OptView Window

Design Document

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Florida Institute of Technology
February 27, 2023

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Introduction:

To create a comfortable and energy-efficient environment in an office building, hotel room, or bedroom at home, windows that can open and close and also have an attached tint can be utilized based on weather conditions. These windows will have sensors installed to constantly monitor the surrounding weather parameters, including temperature, humidity, wind, and UV index. Based on the pre-set conditions, this data will be sent to a microcontroller system that will analyze and determine when to open or close the windows and tint the glass accordingly.

For example, if the temperature inside the building rises above a certain threshold, the control system would automatically opens the windows to allow for ventilation and cooling. If the outside temperature falls below a certain point or if the humidity level increases, the control system closes the windows to keep the heat inside and maintain a comfortable indoor environment. Additionally, if the wind speed reaches a certain level, the windows would close to prevent wind damage. Moreover, if the intensity of UV radiation becomes high, the tint will automatically be activated.

This system could improve the energy efficiency of the building, reduce the need for mechanical cooling systems, protect residents from harmful UV radiation, and provide a more comfortable indoor environment for occupants.

Fully Addressed Use Case:

Use Case: Automated Window Control

Scope: To control the opening and closing of windows in a building based on weather conditions.

Level: User Goal

Stakeholders and Interests:

1- **Building Residents**: Interested in having control over their individual work environment and comfort.

2- **Building Owners**: Interested in ensuring energy efficiency and comfort for building residents.

3- **Window Seller Corporation**: Interested in delivering a functional and reliable window.

4- **Maintenance Facility**: Interested in ensuring the smooth functioning of the window and fixing any issue on building.

5- **Electricity Provider**: Interested in providing electricity in building continuously even with high consumption needs in peak times.

6- **Government**: Interested in lowering the consumption of energy especially if they offer electricity bill payment assistance

Preconditions:

1- The building or room is equipped with windows that have sensors and microcontroller system installed. The system is pre-programmed with threshold levels for temperature, humidity, wind speed, and UV index. The sensors, microcontroller, PDLC, AC, motor stepper must be installed and properly configured on the window.

Success Guarantee (or Postcondition):

1- The windows will open and close automatically based on weather conditions.

2- The tint switch can be adjusted to switch between a transparent and opaque state.
3- Ensuring energy efficiency and comfort for building residents.
4- Ensuring automotive and smooth operation of the windows in the building.

Main Success Scenario (or Basic Flow):

1- As the day progresses, the sensors begin to monitor the weather conditions such as temperature, humidity, and UV index.
2- If the temperature inside the building rises above a pre-set threshold level, or if the CO_2 level increases, the microcontroller system receives a signal from the sensors and activates the automatic window opening function, if the weather outside colder than the room temperature.
3- The windows will open to allow cool air to flow into the building and reduce the temperature inside the room. This function will also save energy by reducing the need for mechanical cooling systems.
4- If the outside temperature falls below a pre-set threshold level, or if the humidity level increases, the microcontroller system will receive a signal and activate the automatic window closing function.
5- The windows will close to keep the heat inside and maintain a comfortable indoor environment. This function will also prevent energy loss and keep the building warm during colder weather conditions.
6- If the CO_2 rises above a pre-set threshold level, the windows will open to allow clean air to flow into the building and reduce the carbon dioxide level inside the room.
7- If the UV index is high, the microcontroller system will receive a signal and activate the automatic window switch from a transparent to an opaque state.
8- If the UV index is low, the microcontroller system will receive a signal and activate the automatic window switch from an opaque state to a transparent state.
9- If the wind speed reaches a pre-set threshold level, the microcontroller system will receive a signal and activate the automatic window closing function.
10- The windows will close to prevent wind damage to the building and protect the occupants from the weather outside.
11- The system will continue to monitor the weather conditions throughout the day and adjust the windows as needed to maintain a comfortable indoor environment and save energy.

Exceptions:

1- **Power Outages:** If the power supply to the system is interrupted, the windows will not be able to open or close as planned.

2- **User Overriding:** If a user manually overrides the system windows wrongly, this may cause the system to function incorrectly.

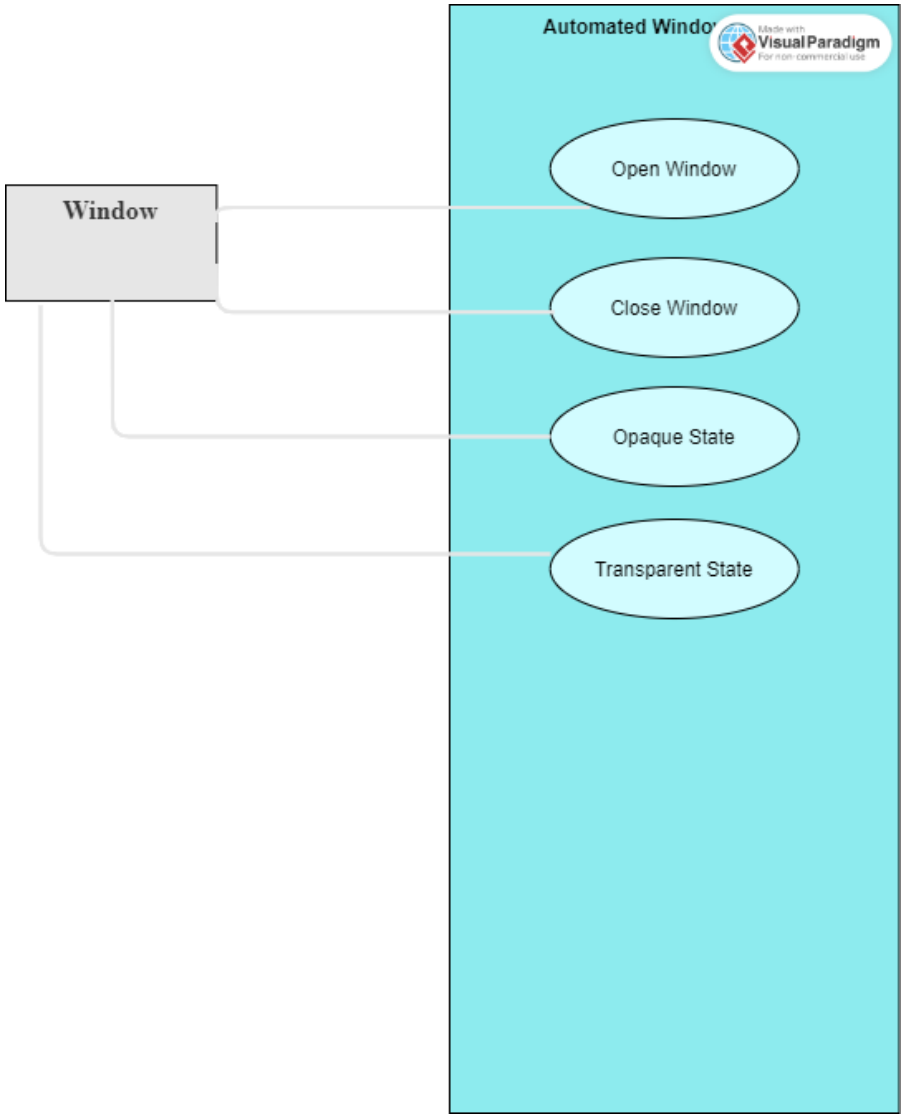
3- **User Intervention**: If a user opens or closes the window manually, this may cause the system to function incorrectly.

4- **Wrong Data**: If the weather service provider gives inaccurate weather information for the building's location that does not match the actual weather, this may cause the system to function incorrectly.

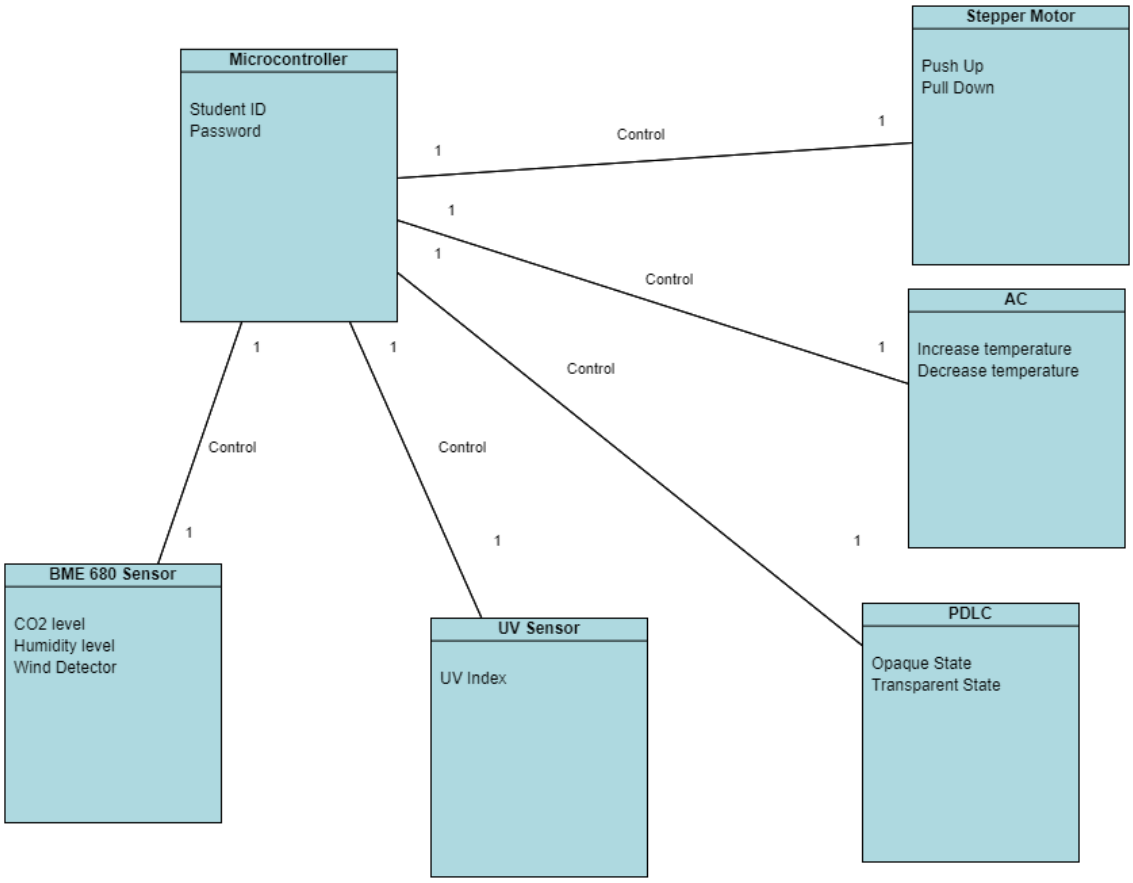
5- **Equipment Malfunctions:** If any of the components of the system, such as the sensors or motors, become damaged, the windows may not be able to open or close correctly.

6- **Environmental Factors:** Factors such as strong winds, heavy rainfall, or extreme temperatures may affect the ability of the system to open or close the windows.

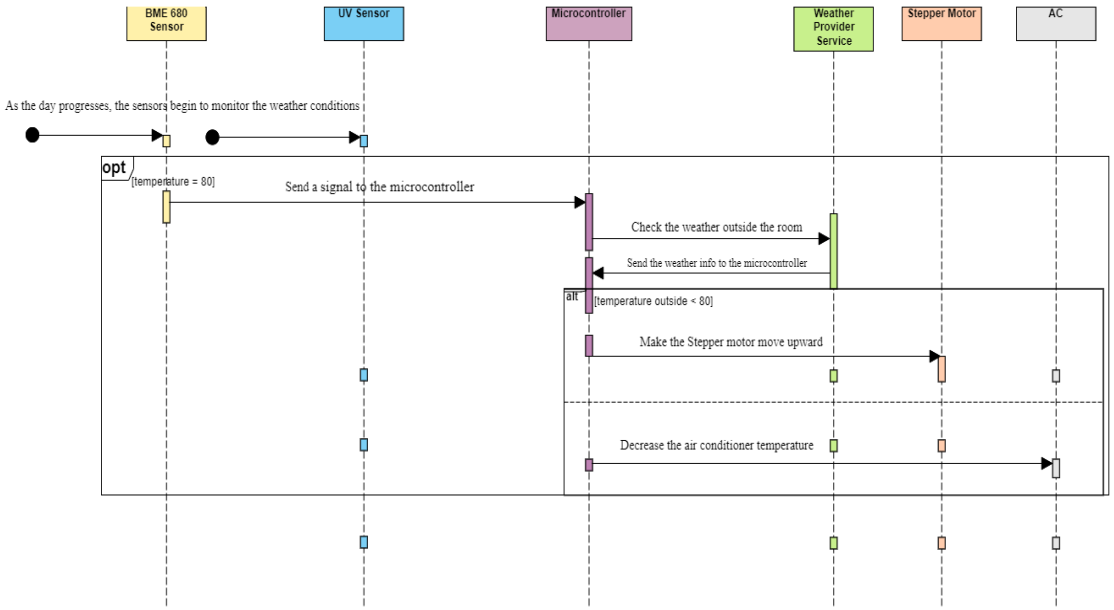
USE CASE DIGRAM:

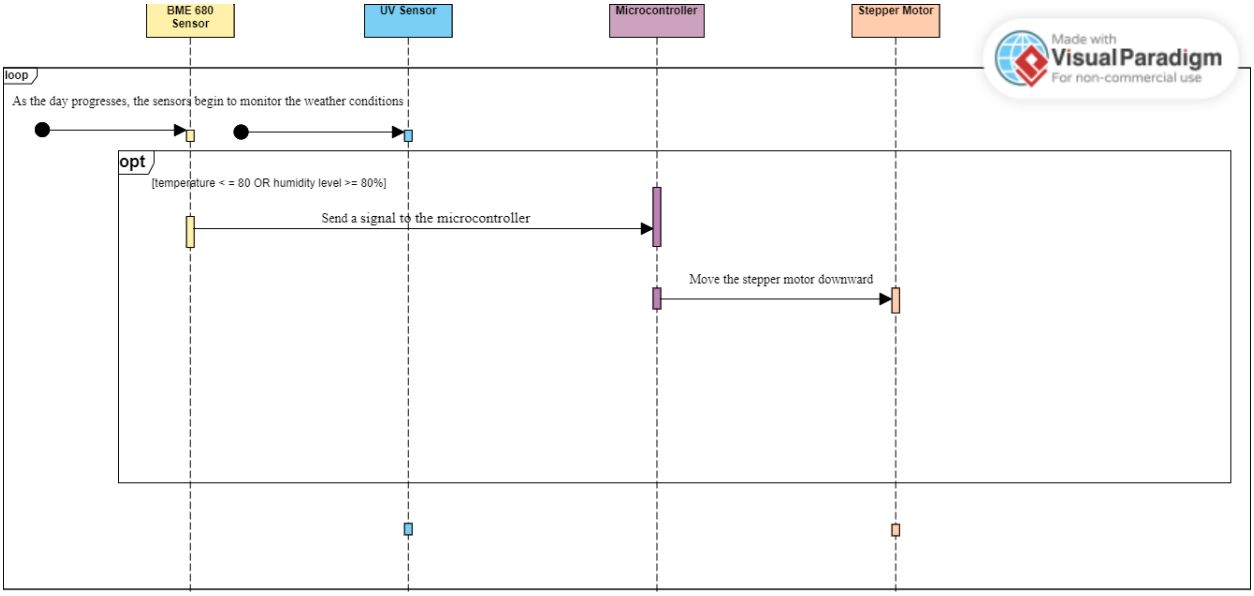


DOMAIN MODULE DIGRAM:



SEQUANCE DIGRAM:




BME 680 Sensor
UV Sensor
Microcontroller
Stepper Motor
loop
As the day progresses, the sensors begin to monitor the weather conditions
opt
[temperature < = 80 OR humidity level >= 80%]
Send a signal to the microcontroller
Move the stepper motor downward
Made with Visual Paradigm
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