Precise Environmental Impact

★ Climatic Factors <possible weather station = eg) Ambient Weather>

Raining

When a weather station detects that it is raining and report to device manager, then SH system

1. integrate the data with open/close status of windows from a connected sensor and send a notification to your smart phone and automatically close motorized windows if windows were left open
2. send a delay command to a smart sprinkler controller if the accumulated rain exceeds a predefined threshold.
3. send a connected, robotic lawn mower back to its charging base.
4. send an execute command to the water tank valve actuator to store water(useful in dry areas) and automatically close the valve if capacity is full.
5. can initiate "**the optimal temperature control protocol**".

Snowing

When a weather station detects that it is snowing and report to the device manager, then SH system

1. integrate the data with open/close status of windows from a connected sensor and send a notification to your smart phone and automatically close motorized windows if windows were left open
2. send an execute command to the Calcium Chloride sprinkler to spray it.
3. send an execute command to the water sprinkler to spray water in order to prevent frozen water pipes.
4. can initiate "**the optimal temperature control protocol**".

Cold Wave

When a weather station detects that it is extremely cold outside and report to the device manager, then SH system

1. integrate the data with open/close status of windows from a connected sensor and send a notification to your smart phone and automatically close motorized windows if windows were left open
2. send an execute command to "smart appliances subsystem" to set "**the optimal temperature control protocol**". In this mode, unlike "**energy saver protocol**", the temperature of each room can be monitored by the temperature sensor installed in each room.
    2.1. If the air temperature of the indoor environment is too low, the floor heaters and the air heater can be turned on. Also, windows will be closed and, if the air conditioner is on, the air conditioner will be turned off. This will be performed until the desired temperature is met.
        2.1.1. (If floor heating is uncomfortable for certain cultural population, then only air heater can be turned on)
        2.1.2. "**The optimal temperature control protocol**" can be even initiated before a user comes back home.
    2.2. **"The Energy save protocol**" can be set when a user is not present at home. For this mode, in order to enhance energy efficiency, the heating/cooling system will be monitored at the basic level.
3. send an execute command to the Calcium Chloride sprinkler to spray it.
4. send an execute command to the water sprinkler to spray water in order to prevent frozen water pipes.

Heat Wave

When a weather station detects that it is too hot outside, or indoor temperature sensors send the indoor temperature data to the SH system(device manager), saying that it is too hot, then SH system

1. send an execute command to the water sprinkler to spray water in order to reduce temperature outside.
2. send an execute command to "smart appliances subsystem" to set "**the optimal temperature control mode**".
    2.1. Then air conditioners will run until the desired temperature is met. Also integrate the data with open/close status of windows from a connected sensor and send a notification to your smart phone and automatically close motorized windows if windows were left open.

2.2. In the meantime, the floor heaters and the air heaters will be managed at the basic level.
3. Or simply open the motorized windows for air circulation while all the heating/cooling system can be turned off

Polluted Air

When a weather station or an indoor air quality sensor detects high concentration of fine particulate matter and sends the data to the SH system, then SH system

1. integrate the data with open/close status of windows from a connected sensor and send a notification to your smart phone and automatically close motorized windows if windows were left open
2. send an execute command to the air purifier to run until desired air quality is met.

(probably this has to do with cultural aspects as well as environmental aspects of the environmental impacts. For example, as I am a South Korean, we experience fine dust problems due to the flow of fine dust from uncountable factories in China.)- maybe this is inappropriate. I mean people who are living near industrial regions can make use of this idea.

Other Environmental Factors to be considered

1. Humidity : SH reads humidity from sensor and react accordingly
    1.1. If it is too humid inside, SH runs air conditioner dehumidify indoor environment
    1.2. If it is too dry inside, SH runs humidifier
    1.3. If it is too dry outside, SH runs sprinkler

★ Natural Disaster

Earthquake (location wise as well, some places are more likely to have an earthquake)

1. Possible earthquakes can be detected as follows:
    1.1. the earthquake detector with MEMS sensors(LIS3DHH) on a side of a house wall detects the earthquake
    1.2. the transmitted earthquake notification from a national weather station is received through the ***internet(?)***
2. Then SH system
    2.1. initiates "**the disaster protocol**" depending on the magnitude of the earthquake
        2.1.1. notify the user via cellphone as well as speaker alarm.
        2.1.2. send an execute command to gas valve actuator to cut the gas line
        2.1.3. send an execute command to the circuit breaker to cut the power line
        2.1.4. send an execute command to the water manager to close the water access.
    2.2. initiates "**the evacuation protocol**" depending on the magnitude of the earthquake
        2.2.1. SH runs backup power that provides electricity only to the device manager, the security device manager, speaker alarm and exit lights installed on walls.
        2.2.2. SH runs the speaker alarm and the exit lights will be turned on. When motion detectors find no human presence indoor after evacuation, then the door will be automatically locked.
3. Possible problem
    3.1. false alarm(can be enhanced by improving detecting algorithm with machine learning approach)

Hurricane/Hails/Storms

When a weather station detects hurricane, hails, storms based on the readings of wind speed, humidity, temperature, rainfall,etc and sends the data to the SH system, then SH system

1. closes the motorized windows if opened
2. closes the motorized vertical blinds to prevent the damage on the windows.
3. initiates "**the optimal temperature control protocol**", "**the disaster protocol**" and "**the evacuation protocol**" depending on the magnitude of the disaster. (user to the basement)

Tsunami(flooding)

When flood sensors, leak sensor and humidity sensors detects a sign of flood or leak of water,
or when SH system is notified with Tsunami, alarmed through internet from national meteorological agency website,
then SH system

1. closes the motorized windows if opened
2. monitors the magnitude of leakage and if the situation is bad, "**the disaster protocol**" is initiated.

Volcanic activity

When SH system is notified that there is volcanic activity, transmitted via internet from national meteorological agency website,

SH system activates "**the evacuation protocol**"

★ Emergency Situations

Fire

When SH system detects fire through thermal sensors, thermometer, CO sensor, and smoke sensor, SH system

1. notifies users by speaker alarm
2. notifies users the exact location of where fire is detected, so that the users can check the magnitude of fire if it is small fire. (until the users confirm that the users are aware of fire <via app>)
3. can run indoor sprinklers where fire is detected to be present.
4. , if users do not solve the situation until the fire is not extinguishable by users (as sensed by above mentioned sensors), automatically initiates both "**the fire protocol**" and "**the evacuation protocol**".
    4.1. In "**the fire protocol**", SH notifies the user of this activated protocol via cellphone as well as speaker alarm.
    4.2. In "**the fire protocol**", SH sends execute commands to indoor sprinklers to run
    4.3. In "**the fire protocol**", SH contacts local authorities for help.
    4.4. In "**the fire protocol**", SH cuts electricity, gas

Guests

The SH system can detect the presence of people and it can identify those who have access to the house.

1. When a motion is detected by sensors, and the size recognition techniques understand that the motion is created by humans, SH notifies users and checks whether the person has the electronic access key to the house, saved in his smartphone or other electronic devices
2. Access
    2.1. If the guest has the access, SH notifies the user and the user can let the guest in by granting SH access to the security device manager.
    2.2. If the intruders don't have the access, SH notifies the user and waits for possible action.
3. Indoor motion detection
    3.1. When a person without the access is detected inside the house, SH notifies the user and turns on the camera, starts recording and saves it to the drive.
    3.2. Users have access to the indoor camera remotely from SH.
    3.3. SH can let users to lock the house completely by closing all the windows and vertical blinds
    3.4. SH can let users to contact local authority

★ Infrastructure

Gas leak

When SH system detects gas leakage through leak sensors, SH system

1. sends an execute command to gas valve actuator to cut the gas line
2. notifies the user which leak sensor detects the gas leak for fixing the problem

Power outage and Backup power

When there is power outage from national electricity grid, then

1. SH notifies users
2. SH is powered by solar panels as well as backup battery packs for blackout.

Internet loss

When there is no internet, it turns on limited functionality mode

Solar Panel and Smart Grid

1. SH monitors the volume of available electricity(backup batteries) provided from solar panels.
2. SH gives the user feedback in terms of the electricity usage of every electronic device with smart meters attached to them.
3. With a weather forecast algorithm based on deep learning, SH can optimize the performance of solar panels (produces adequate amounts of electricity) in consideration of weather forecasts.
   <because electricity is easy to be lost>

★ Human factors

SH interacts differently from people to people

Age

1. SH can block a user's access to adult materials(especially on Smart TV and smart Entertainment) when the user is minor
2. SH can assist in children education by providing entertaining materials for studying (with the aid of Smart Entertainment as well as Smart TV)
3. SH can recommend users with preferable entertaining material with the aid of AI, reducing the possibility of depression of elderly people who live alone.
4. SH can contact local authorities when an emergency button is triggered by elderly people.
5. SH gives users access to the Security Device Manager so that the users/caregivers can monitor elderly people
6. SH monitors the health monitoring device of elderly people inside home and, if there is abnormality, reports it to the user.

Nationality and Culture

1. Different accents
   The device manager can operate on different accents due to deep learning approach as well as appropriate accent settings.

Occupation

1. SH system assists users with those occupations which require accurate weather data in their professions (eg. farmer, fisher, etc) by providing accurate weather forecast as well as remote monitoring
2. SH gives access to users who are farmers to monitor the crops as well as the surrounding environment by acquiring related data from smart farming devices such as CoolFarm
3. SH system notifies users of their schedules when the users wake up in the morning, based on the software where the users record their agenda.