V.I.S.T.A.

Vent Intelligence System for Temperature Adjustment

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Chapter 2-Project Description

2.1 Project Background and Motivation

In an increasingly energy-dependent world, the need to save on power and energy consumption is a driving factor to the production of innovative, smart grid technologies. V.I.S.T.A. aims to increase the efficiency of air conditioning systems in any given space. Operating within a home or commercial building, the system reduces the loss of energy in heating or cooling unnecessary areas. The system will be responsive to the temperature, occupancy inputs, and/or grid signals, allowing occupants to save energy and in turn help the grid with volatile power loads.

The heating or cooling of an entire room is no small feat in terms of energy consumption. The heating or cooling of an entire building is an even larger undertaking. The current standard in most homes and businesses is to set a temperature and heat or cool the whole building. Oftentimes, the temperature adjustment or maintenance of a whole building to a consistent temperature is unnecessary and unattainable. A room may be left unoccupied, have better insulation, more natural light, or may be closer or further away from the heating/cooling source. The discrepancy between the temperature needs of a single room and that room's pre-existing thermal conditions creates wasteful energy consumption. The ability to control the flow of air/heat into a specific room simply from a smartphone app is a unique solution that appeals to not only personal preference, but also decreases cost and improves energy profile.

Typical solutions to temperature discrepancies include window AC units, electric fans, and heating units. While these solutions help solve issues of reaching desired temperatures, there are many drawbacks. Window AC units are energy inefficient, create a great deal of unwanted noise, raise security concerns, and are overall an unpleasant solution that takes up lots of space. Electric fans bring up similar issues in addition to circulating dust particles and other allergens that may be present in a room. Similarly, heating units take up space, create fire hazards, and have to be consistently monitored. All these issues being raised from the most common solutions highlights the need for an alternative temperature control method.

With technological advancements emerging every year, smart homes are becoming increasingly popular. And with that rise in popularity, devices like smart thermostats begin to make an impact in the world. Smart thermostats are an excellent method to save energy in a home. They offer precise temperature control by adjusting settings based on the occupancy of the room and the user's preferences. The ability to change the temperature by simply using a smartphone app emplores people to adjust the thermostat much more frequently- in turn lowering energy costs by eliminating unnecessary amounts of heating and cooling power.

Not everybody can afford a smart thermostat however, let alone an entire smart home. The very advanced technology that is required to power devices like smart thermostats are highly technical and therefore costly. Cheaper options like window AC units, electric fans, and heating units are useful but lack energy conservation and come with a great deal of drawbacks as previously discussed. Therefore, an alternative is necessary that combines both the affordable and usefulness of more typical solutions and the energy conservation of smart home technology. A smart vent system to control amounts of air flow into a given room allows both sides in a unique way that controls the temperature based on the specified space, and even uses infrared sensor technology to measure the occupancy in a room and smart-adjust itself in order to align with the optimal temperatures.

We obtained sponsorship for the project from Dr. Qun Zhou Sun, a professor of power and energy at UCF. She conducts research in many different focuses, one of which being her research on Smart Energy Infrastructure Systems. She has been teaching at the University of Central Florida for almost ten years and continues to inspire students interested in power and energy. The initial proposal Dr. Sun presented ultimately shaped into our project's final idea- a vent intelligence system for temperature adjustment, or VISTA.

2.2 Current Commercial Technologies and Existing Projects

2.2.1 Flair Smart Vent FLAIRVENT

The Flair Smart Vent is an existing commercially available smart ventilation system that claims to reduce energy consumption by up to 30%. It is available in a wide variety of sizes, with nine different sizes available. The most common ventilation size, the 4x10 model, being priced at $99. This smart vent requires the removal of a pre-existing ventilation unit and replacing it with the Flair Smart Vent. The Flair Smart Vent has the option to be powered via battery connection or a wired connection for a more permanent installation, the battery connection however allowing the smart vent to be powered on for a couple years. The Flair Smart Vent works by dynamically adjusting the airflow into the room by utilizing its high-performance temperature sensor. This sensor detects the ambient air conditions and allows cool air to flow in through the vents to match the user’s desired temperature. The Flair Smart Vent also connects to a mobile app and a device called the Puck. The Puck is powered by two double A batteries and allows use of smart home applications, such as using Amazon Alexa to adjust the temperature or other smart home applications. The Puck includes an embedded screen that can also be used to adjust the temperature in combination with the mobile app. The app allows for the use of geofencing technology, meaning that the temperature conditions of the vent can be adjusted depending on whether the user is home or not. The vent can also connect to other smart home devices, such as an ecobee smart home device, to allow for extra functionalities. The Flair Smart Vent can utilize the ambient light sensor or occupancy sensors of an external device to create changes in the temperature settings. For example, utilizing this smart technology the Flair Smart Vent can respond to a higher number of people entering a room and reducing the temperature.

With all of the above listed technology for the Flair Smart Vent, it positions itself in the market as a higher-end product for people looking to have extra features in a smart vent. Its ability to connect with extra smart devices and the ability to be configured with an API justifies a higher cost compared to other smart vent devices. However, for people looking for a simpler and cheaper alternative, there exists alternatives that provides similar functionality. [1] [2] [3]

2.2.2 BIOWIND quiet Register booster fan

The Biowind quiet booster fan is a cheaper alternative to the Flair Smart Vent that can provide similar functionalities, removing some of the higher-end smart functionalities. For one, the Biowind vent is designed to be quiet, claiming to be at an 18 db volume at it's highest capacity. This positions the Biowind booster fan to be placed in rooms such as a bedroom, where a quiet environment would be more desired. Similarly to the Flair Smart Vent, the Biowind vent must be installed in place of a removed vent. The Biowind fan includes an embedded screen on the vent to allow for adjustment of temperature and fan speed controls. It also comes packaged with a simple remote control that can adjust the temperature and fan speed controls. This is useful in case the vent is placed in an inconvenient spot, such as above a door. However in order to see what the set temperature is, one must look at the embedded screen on the vent since there is no available smart app. There is also no available API or ability to connect to a smart device unlike the Flair Smart Vent. The Biowind can also only be powered via a power cord. This means that it can cause an inconvenience for vents placed away from a power outlet. Despite this, the Biowind vent works similarly to the Flair Smart vent by utilizing a high-precision temperature sensor to dynamically adjust airflow into the room, pumping cool air into the room to set a specific temperature. The Biowind vent is also only sold in a limited number of sizes compared to the Flair Smart Vent, with only four available sizes. The standard 4x10 size compatible with most ventilation systems is listed for $49. This price point allows for a more straight-forward functionality for reducing energy costs, removing all of the advanced smart home applications seen in the Flair Smart Vent. [3][4][6]

2.2.3 Summary

In summary, both ventilation products advertise their ability to reduce the consumed energy expenditure on air ventilation by utilizing temperature sensors to adjust air flow into a room. Both listed products demonstrate differences in their extra functionalities, the Flair Smart Vent allowing for more advanced smart home functionalities and the Biowind smart vent removing these smart functionalities in favor of a lower price point. Due to the success of the Flair Smart Vent device, it is clear that there is demand for a high-end smart vent device that allows for many home conveniences, yet still offers a solid amount of energy saving due to the dynamic airflow technology. This creates a space in the market for a smart vent device that can include extra sensors not seen in other devices, to allow for the same smart technology without having to rely on the use of external home devices. For our smart ventilation system, we will be incorporating more advanced functionalities than what is seen in these smart devices, and still reducing the overall energy expenditure of the home on air conditioning. This increase in technology will justify a higher price point.

2.3 Objectives and Goals

The main objective for VISTA is to create a semi-autonomous system that will decrease loss and overall energy cost of a home. The ventilation device will incorporate grid frequency, thermal sensors, and motion sensors to achieve this goal. More of the goals and objectives incorporated in this project are listed below.

Main Goals:
- The ventilation system will be controlled from a mobile app, with two separate modes.
- The first modes will adjust the temperature of the room based on the occupant's specification and room activity.
- The second mode will autonomously adjust the vent based on the grid frequency sensor.

Vents objectives:
- Determine and implement the ideal mechanism to control air flow in existing ventilation systems.
- Determine and implement the most suitable choice for device power and lifetime from a battery or other power source.
- Determine and implement the best mobile framework for easy and simple user experience and suitability for VISTA.

Smart home objectives:
- Determine and implement the ideal communication protocol between the app and the grid frequency sensor.
- Determine and implement a method for VISTA to react to changes in building and room occupancy.

Stretch goals:
- The device will be able to recharge the battery from a small wind-turbine that converts air coming through the vents into reusable energy.
- The app will be able to connect to additional vents and be controlled simultaneously.

2.3.1 Hardware and Standards

VISTA aims to reduce home energy consumption, by way of opening and closing air conditioning vents based on a number of input parameters. Each of these parameters: temperature, occupancy, and power grid usage, and user input need to be ascertained, processed, and then acted upon. Every input is sensed and integrated into the rest of VISTA independently. The following section outlines the fundamental hardware requirements for construction of VISTA.

2.3.1.1 Temperature

To appropriately react to changes in thermal conditions, a temperature sensor must be used. Because VISTA is intended to be fastened directly upon the air vent, a sensor detecting the temperature local to the device would not be accurate to the condition of the whole room. As a result, the sensor must be able to read the temperature of a position in the room from a distance, without physical contact. As the device will be battery operated, this sensor should be low-power. Some standards for devices which meet the criteria, particularly ASTM E2758-22 [7] which can serve as a guideline for selecting contactless infrared temperature sensors, if that is the direction the VISTA project proceeds with.

2.3.1.2 Occupancy

To appropriately react to changes in room occupancy, a wide range of sensor options can be chosen. Most sensors on the market advertised as occupancy sensors are passive infrared motion detectors. As these are often used in security systems, namely security cameras and lights, the ANSI/SIA PIR-01-2000 [8] and NEMA WD 7-2011 [9] standards both exist as design guidelines in motion detector designs. These standards will aid in selecting a sensor which will respond to active occupancy while also decreasing the occurrence of false alarms.

2.3.1.3 Grid Usage

To appropriately react to changes in power grid usage, an accurate sensor of grid frequency changes must be used. Dr. Q.Z. Sun, the sponsor of this project, is able and willing to supply the VISTA project with a suitable sensor designed from a previous project. There are not currently any recognized, or published standards directly applicable to this sensor.

2.3.1.3 Power

Operating VISTA inherently will require a power source. Existing products in the marketspace, likely with somewhat similar energy demands, use batteries and claim a life expectancy of approximately 2 years before the battery needs to be replaced. Primarily for ease of installation, while still meeting energy needs, VISTA will also use a battery system. IEC 61960-3:2017 [10], an IEC standard for judging batteries based on performance metrics may be used to ensure the selected battery can maintain a long lifespan. IEC 62133-2:2017 [11] should be used to ensure the selected battery is safe to use in all possible operating conditions VISTA may be in.

2.3.1.4 Processor

Interoperability of the sensors, mobile app, and the lever switching mechanism will be controlled by a processor. The requirements of the processor are to execute the logic controlling the VISTA device. It will need to interact with the mobile app, meaning it should either have an on-chip interface (SOC) or an external module will be needed. In either case a number of communication technologies may be suitable such as IEEE 802.11 (WIFI)[12], or IEEE 802.15.4-2020 (Low Rate Wireless Networks) [13], Zigbee or many more. A major factor in MCU selection will be that of power usage. As VISTA is battery powered, a low power MCU is strongly preferential to a processor with higher power usage, even if performance is also increased.

2.3.1.5 Open/Close Mechanism

The final goal of VISTA is to open or close the louver (set of slats) on an air vent. This requires mechanical motion. If configured right, this can be accomplished by an actuator, servo, solenoid, etc. Most commercial and residential ventilation covers already have an existing lever mechanism to open or close the louver. VISTA will replace the intended human hand to operate this lever. The mechanical device should only need to apply no more than 5 lbs on the end of the lever to operate under ideal conditions. As the speed at which the louver is not of the utmost importance. A slow moving but high torque motor should be used to use as little power as necessary.

2.3.1.6 Mounting
VISTA must be attachable to an existing air vent. It must not involve any work in removing or replacing dry-wall, a ventilation shaft, or any feature of the room. Mounting the device may be achieved in a number of methods. Adhesives (i.e. Command Strips), suction cups, or clipping onto the existing louvers could all support the needs of VISTA. ISO 21368:2022 [14] outlines best practices in adhesive manufacturing, which may provide insight in determining which kind of adhesive, if that is the mounting design VISTA will use, would support the necessary weight.

2.3.1.7 Integration (PCB/Housing)
Integration of all the aforementioned components will be connected through a PCB. As no part of VISTA will be subjected to extreme stress or temperature; nor will any component ever need or be capable of drawing unreasonably high power, PCB design and manufacturing can adhere to the generic PCB design standards - IPC-2221A [15]. There is one particular concern with the physical interaction between VISTA and it's local environment: dust. Because the device is meant to be installed and left for prolonged periods of time, potentially once every 2 years to replace the battery, an ample amount of dust will have the potential of collecting on the PCB or any of the sensors and components. To reasonably avoid debris from interfering with the device's operation an IP-6X [16] case or similarly sealed housing should be used. While some sensors - particularly the temperature and occupancy sensor will have to be placed outside the case, and connected via an IP-6X or similarly rated grommet or gland. Because VISTA must be mounted to an air vent, it should be as lightweight as possible to reduce the mounting system failing, which will likely result in the device being broken.

2.3.2 Software

VISTA requires the creation of two separate software endeavors. The two software projects involved are the code that will run on the embedded MCU inside VISTA, and the corresponding smart app that will act as the controller for VISTA. Despite the fact that their implementations will be separate, they must work together to ensure a seamless experience. Firstly, the MCU program must be able to control the ventilation system, and be able to read from all connected sensors. Secondly, the MCU software must be able to respond to changes driven by the corresponding smart app. This is important, as the smart app acts as the only way to interface with VISTA since there will not be an embedded screen on VISTA. For the smart app, it must be able to interact with VISTA over a WiFi connection to change the temperature, switch VISTA between Eco mode or the Bare minimum energy mode, and it must be able to receive information from the VISTA device and update the UI accordingly.

2.3.2.1 Microcontroller code
The chosen MCU for VISTA will be the STM32L475. This MCU was chosen because of its integration in the STM32L475 IoT Node development kit, which allows for an easy implementation of WiFi enabled software. It is also an ARM microcontroller known for drawing little power, which is essential because VISTA is battery powered. The development environment for this MCU includes a Hardware Abstraction Library written in C. This will allow for easy implementation of common communication protocols, such as UART or I2C, which will be necessary for communicating with all of the available sensors. One of the most important aspects of the MCU program is to read the status of the thermal sensor and respond appropriately

to changes in temperature. For example, the MCU will read the status of the thermal sensor and determine whether the temperature is above or below the maximum and minimum temperature values. If the temperature is not in the range, the MCU will send a signal along a designated port to control the vent lever. The vent lever will open or close depending on if the temperature is too high or too low. This is one example of the many responsibilities the MCU program will have in ensuring that VISTA fulfills its requirements. The MCU must also be read from the infrared and grid sensor, and make decisions about their status. Finally, the MCU program must be able to communicate all of its internal variables with the Smart phone app, such as the temperature and its current mode.

2.3.2.2 Smart Phone Application code

The Smart phone application will be developed as a web-app written in Javascript. This was chosen to allow for cross compatibility for all mobile devices such as Android and iOS. This application is responsible for providing the user interface for all possible interactions with VISTA. It will include the ability to set the user's desired minimum and maximum temperatures for the room, and will relay this information over WiFi back to VISTA. This application will also include the ability to change from Eco mode to Bare Minimum Energy mode and vice versa. Since this application is the only window into the state of VISTA, it is solely responsible for informing the user about the current temperature of the room, and its selected mode. Therefore, the application must read from the MCU software in order to display the value of the current temperature. The Smart phone application will also include the ability to force open or force close the vents. Finally, depending on the success of this project's stretch goal, the Smart phone application would also include the ability to connect to multiple VISTA devices simultaneously, and display all UI elements for each connected VISTA device.

2.4 Required Specifications

VISTA Specifications	
Hardware	
Installation	Installation time is not to exceed 30 minutes
Reaction time	Vent adjustment time is not to exceed 2 minutes
Maintainability	Entire device lifetime shall exceed 2 years
Dimensions	Shall not exceed 11" x 3" x 9"
Weight	Shall not exceed 5 pounds
Manufacturability	Cost shall not exceed $400
Power supply	
Battery Life	Battery life shall exceed 3 months

Maximum supply voltage	Supply voltage shall not exceed 3 volts
Software	
System Monitoring	Device will communicate Battery life from 0-100%, Temperature, Open/Closed status, within the app
Communication rate	Shall be 2400MHz
Network Range	Shall be 50 ft.
Energy Usage	
Home energy usage [17]	Reduced home energy usage by a 5%

Table 1: Specifications

2.5 Block Diagrams

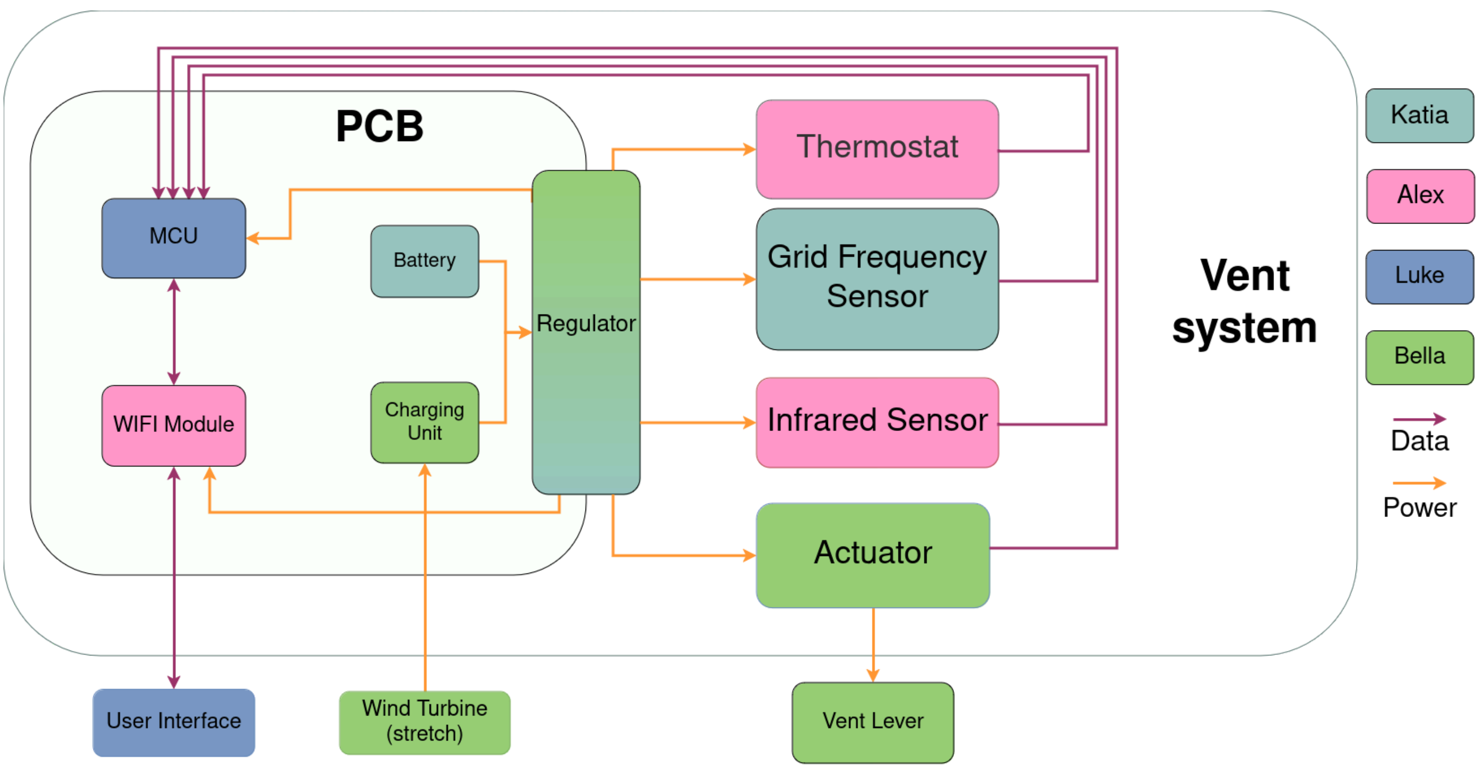


Figure 1: Hardware Diagram

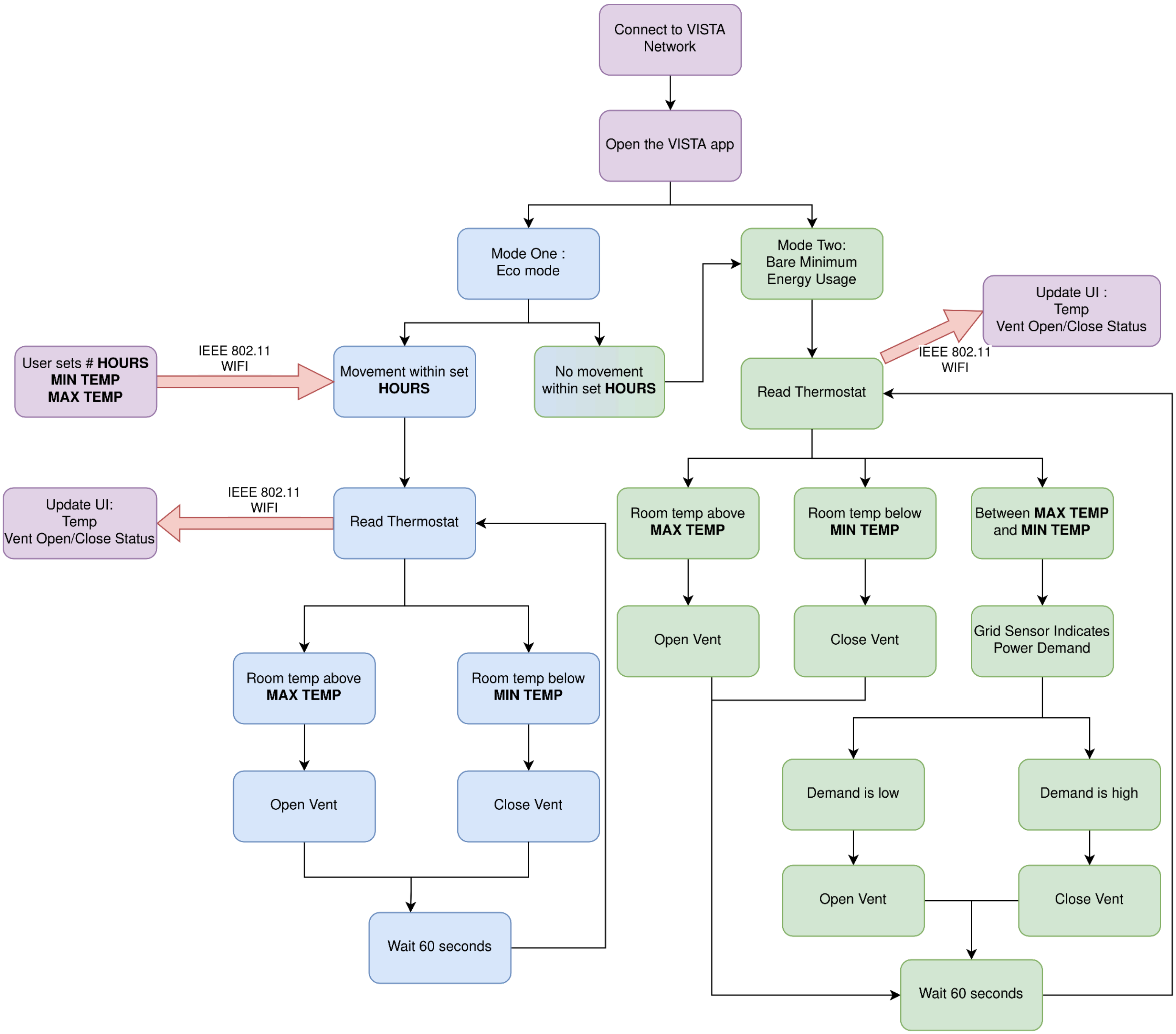
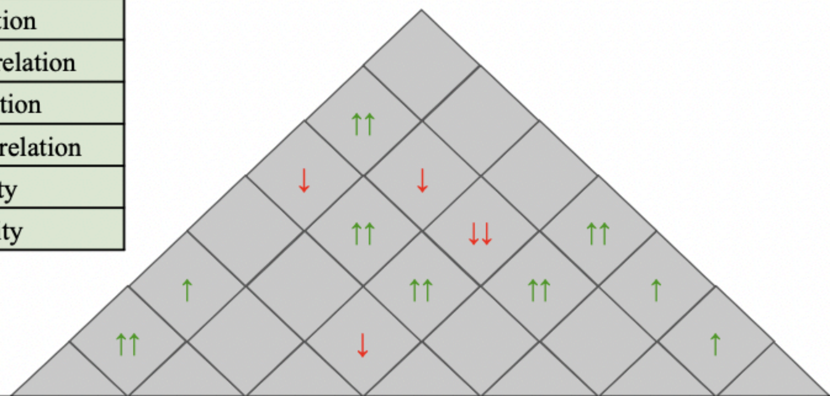


Figure 2: Software Diagram

2.5 House of Quality

Symbol	Description
↑	Positive Correlation
↑↑	Strong Positive Correlation
↓	Negative Correlation
↓↓	Strong Negative Correlation
+	Positive Polarity
-	Negative Polarity



Engineering Requirements		Actuator Force	Performance	Dimensions	Usability	Efficiency	Cost	Maintainability
Marketing Requirements		+	+	-	+	+	-	+
Battery Life	+	↓	↑			↓	↓	↑
Easy to Use	+			↑	↑↑			↑↑
Affordability	+	↓					↓↓	
Energy Efficient	+	↓↓	↑			↑↑	↑	
Lightweight	+			↑	↑			
Reliability	+					↑	↑	↑
Connectivity	+		↑↑				↑	
Targets for Engineering Requirements		Can exert up to 10 pounds of force	<= 3 Volts	L: 11” W: 3” H: 9”	<30 minutes	Will reduce energy usage by 5%	<= $400	Will last up to two years

Figure 3: House of Quality

Chapter 10-Administrative Content

10.1 Budget and Financing

VISTA is sponsored by Dr. Qun Zhou Sun. The maximum budget for this project, from estimation of costs, was set by the group at $400. The main components for our project can be split up into sub-groups as seen below.

Component	Cost
Vent Mechanical Device(s)	$100
Vent component enclosure	$10
Power supply (battery)	$20
Grid frequency sensor	$50 (free? Ask QZ)
PCB Printing	$50
Components	$100
Total Cost	$330

Table 2: Budget

Considering the budget for the project is $400 our group has wiggle room to design the VISTA. This will account for errors in estimation as well as roadblocks we may encounter as the project progresses.

10.2 Distribution of Worktable

To ensure a proper work distribution among group members, the table below organizes general tasks of the project under each member. Specific tasks are assigned to different members, although collaboration among all project sections is necessary to create a proper workflow and produce a successful final project.

Electrical Engineering	Responsibilities
Katerina Brown	Pick the most efficient battery for the design
	Discover how to connect the grid frequency sensor to the app
	Discover the best regulator for load of battery

Electrical Engineering	Responsibilities
Alexander Hatzilias	Design and execute infrared sensor system
	How to communicate between thermostat sensor and vent PCB
	Find the best wifi module for design. How to communicate with app
Computer Engineering	**Responsibilities**
Luke Morrison	Pick the MCU
	Design user interface that interacts with vent system
Electrical Engineering	**Responsibilities**
Isabella Polkey	Discover the best regulator for load of battery
	Pick the actuator for the design
	Design how the actuator will interact with the existing vent lever
	(stretch) How to integrate rechargeable system into charging unit and battery

Table 3: Distribution of Work

10.3 Milestones

In order to execute a successful project, it is important to meet regularly with group members. To complete steps in a timely manner, a breakdown of the meetings and general timeline of Senior Design I and II is shown below.

Senior Design I	
Week	**Task**
0-1	Group formation, Research and discuss initial project ideas
2	Decide on final project idea, Begin Divide & Conquer
3	Form review committee, Complete Divide & Conquer- Due 9/6/24
4	D&C group meeting on 9/11/24, Begin 60-Page Report

5-6	Update and upload D&C Report on group website- Due 9/27/24, Continue 60-Page Report
7-10	Complete 60-Page Report- Due 10/25/24, Begin 120-Page Report
11	60-Page Report Group Meeting, Continue 120-Page Report
12	Update and upload 60-Page Report on group website- Due 11/8/24, Continue 120-Page Report
13-14	Complete 120-Page Report (SD1 Final Report) & Mini Demo Video- Due 11/26/24

Table 4: Senior Design I Milestones

Senior Design II	
Week	**Task**
1	Revise 120-Page Report as needed, Order parts
2	Research building methodology, Start putting together PCB
3-5	PCB building & testing
6-9	System integration research & testing
10-12	Practice Project Demo, Finalize documentation
13	Practice Final Presentation
14	Final Presentation- Date TBD

Table 5: Senior Design II Milestones

Citations/Resources:

[1] Snead, Adrian. “Flair Smart Vents: Everything You Need to Know.” *Smarter Home Guide*, 3 Nov. 2023, smarterhomeguide.com/flair-smart-vents/.

[2] Lee, Mike. “Flair Smart Vent Review: Worth It?” *DIY Smart Home Hub*, 9 Feb. 2022, www.diysmarthomehub.com/flair-smart-vent-review/.

[3] “Flair Smart Vent 4x10 (White), AC Vent Cover for Floors, Walls and Ceilings.… - Amazon.Com.” *Amazon*, www.amazon.com/Flair-Compatible-Honeywell-thermostats-Assistant/dp/B07TLHNXJT. Accessed 5 Sept. 2024.

[4] “Amazon.Com: BIOWIND Quiet Register Booster Fan, Smart Register Vent Fits 4" x 10" Register Holes with Remote Control and Thermostat Control, Heating Cooling AC Vent Fan - White : Tools & Home Improvement.” *Amazon*, www.amazon.com/BIOWIND-Register-Booster-Control-Thermostat/dp/B0BS6H6XV2. Accessed 5 Sept. 2024.

[5] Plumber, John. “Biowind Quiet Register Booster Fan Review.” *Diyfanhvac.Com*, 10 Jan. 2024, diyfanhvac.com/biowind-register-booster-fan-review/.

[6] Mohan. “Biowind Quiet Register Booster Fan Review - Nexus Home Gear.” *Nexushomegear*, 27 Sept. 2023, nexushomegear.com/biowind-quiet-register-booster-fan-review/.

[7]“Standard Guide for Selection and Use of Infrared Thermometers.” *Compass*, ASTM International, compass.astm.org/document/?contentCode=ASTM%7CE2758-22%7Cen-US&proxycl=https%3A%2F%2Fsecure.astm.org&fromLogin=true. Accessed 5 Sept. 2024.

[8] “ANSI/SIA PIR-01-2000: Passive Infrared Motion detector standard - features for Enhancing False Alarm Immunity Standard,” Security Industry Association, https://www.securityindustry.org/industry-standards/ansi-sia-pir-01-2000/ (accessed Sep. 5, 2024).

[9] “Occupancy motion sensors standard,” NEMA, https://www.nema.org/standards/view/occupancy-motion-sensors-standard (accessed Sep. 5, 2024).

[10] “IEC 61960-3:2017,” IEC, https://webstore.iec.ch/en/publication/29603 (accessed Sep. 5, 2024).

[11] “IEC 62133-2:2017,” IEC, https://webstore.iec.ch/en/publication/32662 (accessed Sep. 5, 2024).

[12] “Wireless Local Area Networks,” IEEE 802.11, The Working Group Setting the Standards for Wireless LANs, https://ieee802.org/11/ (accessed Sep. 5, 2024).

[13] 802.15.4-2020 - IEEE standard for low-rate wireless networks | IEEE standard | IEEE xplore, https://ieeexplore.ieee.org/document/9144691 (accessed Sep. 5, 2024).

[14]“ISO 21368:2022(En).” *ISO*, ISO, 2022, www.iso.org/obp/ui/en/#iso:std:iso:21368:ed-2:v1:en.

[15] “IPC-2221A - Generic Standard on Printed Board Design.” *IPC*, www.ipc.org/TOC/IPC-2221A.pdf. Accessed 5 Sept. 2024.

[16] *Ingress Protection (IP) Ratings*, IEC, 2024, www.iec.ch/ip-ratings.

[17] Smart ventilation controls, https://www.nrel.gov/docs/fy20osti/76087.pdf (accessed Sep. 5, 2024).

[18]"University of Central Florida logo," 1000 Logos The Famous logos and Popular company logos in the World University of Central Florida Logo Comments, https://1000logos.net/university-of-central-florida-logo/ (accessed Sep. 5, 2024).