<div align="center">**Senior Design Proposal**
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1 Introduction

Sometimes, one of the most difficult parts of the day is getting out of bed in the morning. Our proposed senior design project is a "morning companion" that allows the user to have a better experience waking up every day. It will combine several unique features, including automated blinds that open at a specific time specified by the user, as well as a weather reading taken from directly outside the user's window. This weather reading will be sent to the user's phone, alert them in an app of the current temperature, humidity, and luminosity (cloudy/sunny), and give them a suggestion of what to wear based on this information. Additional functionality we could add includes a speaker that would play a predetermined sound to aid in waking the user up instead of having them set a phone or clock alarm. We could also run the microcontroller primarily off of solar power instead of a battery in order to make the product more energy efficient; the user would never have to worry about changing the battery. Throughout the day the blinds will act as a smart automated system, taking in relevant information regarding light and temperature and subsequently opening or closing the blinds accordingly. For example, if the inside of the house reaches a certain temperature threshold the blinds will close. This action should keep the house cool more efficiently, cutting down on energy costs.

2 Problem Description

Waking up, particularly on a weekday morning to get ready for school or work, is a difficult task that many people do not enjoy. The room is dark with the blinds closed, making it difficult to roll out of bed and begin the day. From the moment someone wakes up, they are immediately plagued with questions such as: What is the weather like outside? What am I going to wear today? All of these combined issues make for a hectic and unpleasant morning routine that can start a person's day off on the wrong note.

Additionally, people spend time in the morning and evening opening and closing the blinds in their house. Furthermore, when people are away from the house for long periods of time, such as on vacation, leaving the blinds permanently in either an open or closed position is an indicator to burglars that no one is home. Leaving blinds open during the day allows the sun to heat a room past the thermostat set temperature, resulting in higher energy cooling costs. Conversely, leaving blinds closed early in the morning can lead to missing out on a chance to more efficiently heat the home at the beginning of the day. Also, many modern homes have windows in high or hard to reach places, making it difficult to adjust blinds or impractical to have them at all.

3 Proposed Solution

This project seeks to make the morning experience more enjoyable and less stressful by quickly answering some of these daily questions for the user, as well as opening up the blinds to illuminate the room to prompt the person to get out of bed. The blinds will operate via rotational

motor and will open/close and/or raise/lower at a specific time set by the user. This wake up time may be accompanied by a noise. Additionally, the weather station will take various data readings at that time, analyze the corresponding data, and notify the user of the weather for the day and what items of clothing are appropriate to wear. This combined app + automated blinds + weather station interface will make for a much more pleasant and prepared morning. The weather station will be equipped with various sensors needed to gather important weather data (light, temperature, humidity, etc.) The app will allow the user to set various parameters such as the time for morning wake-up, and it will provide the user with controls for the blinds. We plan on having a wireless interface for everything to communicate with ease. Lastly, to solve the other blinds related problems, the blinds will automatically adjust throughout the day based on sensor readings inside and outside the house. With this setup, problems with forgetting to adjust blinds, having windows in hard to reach places, adjusting blinds while away on a trip, or using the blinds to help cool or heat the house can be solved.

4 Demonstrated Features

- Fully functioning blinds that rotate via motors at a preset time to alert the user that it is time to wake up, and automatically close at a predetermined time later in the day.
    - The blinds also rotate during the day according to sunlight outside and/or temperature inside.
- A weather station with the following sensors that take a weather reading each morning to notify the user of the current outside conditions:
    - Temperature sensor
    - Humidity sensor
    - Light sensor
    - (Potential) rain detector
    - (Potential) wind detector
- An app interface that will indicate the morning's weather readings in the form of a temperature, humidity percentage, and cloudy/sunny description. It will also indicate the current state/setting of the blinds and allow the user to adjust the blinds manually without the need for temperature or light input.
- The proposed project will be potentially powered by a solar cell with a battery backup. This works well with the fact that we take in luminosity data and the weather station will be placed outside the home, near the window. This feature also reduces home power consumption, and the battery backup will be utilized in the event the sun isn't present.

5 Available Technologies

- A wireless interface will be needed to communicate between the microcontroller and the iPhone application. For this, the ESP8266 part will be used and connected to the hardware in the blinds to signal to the phone the current weather conditions and state of the blinds.
- Various sensor technologies will be needed to take the weather readings, including a temperature sensor (TMP36 - https://www.sparkfun.com/products/10988), a humidity sensor (HIH-4030 - https://www.sparkfun.com/products/9569), a light sensor (Photocell -

-   A power source, potentially solar powered with a back-up battery
    (http://www.amazon.com/Small-Solar-Panel-3V-20mA/dp/B002MAX0FS or
    https://www.sparkfun.com/products/9962 for solar cell
    depends on power requirements and availability)
-   A microcontroller, type to be determined after further research
-   An application interface programmed for iOS using Xcode

6 Engineering Content

Below is a block diagram showing how we plan to structure our project. Our microcontroller will communicate with the user via an app interface and be in charge of controlling our weather station and blinds movement.
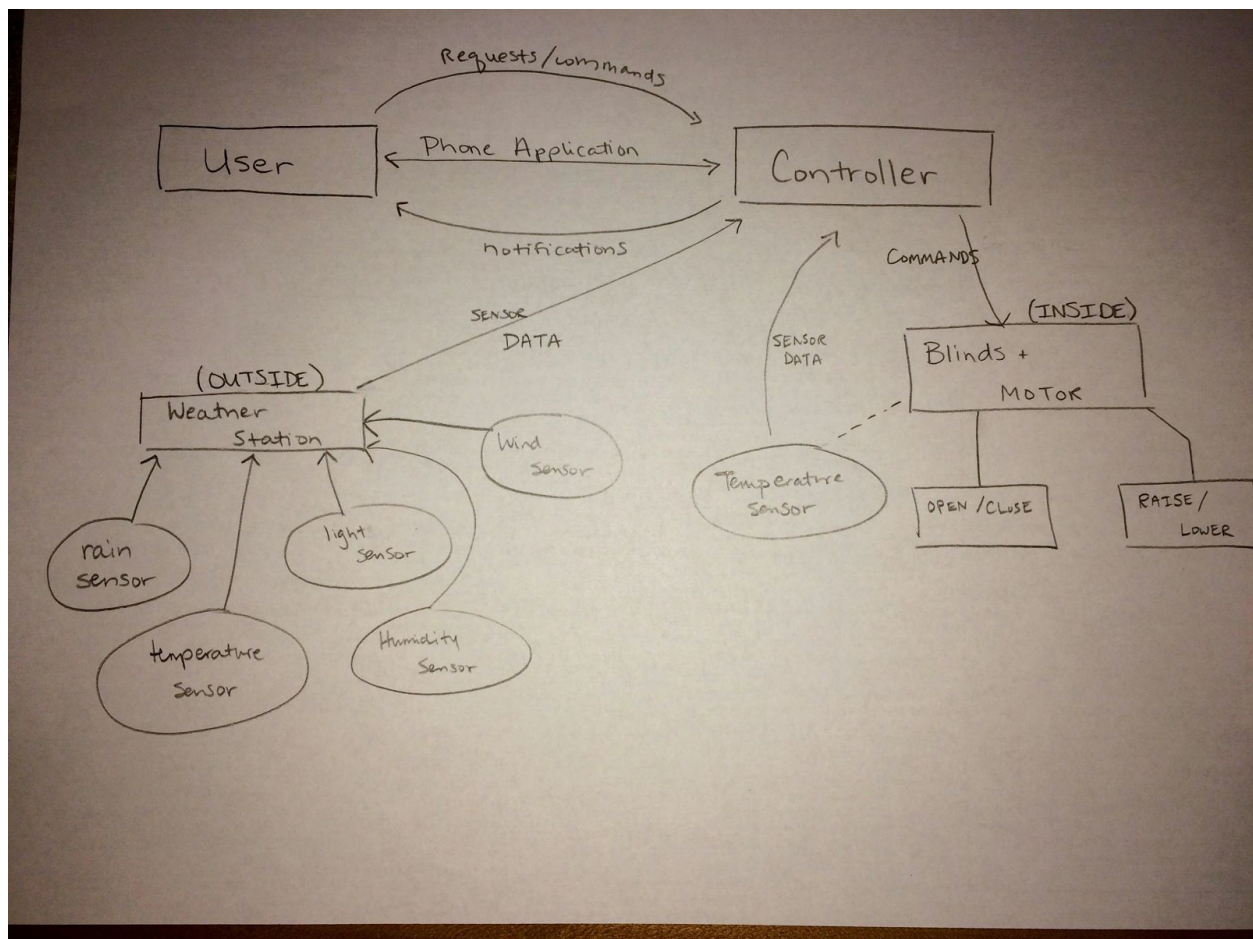

Figure 1. Project Flow Diagram

The following steps will need to be taken in order to go from this idea to a well-developed product:

- Customize the controller
- Install the motor to the blinds
- Connect blinds/motor system to controller
- Calibrate sensors
- Develop code functions and controller logic/flow
- Develop application for iPhone
- Interface each block with each other

7 Conclusions

We believe our product is simple enough to be a feasible project for a team of three people while solving the dual problems of waking up in the morning and efficiently managing blinds to save on home heating and cooling costs. It will achieve this through combining an automated blinds system with a small weather station to streamline the morning routine and make it a more pleasant experience. The blind system will be put to further use throughout the day to manage and adjust itself according to lighting and temperature needs. Costs to powering the system will be kept down through utilizing a solar cell with a battery backup. The user will be able to manage the entire system and view relevant information regarding it using a smartphone app interface. The relevant technologies needed to realize these goals and features are cheap enough that our project should come in under budget with some room to spare, and our plan of steps we need to take to realize the system will keep us on a path for success. For all these reasons stated above, we believe our project should receive approval and funding.