Automatic Blinds Conversion Kit

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Motivations

The motivation behind this project is to promote accessibility and convenience. Grip strength and limited-motion are major problems to those with hand and arm disabilities. An automated device can eliminate these movements with a simple press of a button.

Those who have trouble waking up or scheduling difficulties can also make use of the automation by scheduling when the blinds will automatically open and close.

Our product reduces waste as it allows conversion of existing blinds, which eliminates the need to buy brand new, expensive automatic blinds and throw away their old ones.

Requirements

Complicated to Install	
Incompatible With Aluminum Slat Blinds	
Expensive ($100 - $700)	

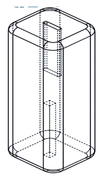
Market Competitors

We found that current market options were between $100 and $700 dollars and required a completely new system to be installed. Our goal was to create a product that was easily accessible and affordable.

	Easy Installation		Simplicity
	Durability		Low Power Consumption
	Low Cost		Seamless Functionality

Our design priorities are functionality and convenience. The device needs to be low maintenance and easy to use with a remote control system. We required the device to be under $50 as this makes us stand out in the market. It must make less than fifty decibels of sound and be unobtrusive. It has to create less than 100g of waste at the end of its lifetime and last for at least six months without repairs. We decided to also include a bonus requirement, which was an alarm clock feature.

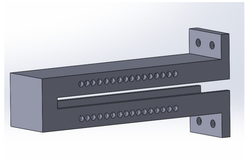
The Design Process



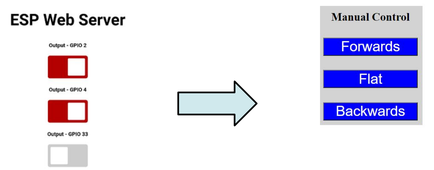
This design translates the rotational motion of the motor into rotational motion of an internal tilting mechanism that tilts the blinds. However, this design did not hold the hook/loop part securely

We moved on to a hook design that features a hook at the top, and a motor insert at the bottom

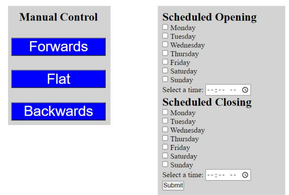
We created a new hook with less stress concentrations and more efficient torque translation



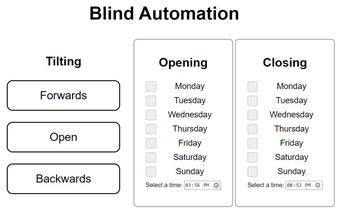
This wall mount houses the motor with adjustable lengths for different blind configurations



Initial website when learning ESP32 basics

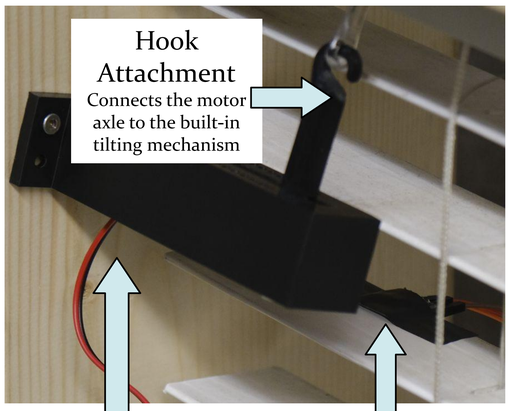


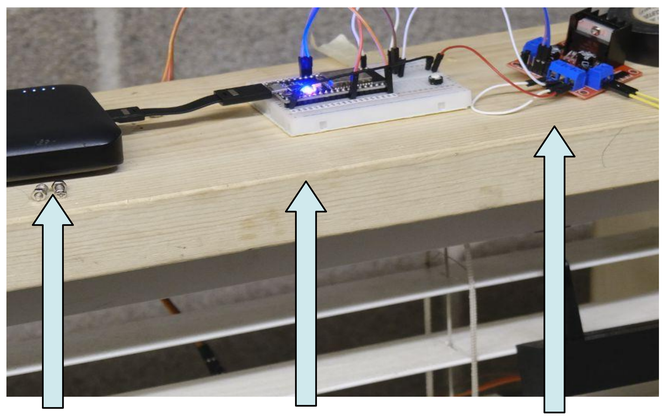
First iteration with scheduling



Final design with stylistic changes

Final Design





DC Motor & Bracket:

Holds the motor as it rotates to control the tilt.

Accelerometer

Reads the acceleration which is converted into an angle measurement that lets us see what position the blinds are in. Acts as a gyroscope.

Power Source

Powers the ESP32 which is powering the rest of the device.

ESP32 Microcontroller

Contains the programming that controls our device. Emits a Wi-Fi signal, allowing for remote control and web-based scheduling.

Motor Driver

Controls the motor based on input from microcontroller.

Capabilities

Speed:
Our device can automatically tilt the blinds from fully forwards to backwards in **5-6 seconds.** This is the same speed as manually tilting using hands.

Resilience:
Provided that the device operates in regular household conditions, our testing has shown **no signs of physical damage** over 5 hours of testing.

Power Consumption:
From our tests, we estimate the device can continuously run for **1-2 hours on a 2000mAh battery pack**. Considering the device only runs for a few seconds every day, the estimated time between recharges is at minimum **1 month**. Our device can be plugged into an outlet or charger, eliminating this inconvenience.

Functionality:
The device has **semi-manual** and **fully automatic controls.** The user can tap buttons if they want the blinds to be fully open, up, or down. For the automated schedules, users can select which day(s) of the week along with specific times for the blinds to open or close.

Connectivity:
The system will initially launch in Access Point mode, so it will emit its own Wi-Fi signal which must be connected to by the user. It will then allow for a change to Station mode, so it will connect to a private network and allow for any device on that network to control the device.

Looking Forward

Lifting:
We want to integrate full control of the lifting mechanism as well, adding even more convenience and eliminating access to potentially dangerous cords. This must be accomplished in a cost-effective, efficient way without sacrificing current functionality

Power Optimization:
There are lots of opportunities to optimize this prototype, particularly in power consumption. It is currently using Access Point and Station Mode Wi-Fi, which is best suited for convenience. However, this design would use significantly less power in Bluetooth Low Energy mode with a dedicated smartphone application for control.

Integrated Circuit:
We would also like to optimize the electronic configuration to a integrated circuit with a much smaller form factor than our current power box, improving the aesthetic and refining the product.

Redundancy:
Finally, optimization to the wifi connectivity and memory of the scheduling in the event of power loss will be a large area of improvement for commercial use