Smart Windows

Let your blinds work for you!

David Shilling

Kelley Daniels

Andy Spangler

Tom Haunert

PROBLEM

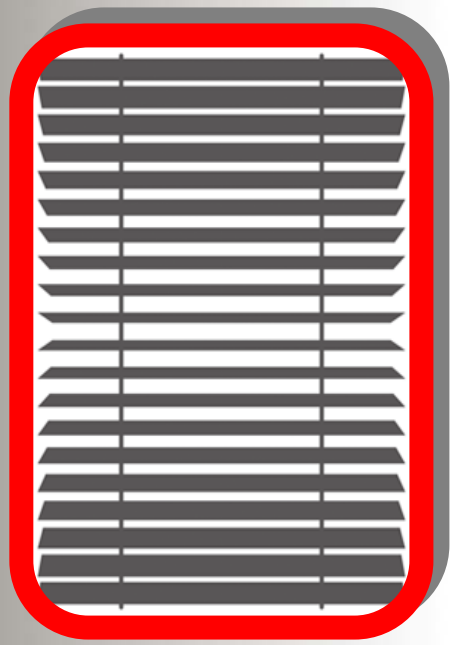
Gluttonous Energy Consumption

- A/C Units are responsible for 20% of all residential electricity use in the US (EIA survey)
- The D.O.E. recommends closing window blinds while operating A/C units to reduce load.
- Reflective shades can reduce heat gain up to 45%.

Home Security

- The windows can demonstrate “lived in” features, even when you’re not home.
- “A burglar can do an assessment of what they can steal just by walking down the street looking in the windows.” (South Bend Police Chief in *The Observer*)

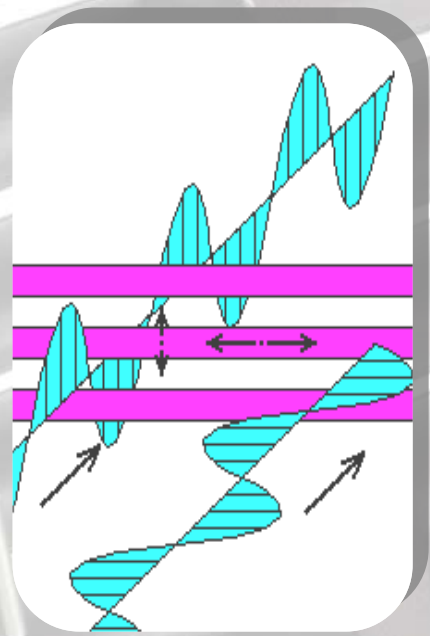
WINDOW TREATMENTS



Venetian

Vertical

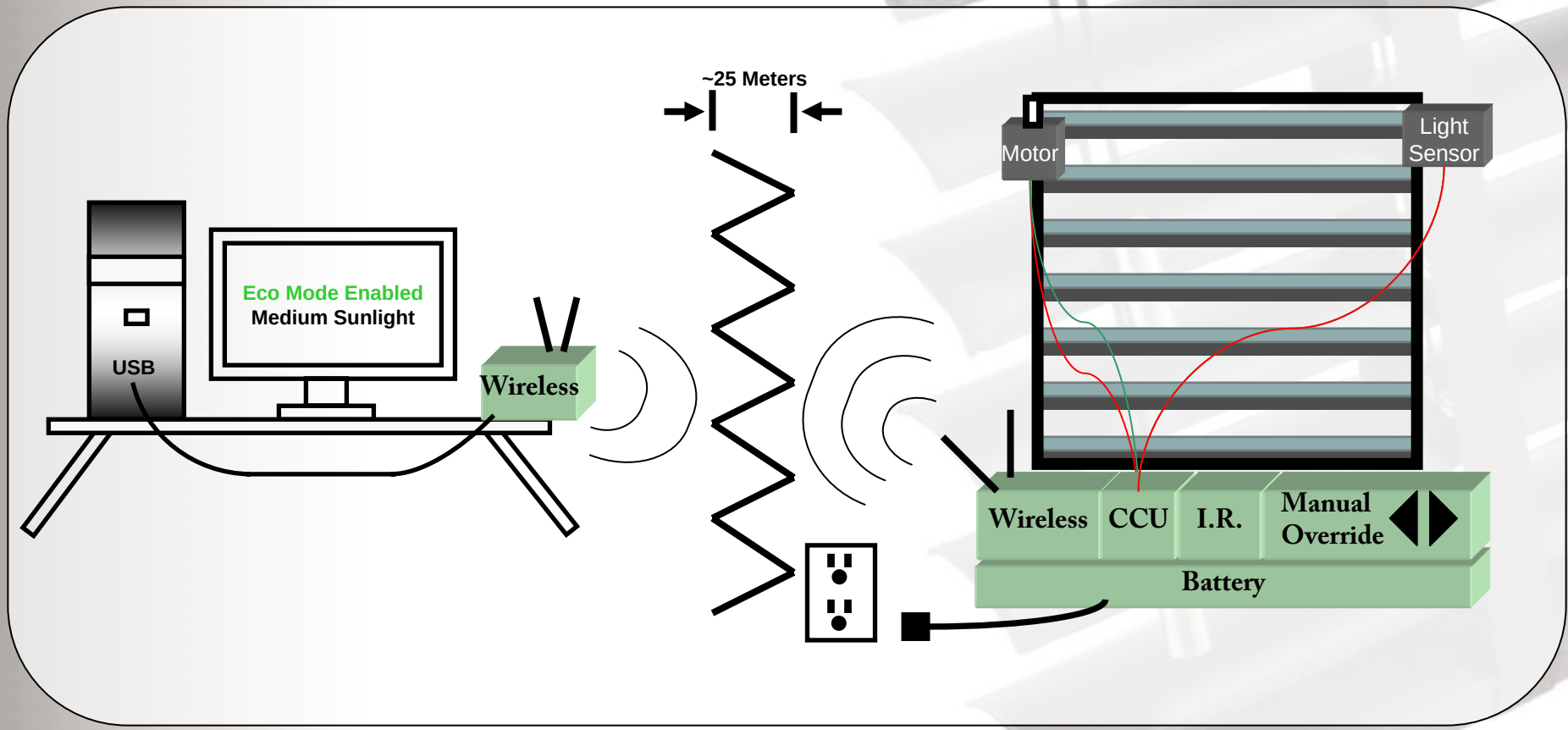
Shades



Polarization

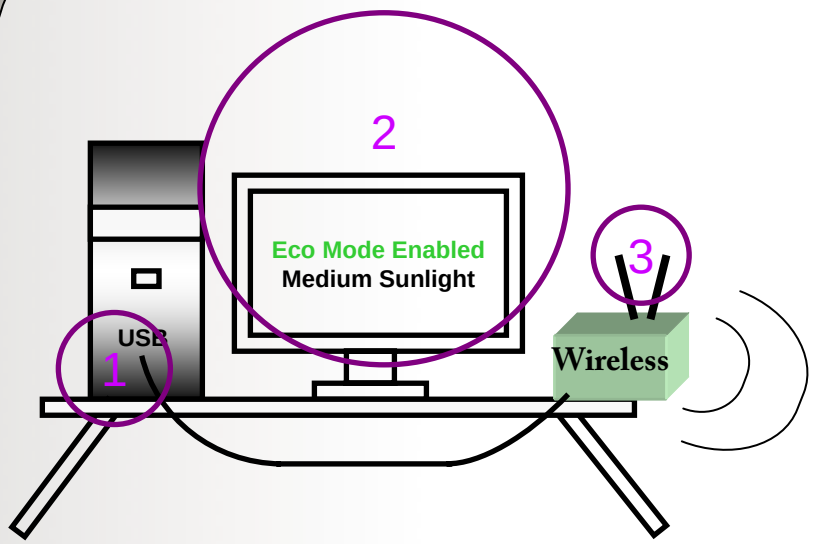
PROPOSED SOLUTION

Whole System



PROPOSED SOLUTION

PC Side



1- The main command module connects to a PC.

2- A PC program sends user settings to the on-window controllers.

3- The PC (when it is on) maintains two-way wireless communication and reports window status.

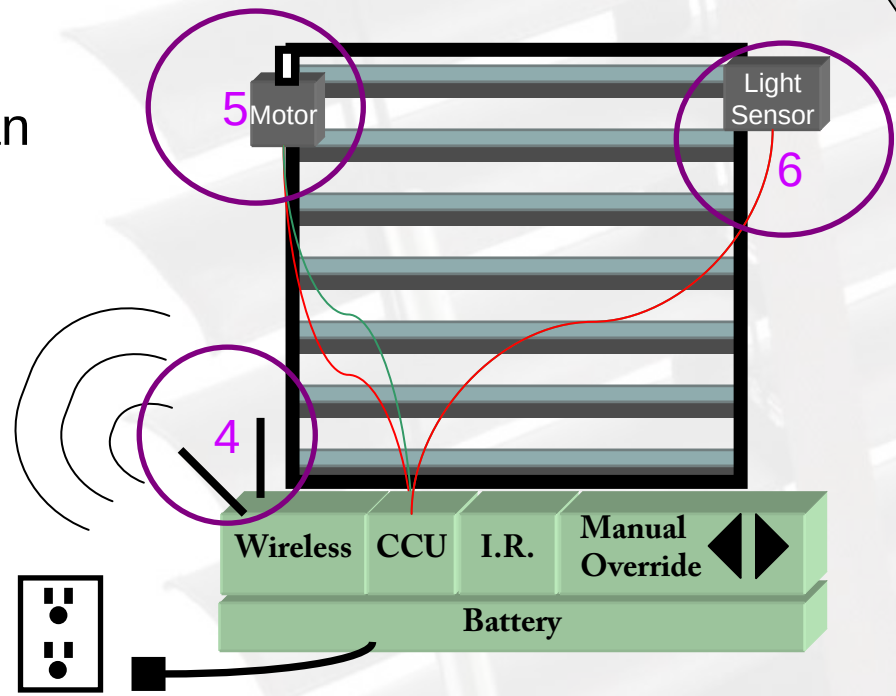
PROPOSED SOLUTION

Embedded System Side

4- The blinds control unit has two-way communication ability, and can function independently of the PC.

5- A motor is fitted for our set of blinds, and turns the blinds the correct amount.

6- A light sensor is carefully positioned and calibrated to read only outside sunlight.



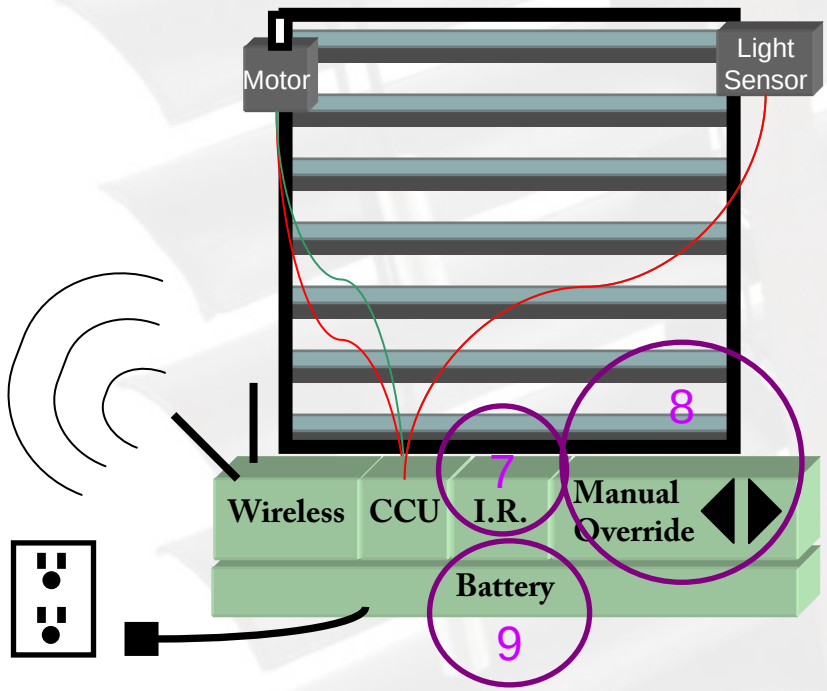
PROPOSED SOLUTION

Embedded System Side

7- An infrared remote control can be used to “manually” turn the shades.

8- The blinds can also be operated by pressing a key.

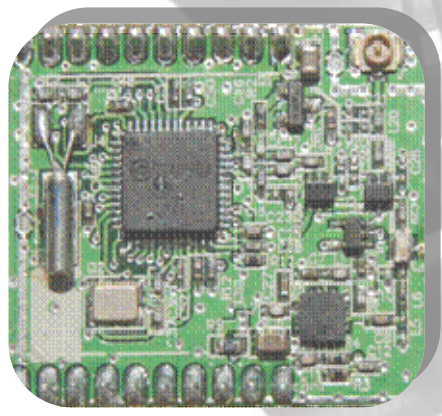
9- The device will be battery powered, possibly with wired recharging capability.



AVAILABLE TECHNOLOGY

Wireless

- RF/ZigBee
  - Low power
  - Low data rate
  - 70 meter range
- Wi-Fi
  - Higher data rate
  - Higher range
  - More complexity
- IP Over Power
  - Speedy
  - Large bandwidth
  - Expensive
- Infrared
  - Short range
  - Does not penetrate walls
  - Common remote control technology



AVAILABLE TECHNOLOGY

Power

- Lithium-Ion Battery
  - Rechargeable
  - High energy-to-weight ratio
  - No memory effect
  - Poor cycle
  - High internal resistance

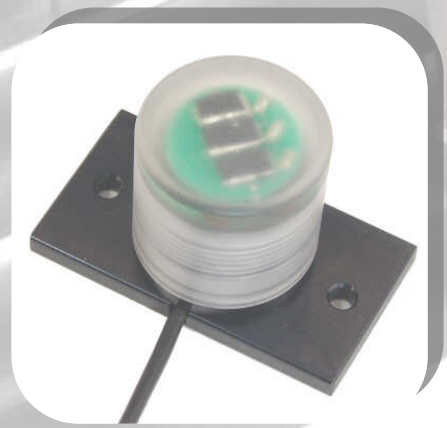
- 9 Volt Battery
  - Easy to find
  - Easy to replace
  - Cost of replacing
  - Battery life concerns

AVAILABLE TECHNOLOGY

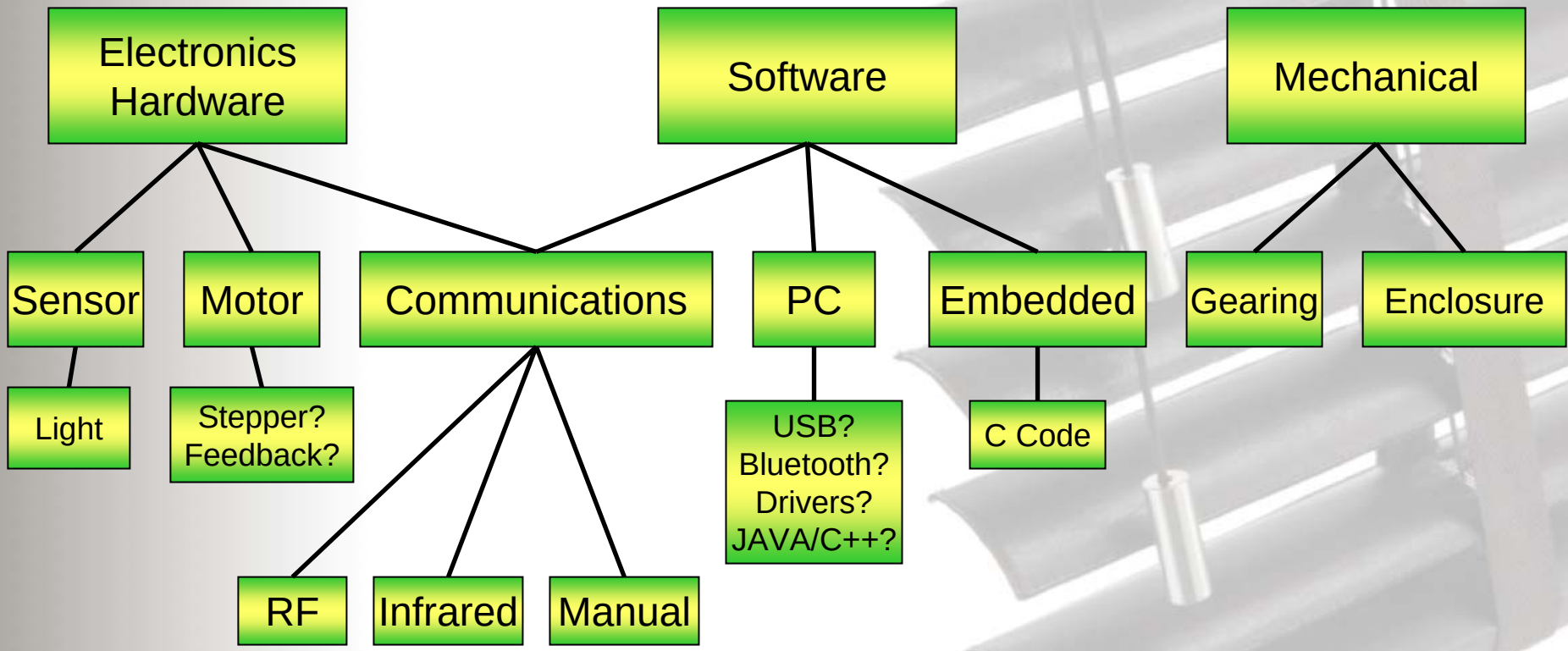
Devices

- Sensors
  - Visible light
  - Infrared

- Motors
  - Smooth
    - Requires a second device to measure rotations
    - Relatively quiet
  - Stepper
    - Single device
    - Greater precision
    - More vibrations



ENGINEERING CONTENT



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SUMMARY

Project Highlights

- Intelligent Window Treatments
- Manual Override Operation
- Wireless Remote Operation
- Interactive PC Interface

Project Benefits

- Reduce Gross US A/C Power down from 20%
- Improved Home Security

Engineering Content

- Electronic Hardware
- Software
- Mechanical Interface

Knowing the Customer and Competitor

Competitors- Hobbyist and Major Companies

- Fully Custom Window Treatment
- Unique Home Architecture
- Lack PC Interface as CCU

Customers- Middle Income Families

- Affordable
- Weekend DIY Project