

Department of Mechanical and Aerospace Engineering

Auto Windshield Reflector

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Motivation

- Shade can alter temperatures from 10°F to 60°F
- Car interiors exposed to UV light release a toxic chemicals such as benzene → known to cause Leukemia
- UV exposure on humans leads to skin cancer
- Interiors exposed to UV radiation become damaged through photodegradation
- It is illegal to tint windshields in many states



Photodegraded leather



Photodegraded plastic dashboard

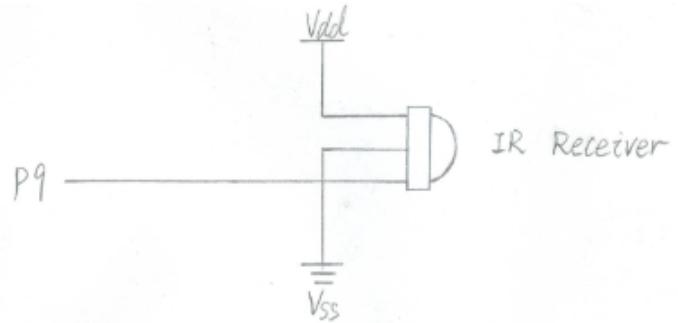
Features

- System only works when the engine is off.
 - Prevents the cover from coming down while driving
- Detects light intensity from the sun via a phototransistor and accordingly lowers the cover
- Detection stops when the cover is activated and in the down position
- Unlock button raises the shade back up and turns off the system in anticipation of user driving.
 - Is also operated remotely through infrared transmitter and receiver.
- Override function allows user to manipulate the cover

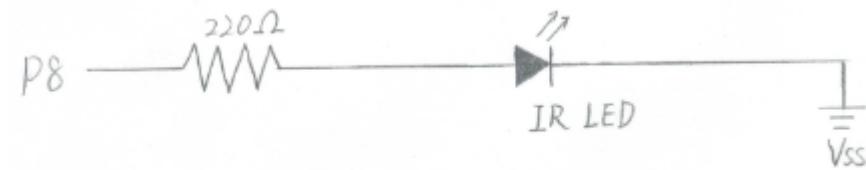
Advantages

- Manual windshield reflectors can be cumbersome and difficult to install.
- There is the risk of forgetting to put it in place after leaving the vehicle
 - Our system eliminates this issue
- Automatic options on the market can only be actuated remotely.
 - Lacks sensing/detection capabilities. Not intelligent

Schematics

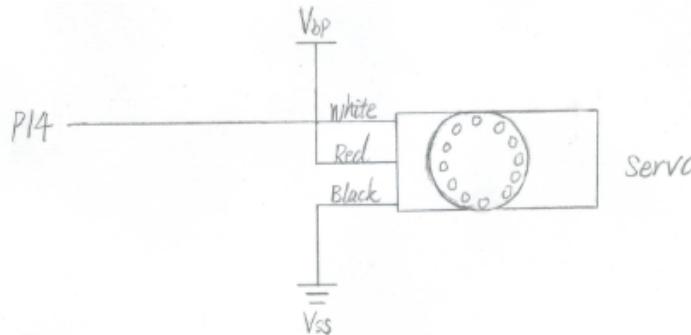


*IR Receiver
Circuit*

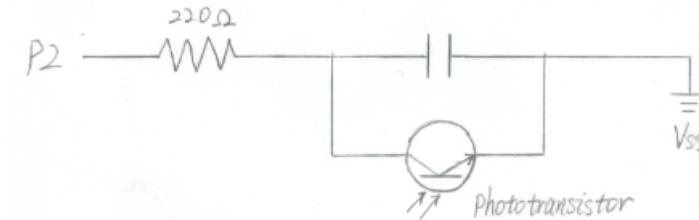


*IR Transmitter
Circuit (on remote)*

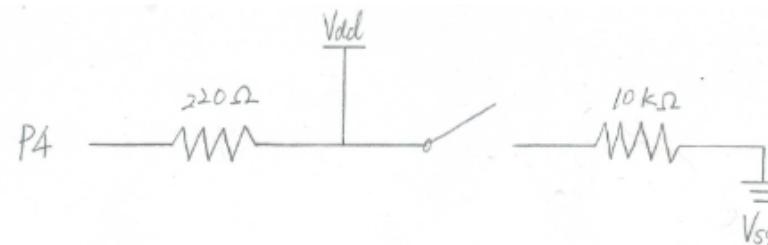
Schematics



*Continuous
Servomotor Circuit*

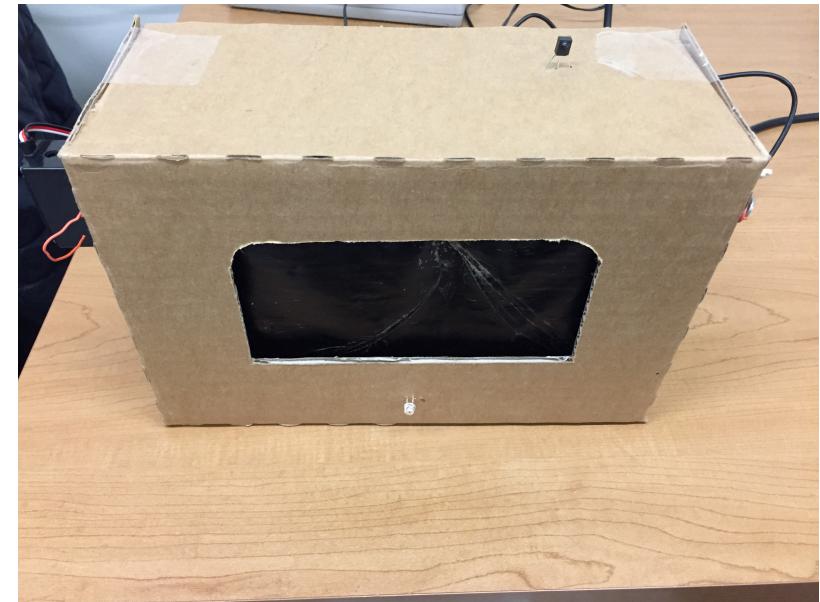
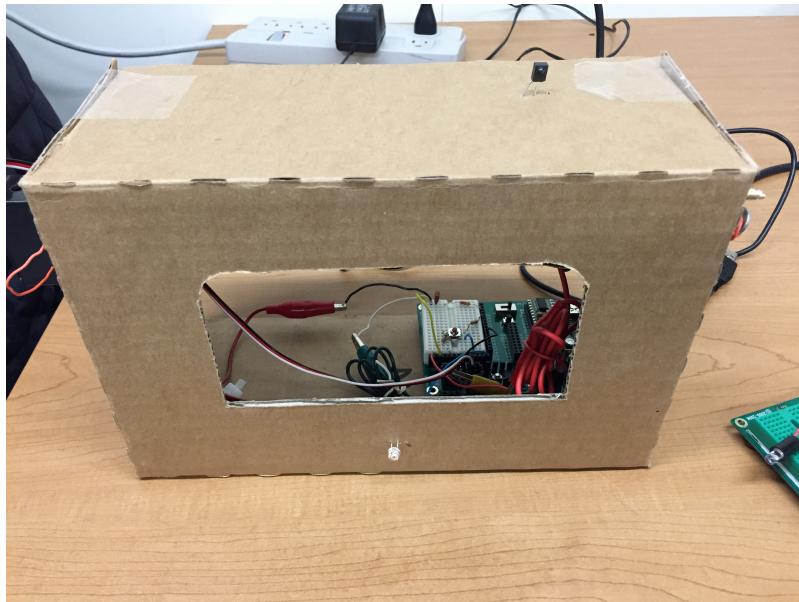


Phototransistor Circuit



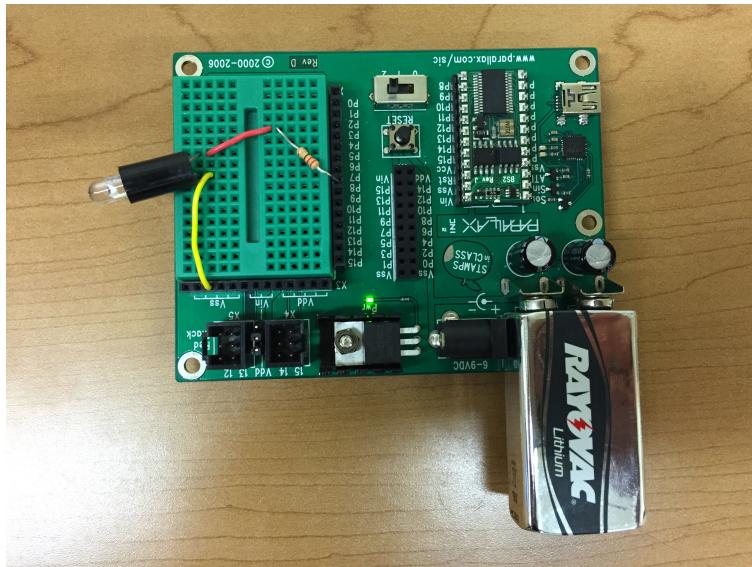
Button Circuit

Model

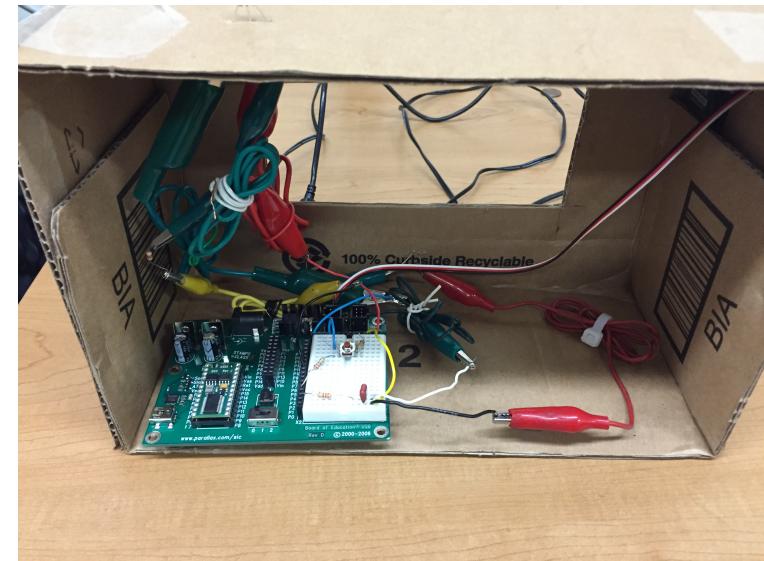


Front View

Model

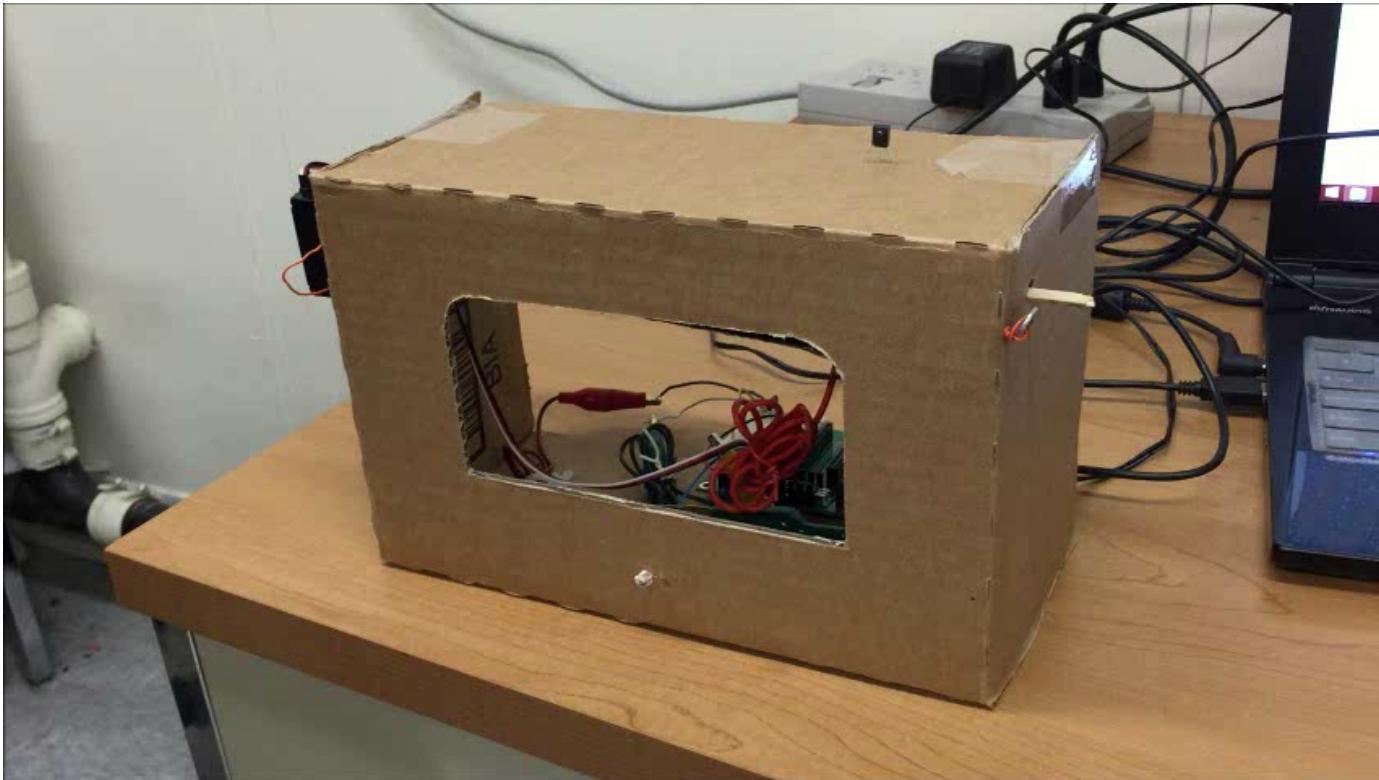


Remote Control



Inside View

Demonstration



Parts/Cost

Component	Quantity	Cost
BASIC Stamp 2 module	2	\$73.5
Board of Education Development Board-USB	2	\$125.98
Infrared Receiver	1	\$2.69
IR Transmitter	1	\$2.16
Phototransistor	1	\$1.34
Servo	1	\$12.59
Button	2	\$0.9
Battery	1	\$5
Wires, Resistors, Capacitor		\$1
	Total	\$225.12



BS2 Code

```
' ($STAMP BS2)
' ($PBASIC 2.5)

intensity VAR Word
status VAR Word
counter VAR Word
engine VAR Word
psys VAR Word
IrDetPin PIN 9
irPulse VAR Word
manual VAR Word

engine = 1

DO

  IF IN4 = 1 AND engine = 1 THEN
    engine = 0
  ELSEIF IN4 = 1 AND engine = 0 THEN
    engine = 1
    psys = 0
  ENDIF

  DO WHILE ( engine = 0 )

    HIGH 2
    PAUSE 100
    RCTIME 2, 1, intensity

    PULSIN IrDetPin, 0, irPulse

    IF status = 0 AND psys = 0 AND intensity<50 THEN
      FOR counter =740 TO 1000
      PULSOUT 14, 1000
      PAUSE 20
      NEXT
      status = 1
    ENDIF

    'Variables declared

    'If the button is pressed and the engine is on, the engine turns off
    'If the button is pressed and the engine is off, the engine turns on
    'Light detector permission is enabled next time engine is off

    'The system is running when the engine is off
    'The light sensor is on to detect any sunlight
    'Key remote detects

    'If the shade is off and permission is on and light is bright, the shade is on
```

BS2 Code

```

ENDIF

IF status = 0 AND psys = 1 AND manual>15 THEN          'If the shade is off and permission is off, but unlock button is pressed twice, shade is on
FOR counter =740 TO 1000
PULSOUT 14, 1000
PAUSE 20
NEXT
status = 1
manual = 0                                         'The unlock button memory is set to 0
ENDIF

PULSIN IrDetPin, 0, irPulse                         'Key remote detects

IF status = 1 AND irPulse < 600 THEN                  'If the shade is on and unlock button is pressed, the shade is off
FOR counter =715 TO 1000
PULSOUT 14, 20
PAUSE 20
NEXT
status=0
psys = 1                                         'Light detector permission is off
manual = 0                                         'The unlock button memory is set to 0
ENDIF

DO WHILE irPulse < 600 AND status = 0                'When the shade is off, the number of unlock button pressed is detected
manual = manual +1
PULSIN IrDetPin, 0, irPulse
LOOP

LOOP

```

|

BS2 Code

Remote Code

```
' {$STAMP BS2}
' {$PBASIC 2.5}

' Declaring Variables
IrLedPin    CON  8
IrFreq      CON  38000
StartBitTime CON  3

'When the reset button is pressed, the infrared transmitter sends infrared light
FREQOUT IrLedPin, StartBitTime, IrFreq

STOP
```

References

- <http://www.ggweather.com/heat/>
- <http://www.shadetreeonline.com/theshade/theshade.htm>
- <http://healthypets.mercola.com/sites/healthypets/archive/2010/08/10/dead-in-minutes-dogs-and-heatstroke.aspx>
- <http://www.ecvv.com/product/176217.html>
- <http://www.bt.cdc.gov/agent/benzene/basics/Facts.asp>
- <http://pubs.acs.org/doi/abs/10.1021/es0617901>