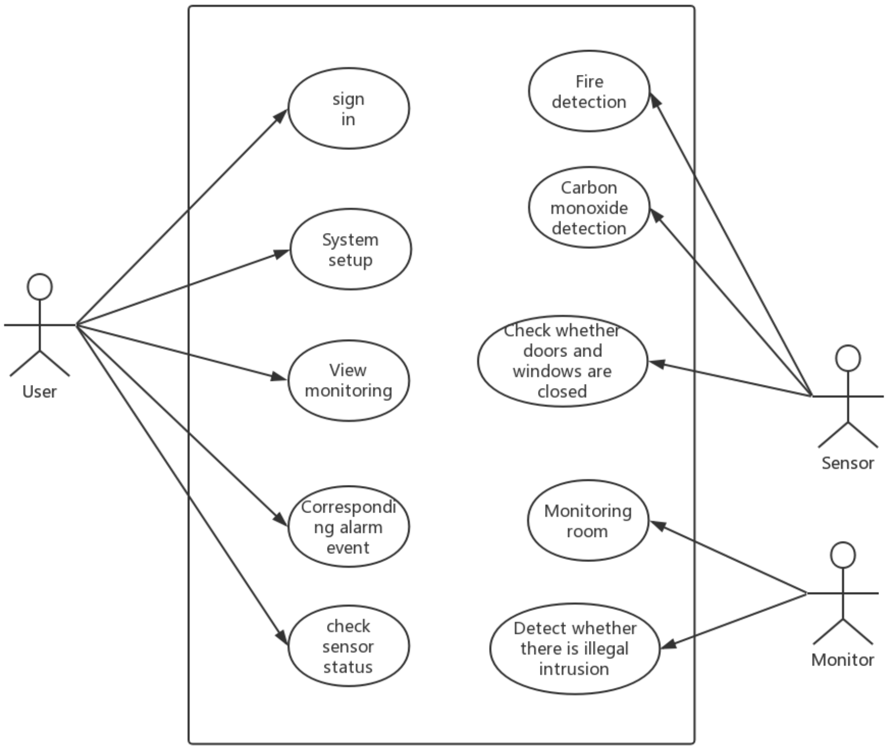

sign in
System setup
View monitoring
Correspondi ng alarm event
check sensor status
User
Fire detection
Carbon monoxide detection
Check whether doors and windows are closed
Monitoring room
Detect whether there is illegal intrusion
Sensor
Monitor

Figure1: safehome use case diagram

story: When the safehome system is ready, user can sign up by using the control panel. The user should first input account number and password, the safehome system will check the password, if the account and password are correct, then the user can process to the next step. If the account and password are wrong, then the control panel will ask the user to enter account and password again, if the user fail three times, then the system will be locked in a few minutes.

Use case: Sign up

Primary actor: Monitor, system

Goal in context: The homeowner enter password to sign up to access the system.

Preconditions: The system work normally.

Trigger: The homeowner decides to take some operations in the system.

Scenario:

1. Homeowner: enter the password
2. System: check the password
3. System: lock the system

Exceptions:

1. power cut
2. Abnormal system
3. Software exception

Priority: High priority

When available: First increment.

Frequency of use: frequent

Open issues:

1. What is the number of digits in the password?
2. What if the user enters the password and gives up half of the input?

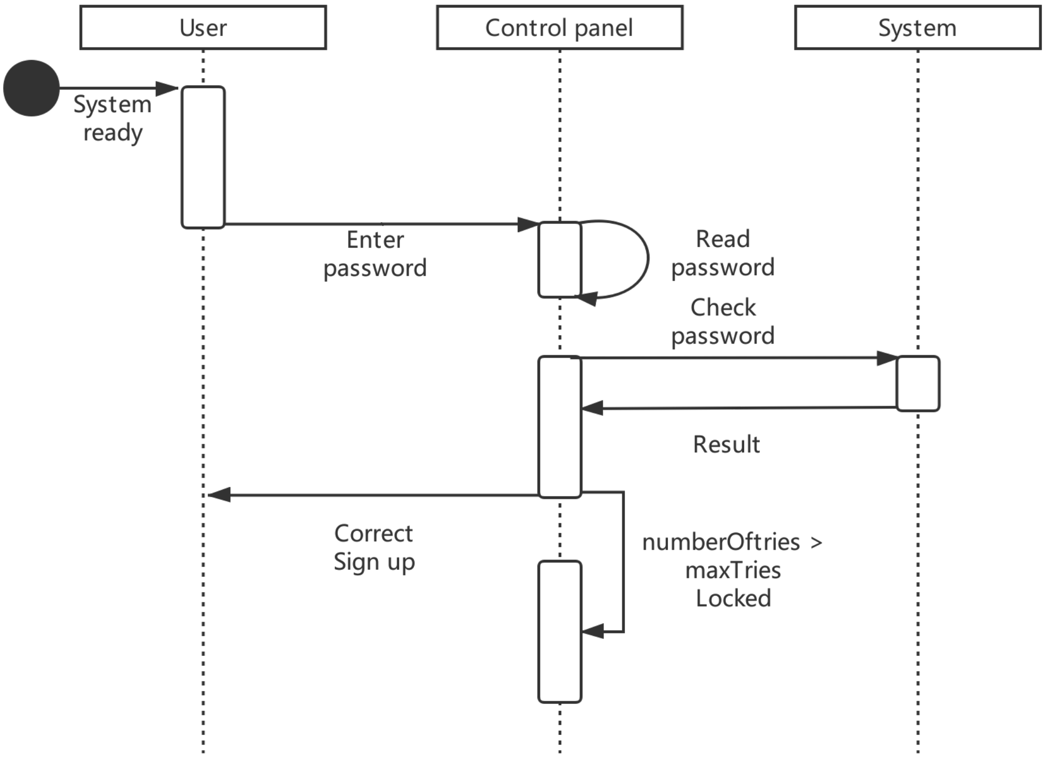


Figure2: sign up sequence diagram

Story: When the homeowner leave house and set the system to away mode, the detection of illegal intrusion system begins to work, the sensors and monitors will detect strangers. If they find strangers, then the system will alert homework.

Use case: Detection of illegal intrusion

Primary actor: Monitor, sensor, system

Goal in context: The system detects whether there is any illegal intrusion through the door and window sensors and monitoring. If there is, it will send a prompt to the user and send a prompt sound in the room to prevent the continuous development of illegal intrusion. If the prompt is invalid, it will alarm.

Preconditions: The homeowner opens the away mode, and the sensors and monitoring devices work normally.

Trigger: If the sensor on the window and door detects the abnormal situation and the monitor detects the stranger, it is preliminarily determined that the illegal invasion occurs.

Scenario:

1. Sensor: Detect abnormal conditions detected by sensors on windows and doors Administrator: input b to rent out and input r to take back boat
2. Monitor: Stranger detected
3. System: Alert the homeowner
4. System: Call police.

Exceptions:

1. power cut
2. Abnormal sensor and monitor
3. Software exception

Priority: High priority

When available: First increment.

Frequency of use: Low

Secondary actors: Safety department

Channels to secondary actors:

Safety department: homeowner call

Open issues:

1. How to notify homeowner?
2. How to make the sensors of doors and windows and monitors more accurate to judge whether there is any invasion? Is there any standard of judgment?
3. When the homeowner cancels the alarm and encounters the same situation in a short time, do not continue to remind the homeowner?

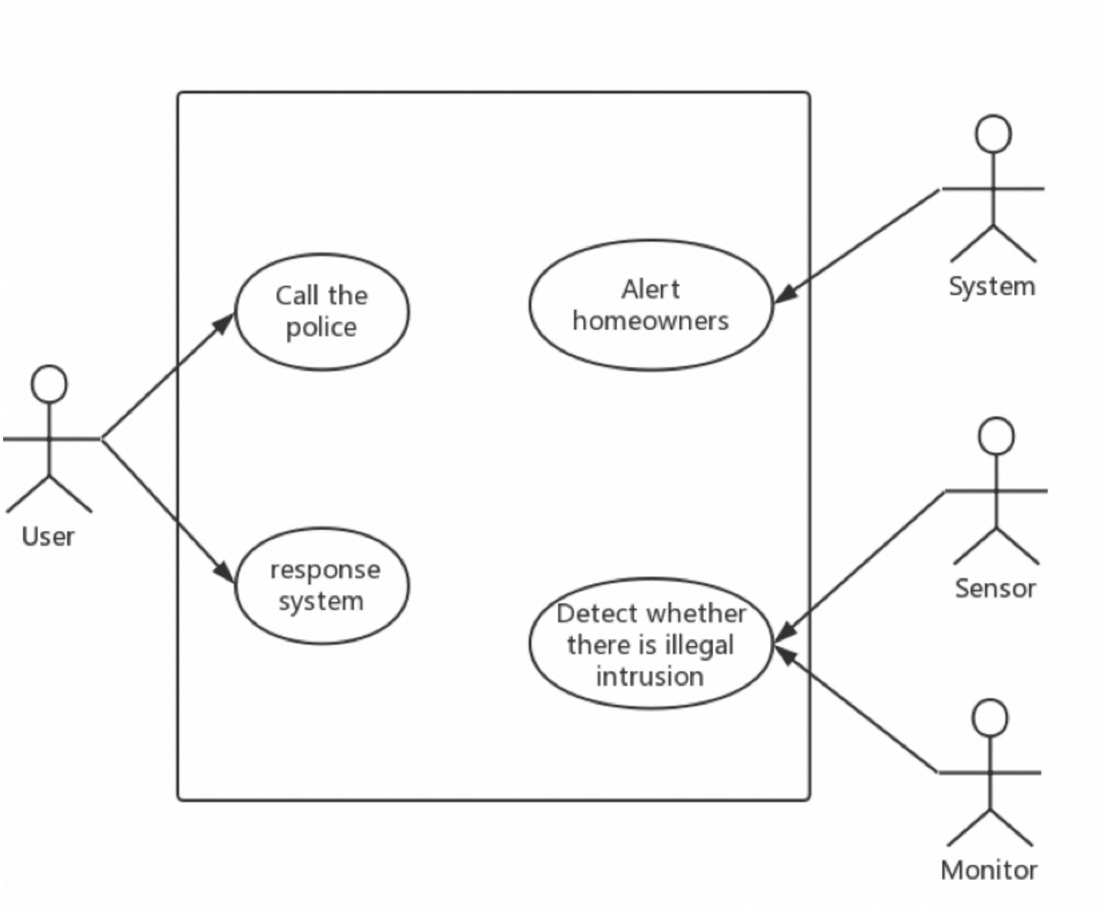


Figure3: Detection of illegal intrusion use case diagram

Story: When the sensors detect carbon monoxide exceeds the standard, if the system mood is stay then there will be alarms sounded. If the system mood is away then the system will alert the homeowner, if no response, then the system will call fire department.

Use case: Carbon monoxide gas detection and treatment

Primary actor: Homeowner, sensor, system

Goal in context: Monitor the concentration of carbon monoxide gas. If the concentration of the gas exceeds the default value of the system, it will be identified as a dangerous situation and an alarm will be given to inform the owner and the hospital or the fire department.

Preconditions: The sensors and system work normally.

Trigger: Detection of carbon monoxide concentration exceeding the standard

Scenario:

1. Sensor: Detection of carbon monoxide concentration exceeding the standard Administrator: input b to rent out and input r to take back boat
2. System: The system gives an alarm, lights up the hazard indicator and plays a warning sound of carbon monoxide exceeding the standard.
3. System: Detect the user's position setting status. If "stay" is displayed, the processing information will be played circularly. If the user does not respond to the alarm, or the concentration does not drop, the user will send the rescue information to the fire department and the medical department to report the dangerous situation.
4. System: Test the user's location status. If "away" is displayed, the system will send alarm information. If there is no response, send a distress signal to the fire department and report the dangerous situation.

Exceptions:

1. The user shut down the alarm system manually.
2. abnormal sensor.
3. Software exception

Priority: High priority

When available: First increment.

Frequency of use: Low

Secondary actors: Fire department

Channels to secondary actors:

Fire department: homeowner or system call

Open issues:

1. What is the alarm when the concentration of carbon monoxide is?
2. From the contact user to the determination that the user has no response, what is the time interval?
3. If the alarm occurs, the user does not answer, what should system do now?

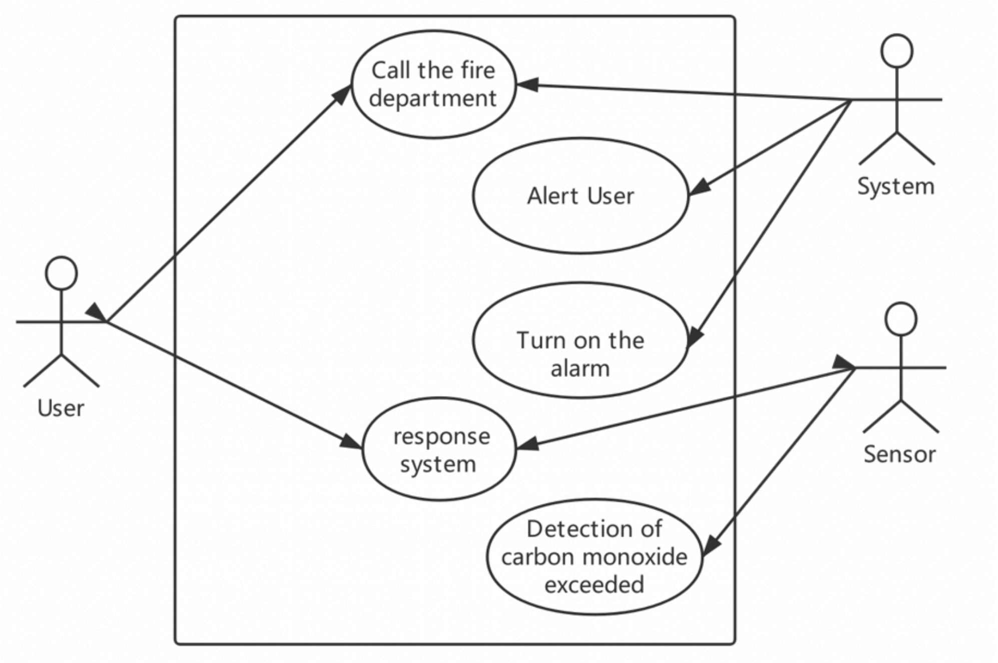


Figure4: Carbon monoxide gas detection and treatment use case diagram

Story: The sensor monitors the smoke. When the sensor detects a fire, the system issues an alarm and notifies the homeowner. If the homeowner does not respond for a long time, the system will automatically notify the hospital and the fire department.

Use case: Fire monitoring system

Primary actor: Sensor, system

Goal in context: Monitor any corner of the entire residential area with a fire monitor to sense if a fire has occurred

Preconditions: The fire detector works normally and is connected to the safehome system.

Trigger: Some local areas of the house are above the standard value or the flame level in the house is higher than the standard value.

Scenario:

1. Sensor: Entering the working state, monitoring and smoke concentration of each corner of the residential house.
2. System: Feedback safety information to the homeowner; if the homeowner does not respond to the information, if the alarm is not touched within a certain period of time, the alarm is issued according to the fire level.
3. System: Fire alarm sounds to alert the user to the occurrence of a fire.

Exceptions:

1. Fire monitoring and safety alarm system malfunction.
2. Abnormal system.
3. Software exception

Priority: Medium priority, must be implemented after the implementation of the basic functions

When available: First increment.

Frequency of use: Low

Secondary actors: Homeowner, fire department

Channels to secondary actors:

Fire department: homeowner or system call

Homeowner: system notify

Open issues:

1. How to judge whether the fire monitoring and safety alarm system has a fault, how to solve if there is a fault?
2. If the alarm occurs, the user does not answer, what should system do now?

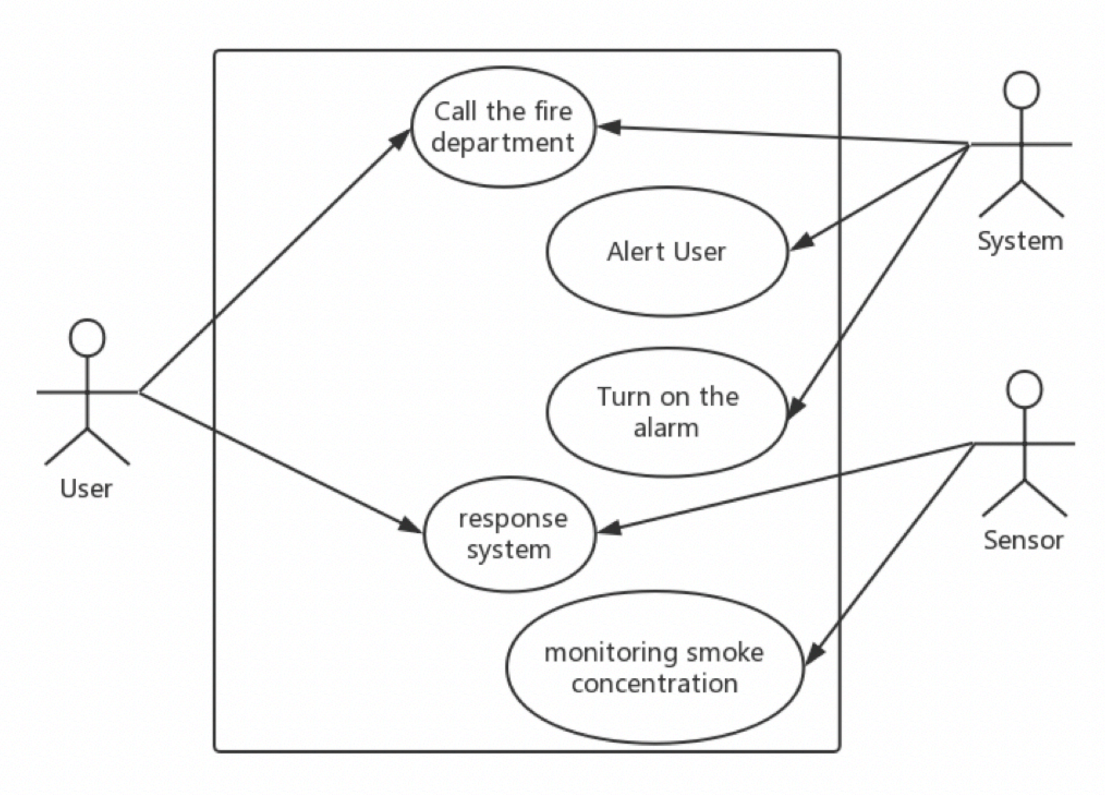


Figure5: Fire monitoring system use case diagram

class based

When the safehome system is *ready*, user can *sign up* by using the control panel. The user should first *input* account number and password, the safehome system will *check the password*, if the account and password are correct, then the user can process to the next step. If the account and password are wrong, then the control panel will *ask* the user to enter account and password again, if the user fail three times, then the system will *be locked* in a few minutes.

When the homeowner *leave house* and *set the system to away mode*, the detection of illegal intrusion system begins to *work*, the sensors and monitors will *detect strangers*. If they *find strangers*, then the system will *alert homeowner*.

When the sensors *detect carbon monoxide exceeds the standard*, if the system mood is stay then there will be alarms sounded. The system will alert the homeowner, if no response, then the system will *call fire department.*

The sensor also monitors the smoke and temperature. When the sensor detects a fire, the system issues an alarm and *notifies the homeowner*. If the homeowner does not respond for a long time, the system will automatically *notify the hospital* and the fire department.

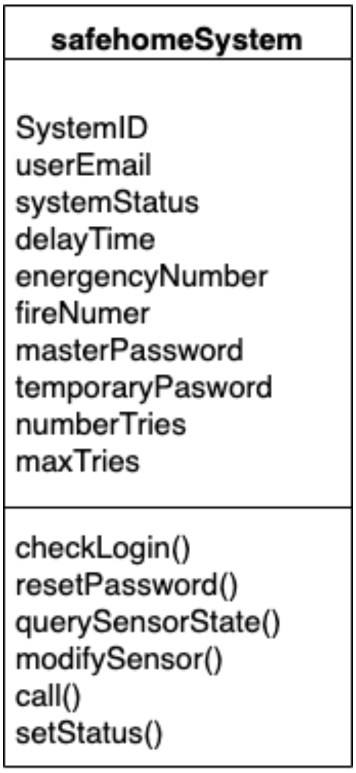
Extracting the nouns, we can propose a number of potential classes:

Potential class	general classification
safehome system	things
homeowner	external entities
control panel	external entities
account number and password	not objects, attributes of safehome system
detection of illegal intrusion system	things
sensors	external entities
monitors	external entities
strangers	role
system mood	not objects, attributes of safehome
department	place
smoke	not objects, attributes of environment
temperature	not objects, attributes of environment

hospital fire	place

Potential class	Characteristic Number That Applies
safehome system	accepted: all apply
homeowner	rejected: 1, 2 fail even through 6 applies
control panel	accepted: all apply
account number and password	rejected: 3 fails
detection of illegal intrusion system	rejected: 1 fails, part of safehome system
sensors	accepted: all apply
monitors	accepted: all apply
strangers	rejected: 1, 2, 6 fail
system mood	rejected: 2,3 fail, attributes of system
department	rejected: 2.3 fail
hospital fire	rejected: 2,3 fail

safehome system



SystemID: id of system

userEmail: email in case of emergency

systemStatus: identify the current status of the system

delayTime: time for the system to respond to an alert

emergencyNumber: police number

fireNumer: fire department number

masterPassword: user password

numberTries: number of user attempts to log in

maxTries: max number of user attempts to log in

checkLogin(): check user password

resetPassword(): reset user password

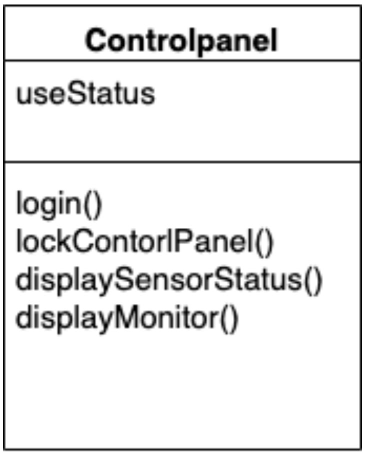
querySensorState(): query all sensors status

modifySensor(): change sensor work status

call(): call emergency department

setStatus(): set system status

control panel



Controlpanel

useStatus

login()
lockContorlPanel()
displaySensorStatus()
displayMonitor()

useStatus: identify whether the control panel is useable

login(): display login page, and ask user to input password

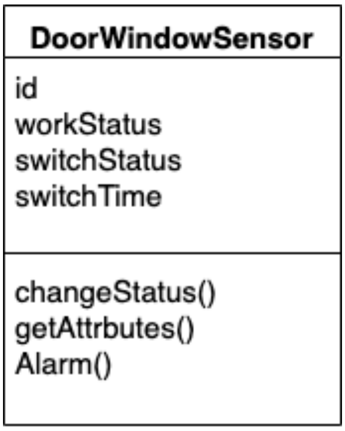
lockContorlPanel(): when numberTries > maxTries lock the control panel, then the control panel is available in a period of time.

displaySensorStatus(): query sensors status from system, then display them.

displayMonitor(): query monitor image from system, then display it.

sensors

DoorWindowSensor



id: identify number for each door and window sensor.

workStatus: identify whether the sensor is working.

switchStatuc: identify whether the door or window is open.

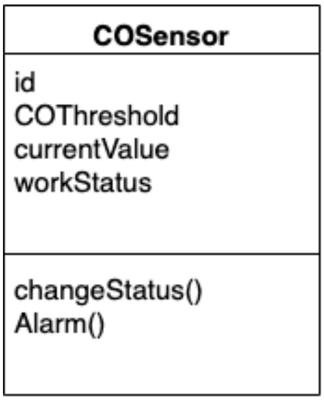
switchTime: record recent switch time.

changeStatus(): change work status.

getAttrbutes(): get workstatus, switchstatus and switch time.

Alarm(): if the sensor is working and detect the door or window open then alarm.

COSensor



id: identify number for each COsensor

COThreshold: co threshold for CO sensor if current CO value exceed the threshold then alarm.

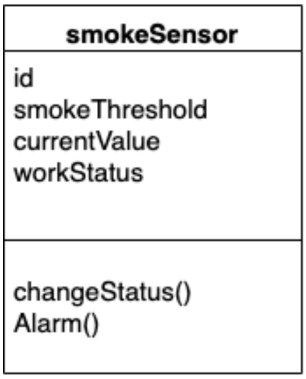
currentValue: current CO value.

workStatus: identify whether the sensor is working.

changeStatus(): change work status.

Alarm(): alarm when current CO value exceeds threshold.

smokeSensor():



smokeSensor

id
smokeThreshold
currentValue
workStatus

changeStatus()
Alarm()

id: identify number for each smokeSensor

smokeThreshold: smoke threshold for smoke sensor if current smoke value exceed the threshold then alarm.

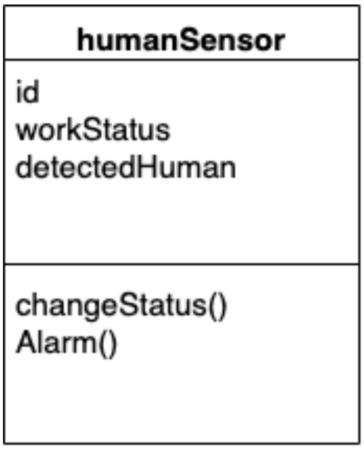
currentValue: current smoke value.

workStatus: identify whether the sensor is working.

changeStatus(): change work status.

Alarm(): alarm when current smoke value exceeds threshold.

humanSensor



humanSensor

id
workStatus
detectedHuman

changeStatus()
Alarm()

id: identify number for each human sensor.

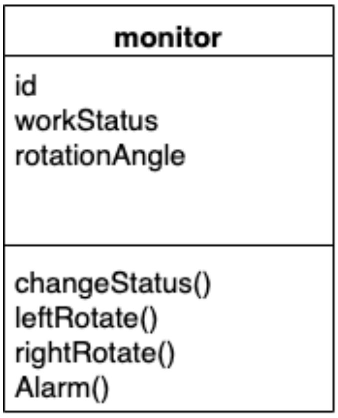
workStatus: identify whether the sensor is working.

dectedHunmam: identify whether detect human.

changeStatus(): change work status.

Alarm(): when system mode is away, alarm when detected human.

monitor



id: identify number for each monitor.

workStatus: identify whether the sensor is working.

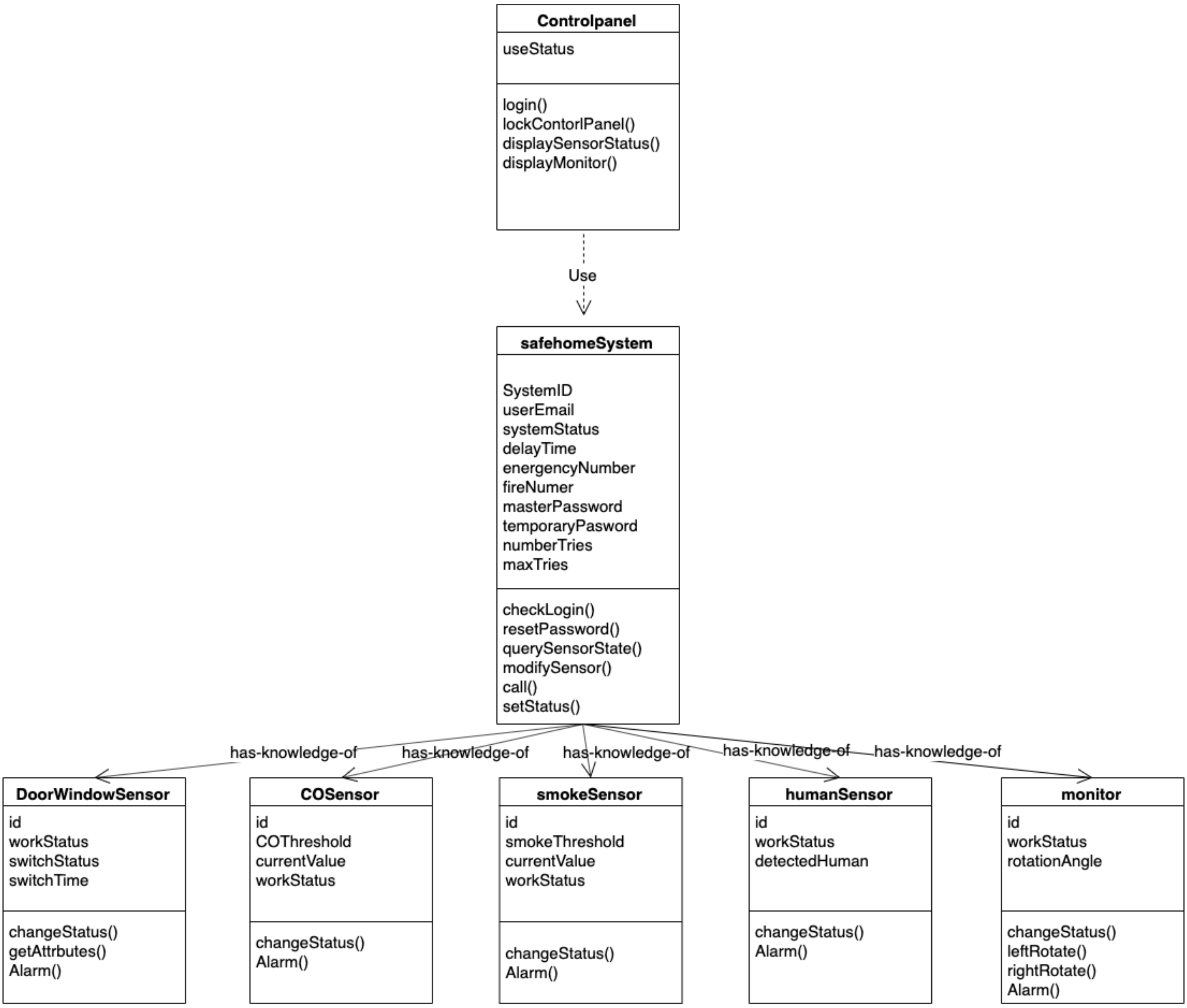
rotationAngle: the angle the monitor turns.

changeStatus(): change work status.

leftRotate(): rotate monitor left.

rightRotate(): rotate monitor right.

Alarm(): when system mode is away, alarm when detected human.


Controlpanel
useStatus
login()
lockContorlPanel()
displaySensorStatus()
displayMonitor()
Use
safehomeSystem
SystemID
userEmail
systemStatus
delayTime
energencyNumber
fireNumer
masterPassword
temporaryPasword
numberTries
maxTries
checkLogin()
resetPassword()
querySensorState()
modifySensor()
call()
setStatus()
has-knowledge-of
has-knowledge-of
has-knowledge-of
has-knowledge-of
has-knowledge-of
DoorWindowSensor
id
workStatus
switchStatus
switchTime
changeStatus()
getAttrbutes()
Alarm()
COSensor
id
COThreshold
currentValue
workStatus
changeStatus()
Alarm()
smokeSensor
id
smokeThreshold
currentValue
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changeStatus()
Alarm()
humanSensor
id
workStatus
detectedHuman
changeStatus()
Alarm()
monitor
id
workStatus
rotationAngle
changeStatus()
leftRotate()
rightRotate()
Alarm()