BikoTech
Automated Systems

Smart Blinds Systems

Project Team

- Jorden Bryer – CEO
- Chaman Toor – CTO
- Willy Wong – CFO
- Clark Zhao – COO

Outline

- Background
- High Level Design
- Main Components
- Functional Spec Deviations
- Final Schedule
- Total Costs
- Demo
- Individual Responsibilties
- Questions

Background

- Waking up in the morning can be one of the most difficult parts of the daily routine
- Natural light can help you wake up in the morning
- Manually closing the blinds every night can be a hassle for large buildings
- Design an automated blind system to solve these issues

Current Solutions

1.) Electric Curtain Tracks - HT100 [1]

- Requires a custom track to be installed
- Can be used with a remote control

2.)Dawn to Dusk electric curtain [2]

- Needs a Glider Track for the curtains
- Weight limitations on curtains
- Needs to plugged into a wall socket

Current Solutions

Glider Track – View: Looking Up

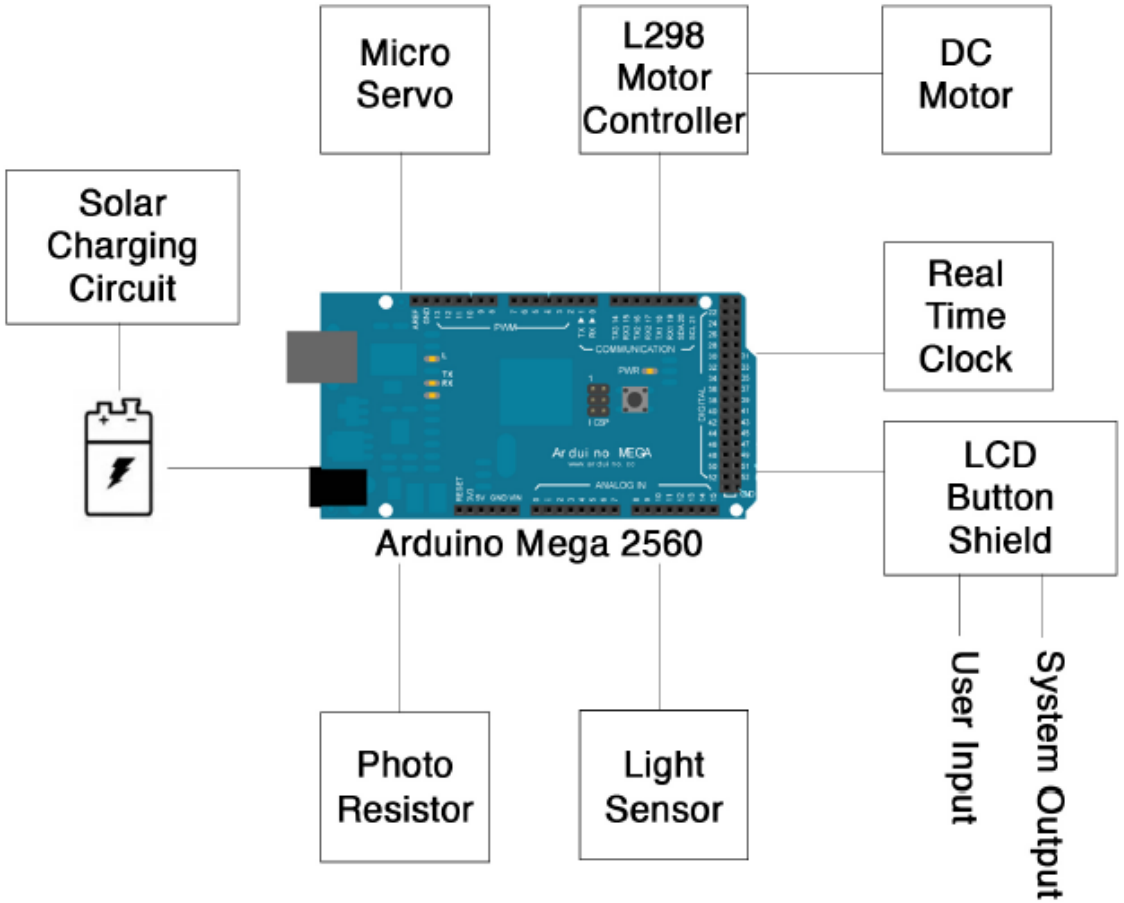
Our Solution

- Integration of manual and automated system
  - Enabled by alarm utilizing a real time clock
  - Detects sunlight and inside light conditions
  - Sensors monitor light levels and control blinds according to a users settings
  - Compact design that fits securely in regular blind housings

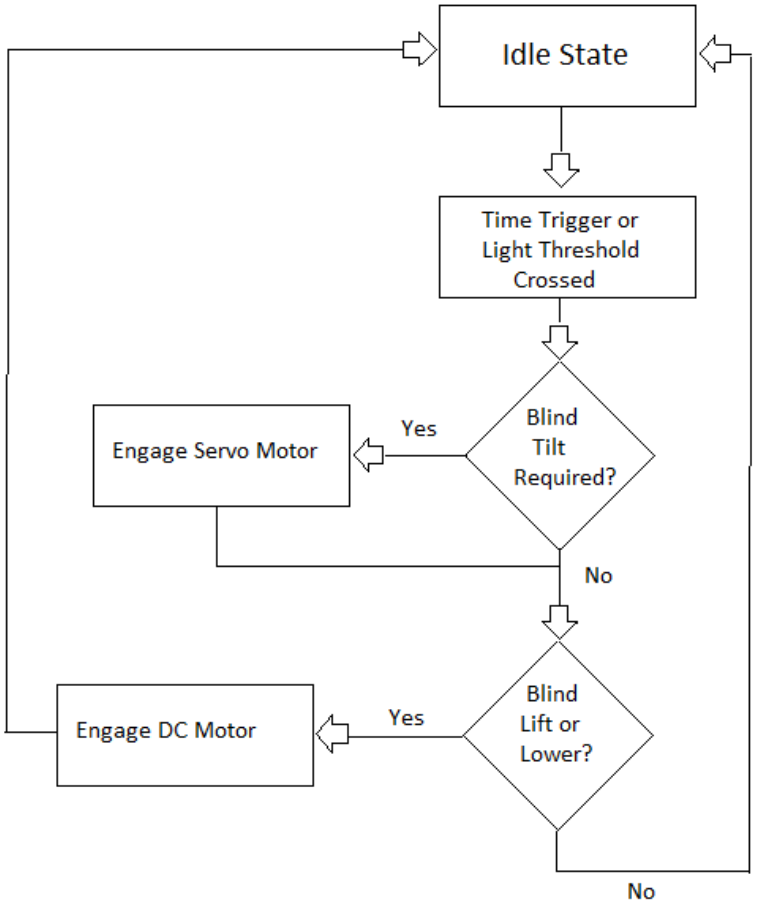
Project Objectives

- Motorized blind lifting and tilting mechanisms to control the light entering a room
- Ambient light sensing, allowing our microcontroller to obtain real time data on light conditions
- Software interface to allow the user to program a number of settings
- Aesthetically pleasing design with cords, motors, and other electrical components hidden

High Level Design



High Level Diagram



System Flowchart

Main Components

1.) Arduino Mega Microcontroller

2.) LCD Panel User Interface

3.) Blind Tilt Mechanism

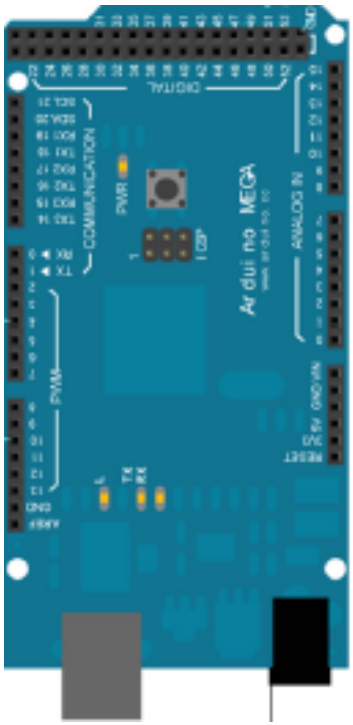
4.) Blind Lift Mechanism

5.) Photo Resistor

6.) BH1750 Light Sensor

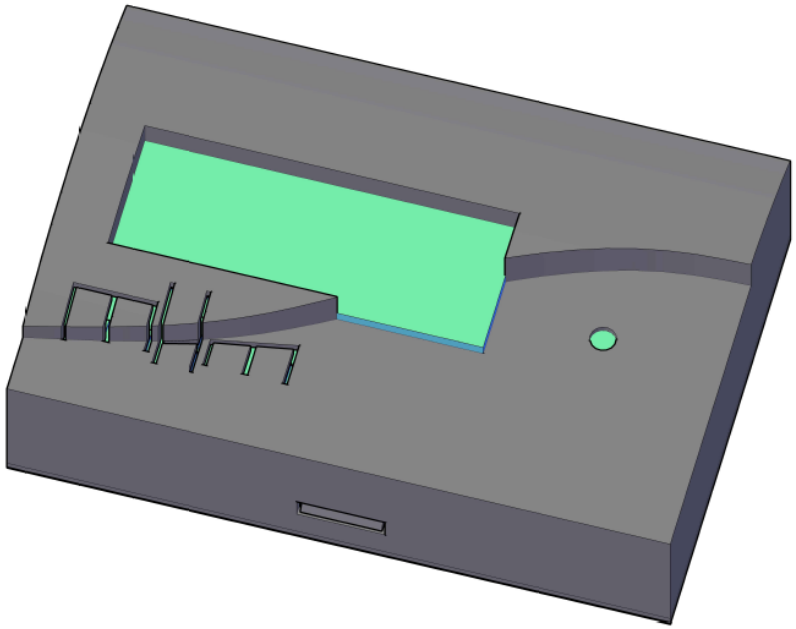
7.) Software

Arduino Microcontroller



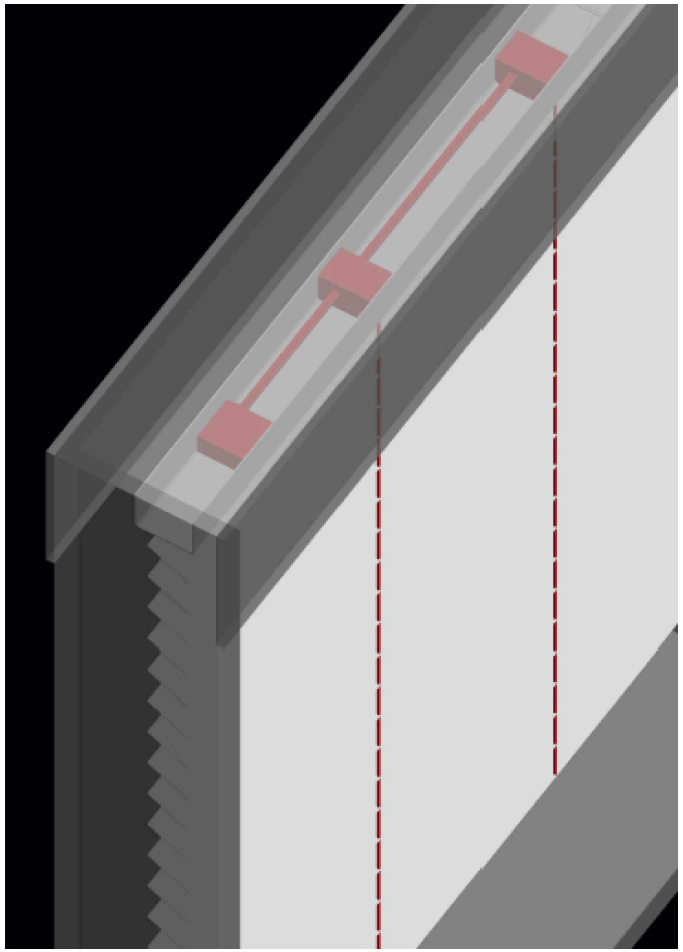
- Heart of the device
- Powers all components
- I2C used for light sensor and real time clock

User Interface



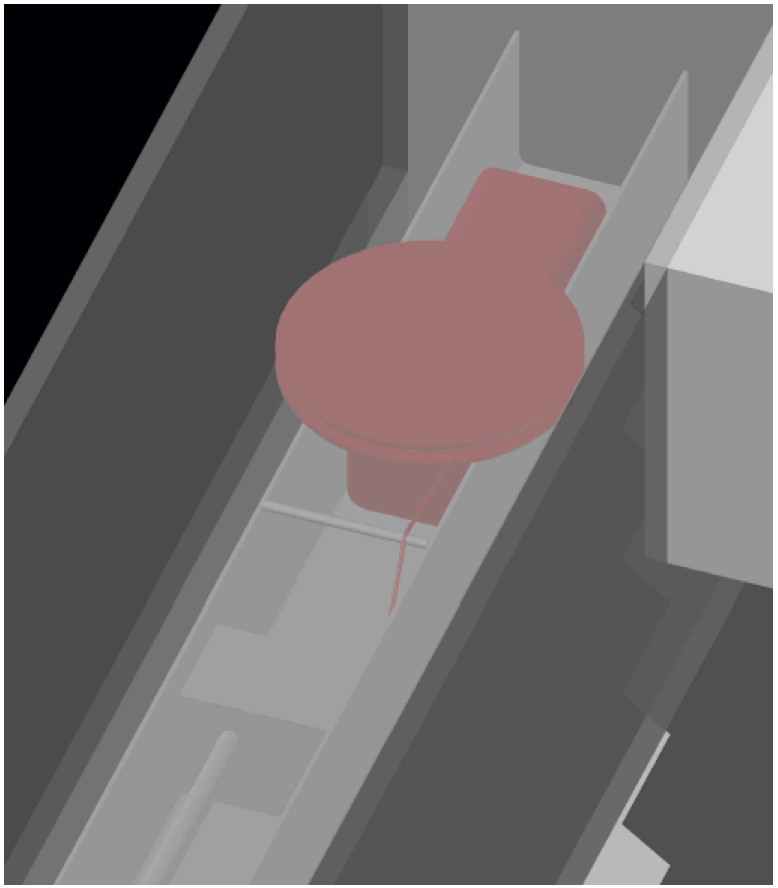
- The LCD panel allows user interaction
- Push buttons
  - Set Alarm
  - Set Clock
  - Set Light settings
  - Reset the device

Blind Tilt Mechanism



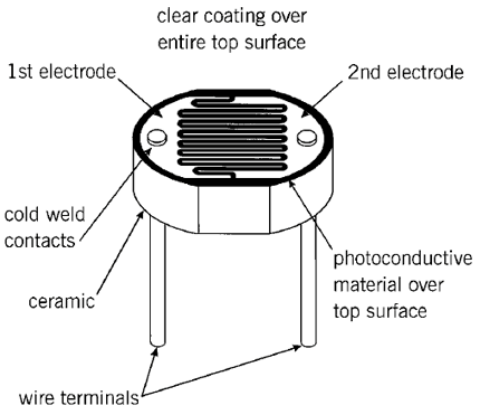
- Serves to Tilt the blinds
- Triggered by either the Light Sensor or Photo resistor
- Consists of:
  - Servo Motor
  - Tilt Rod

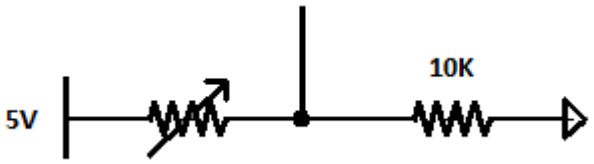
Blind Lift Mechanism



- Serves to Lift the blinds
- Triggered by either the Light Sensor or Photo resistor
- Consists of:
  - DC Motor
  - String Spool
  - L298 Motor Controller

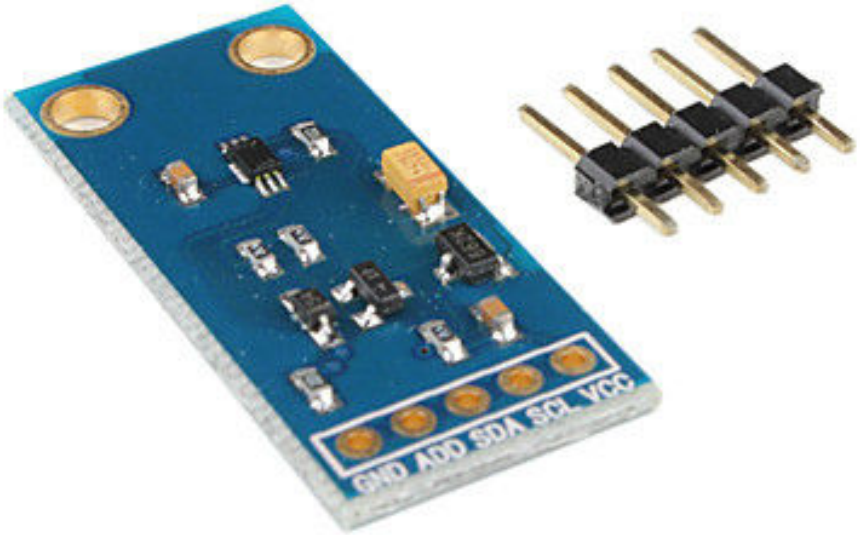
Photo Resistor





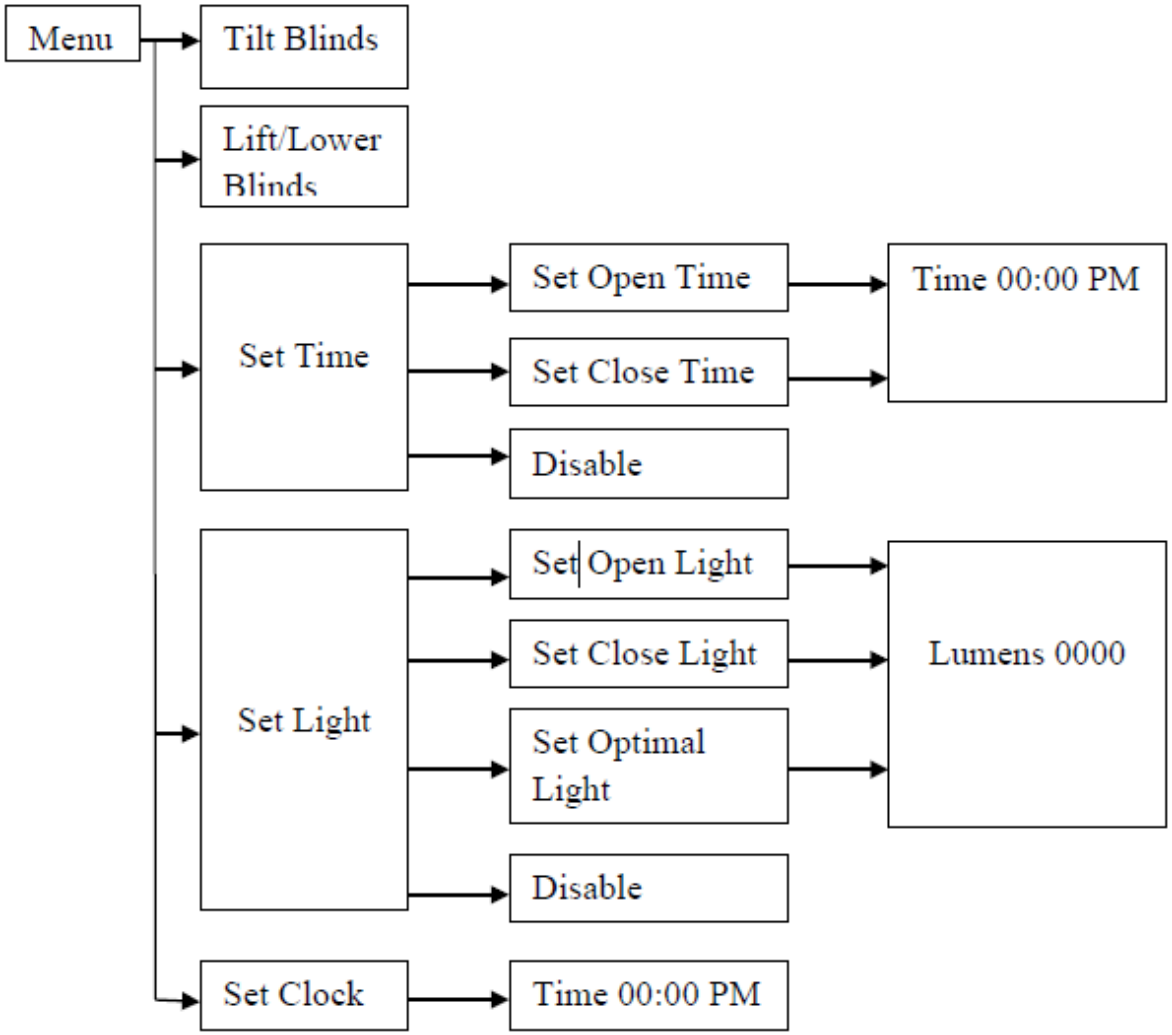
- Serves to detect either day or night
- Triggered by absence or presence of Sunlight
- Connected in a voltage divider configuration
- The output of this component is a voltage level which corresponds different LUX

BH1750 Light Sensor



- Serves to detect accurate light levels inside the room
- Adjusts the tilt on the blinds to optimize light in room
- Interfaced using I2C bus

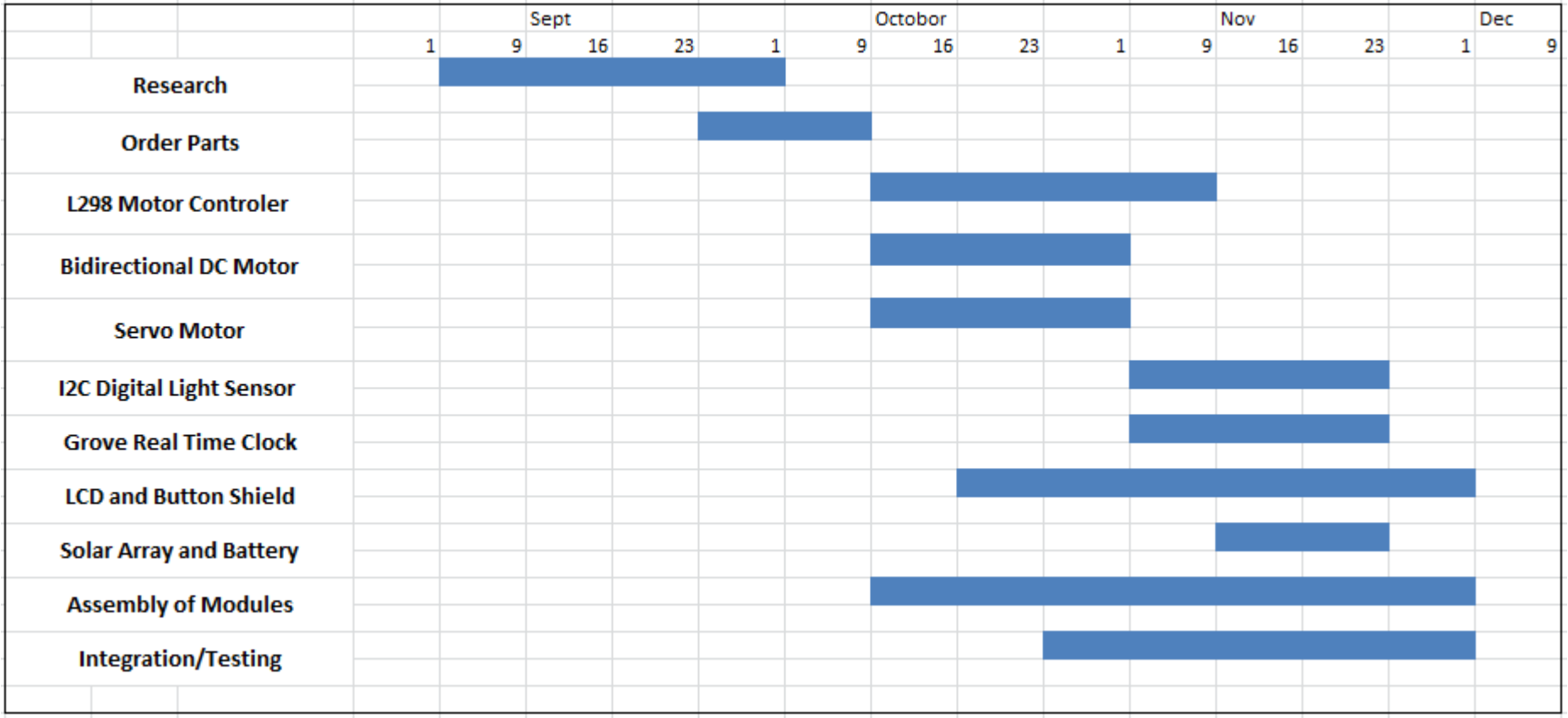
Software


Menu
Tilt Blinds
Lift/Lower Blinds
Set Time
Set Open Time
Set Close Time
Disable
Time 00:00 PM
Set Light
Set Open Light
Set Close Light
Set Optimal Light
Disable
Lumens 0000
Set Clock
Time 00:00 PM

Functional Spec Deviations

- There is no solar charging component
  - Charge time for battery is very long
  - Solar array supplies very little current
  - Tried Lead Acid and NiMH batteries
  - Rechargeable batteries that fit our requirements are very large and heavy
- No audio alarm
  - Decided wasn’t completely necessary to our design

Final Schedule



Total Costs

Total Fund granted from ESSS	**$500**
Total expenditure till now	**$403**
Remaining Fund	**$97**
Expenditure details	
1 Inch Light filtering Blinds and Frame	$36
Arduino Mega 2560	$70
LCD button Shield Kit for Arduino	$26
Ardumoto – Motor Driver Shield	$30
Grove RTC	$12
Light Sensor and Photoresistor	$10
Servo	$15
Motors (Step and Bi-Directional)	$32
Medium Duty Solar Panel	$17
Batteries, Clips and cables	$45
Speaker, Glue Stick, Prototype Board, and Bobbin	$24
Housing raw materials, shrink wrap, cable	$25
Solder equipment, flux, soldering wick	$25

Future Improvements

- Reducing cost replacing our microcontroller
- Add production level features defined in functional specification
- Improvements to the lift mechanism reliability, and overall design
- Implementing the solar charging circuit
- Add audible morning alarm feature

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Conclusion

- The project was complex enough that it could be completed in 3 months
- Everyone’s schedule was accommodating which really helped
- It helped having that contingency fund just incase anything went wrong
- Only minor deviations to our functional specification were required to fit the project into the allowable timeline

Individual Responsibilites

- Jorden
- Chaman
- Willy
- Clark

Acknowledgement

- Bonnie Gray - 3D printer
- Lucky One
- Mike Sjoerdsma
- Lukas-Karim Merhi
- Reza (350 TA)
- 440/305 TA’s

Reference

[1] - http://exp-china.com/electric-curtains-catalogs/electric-curtain-tracks-ht100

[2] - http://www.amazon.co.uk/Electric-curtain-blind-automatic-feature/dp/B00DBYG966

[3] - http://www.instructables.com/id/BH1750-Digital-Light-Sensor/

[4] - http://learn.adafruit.com/photocells

Questions