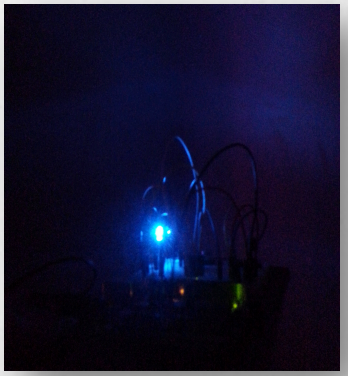
Light Up Your Night!



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What?

- What is project about? *This is a fully customizable, compact, and interactive remote-controlled LED backlight system that will make a great addition to any entertainment setup and be an economic way to enhance visual experiences at home or in public venues.*

Why?

- Why are you doing this project? *I have a great interest in entertainment production and I wanted to add a cool gadget to my home theater.*
- What existing problems does it address/solve? *Some similar items are expensive and require specific connections (such as VGA pass-through) not universal to all visual outputs.*
- What impact does it have? *Can be used in a variety of ways like to enhance simulations for medical or transportation officials, heighten sensory entertainment in theaters, studios, or theme parks, and even make long distance communications more interactive.*

How?

- How are planning to achieve you goals?
  - Start off researching current products
  - Use my knowledge of Arduino to run tests
  - Create the base-line code for this embedded system
  - Obtain applicable hardware
  - Figure out interface
  - Create Prototype
  - Test and correct errors

The Goal:

- Create an embedded LED controller that switches modes with an IR remote.

Inputs:

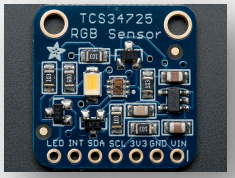
- IR Remote (interrupts)
- RGB Sensor
- Microphone

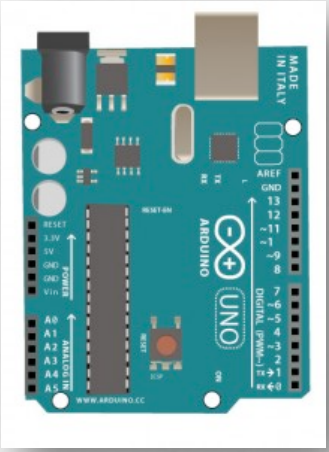
Processing and Storage:

- Arduino UNO

Outputs:

- Multicolor Backlight LEDs





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Testing details

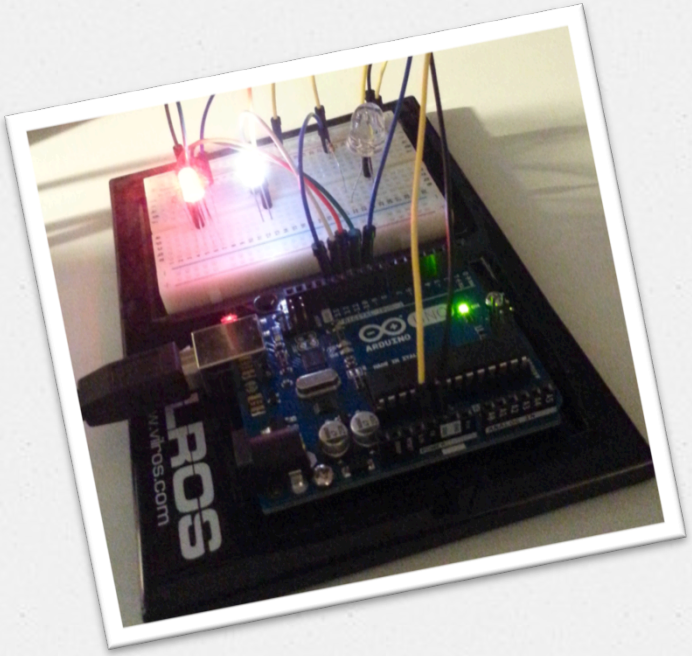
- How do you plan to test it? *Make sure the sequence of states runs correctly with input from the RGB sensor, microphone, and remote*
- Sequence:
  - Start state: LED off > LED Solid colors (Red,Green,Blue,Yellow,Cyan,Purple,White)> LED changing colors > LED reacts to sound > LED reacts to light colors > initial state and loop

My Progress

- I attempted to incorporate all ideas in my original plan. However I encountered some hiccups and realized some implementations needed more time and materials (soldering iron). I intend to continue work up until my demo day, but at this time I did make a functioning, IR remote controlled system that reacts to sound and music. The following slides are the steps I took to achieve this. Enjoy *Lighting up your night*!

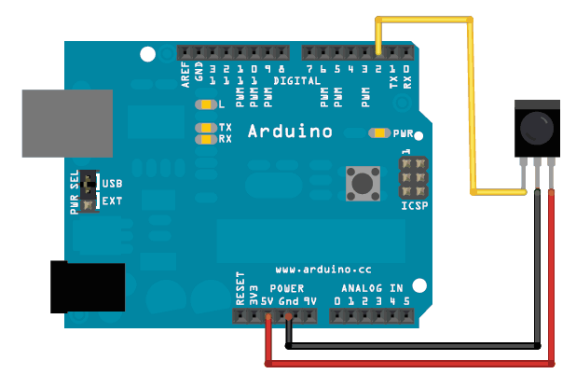
Step 1

- Test RGB LED



Step 2

- Learn how to use the IR sensor
- The Arduino can detect specific on and off periods for remote buttons, but I will use the sensor as a mode signal changer with interrupts (more later on)
- The IR sensor can be read as a digital input and tracked
- Sometimes the IR sensor reads outside IR interference and the system switches modes unintentionally, but in a dark room where this system is meant to be deployed this should not be a distinct worry



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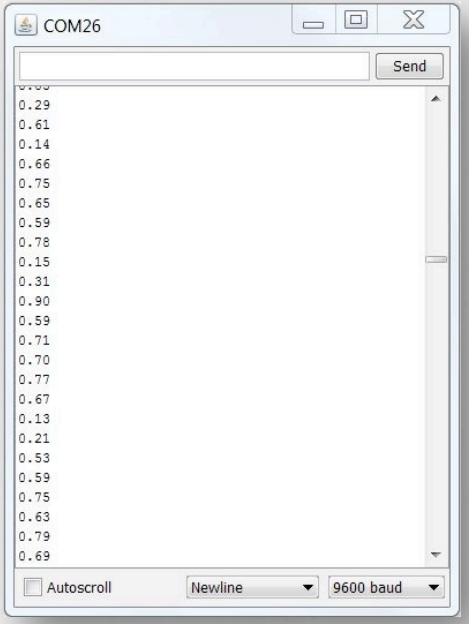
Step 3

- Test Microphone
- Use code to see what the output levels are reading on the Serial Monitor, and then calibrate which colors correspond to which reading ranges (Green is low volume, blue is louder, and red is loudest)
- The microphone responds with analog voltage readings through an output pin while the other two pins are connected to Ground and 3.3Volts
- SEE VIDEO OF MY MIC TEST (with my wonderful voice and claps at varying distances):
  - https://www.dropbox.com/s/slx6ecx5ck8a199/20141207_025608.mp4?dl=0



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Step 4

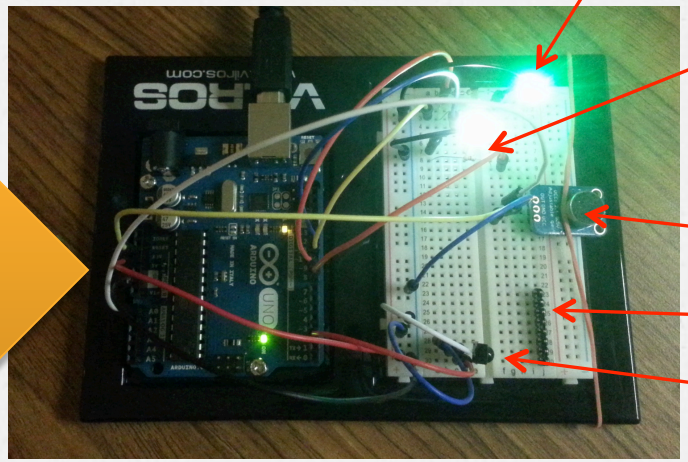
- Test RGB sensor, but at this point I need to solder the connections because they are too loose to respond correctly
- In the end, different readings of Red, Green and Blue light will be fed through an algorithm to allow the RGB Led to match the input colors
- The sensor will “watch” a television screen while the LED displays the screen color on the background of the room

Step 5

- Research Interrupts
- First I tested with a push-button interrupt:
- Video: https://www.dropbox.com/s/rg4tkhdmcpsdepn/20141207_052107.mp4?dl=0
- Figure out how to use attachInterrupt(interrupt, ISR, mode) to allow IR signal override and change of mode
- Determined I needed to use a mode of RISING and also a debounce so that each remote signal would not be read as a mode change

Step 6

- Put the components together
  - In this step, I combined the IR sensor, the Mic and its music response code, and the LED into one program so that the modes can be switched with the click of an IR remote button



RGB LED for backlight color (this can be placed behind the TV for full effect or just placed in a room)

White LED turns on when in "music" mode and the RGB reacts to different sound levels

Arduino UNO connected via USB to computer

Microphone

Pins for RGB Sensor

IR sensor

Complete Project

- Please click the link to view a video of the project working – switching from music mode to other modes to off with the press of a remote button:
- https://www.dropbox.com/s/uvbr8rjwd4u7f3v/20141207_210909.mp4?dl=0
- Pin connections:
  - 3.3V to MIC VCC
  - 5V to + rail for LEDs
  - GND to Ground rail
  - A0 to MIC OUT
  - 2 to IR sensor OUT
  - 8 to White LED IN
  - 9 to RGBLED Red lead
  - 10 to RGBLED Green lead
  - 11 to RGBLED Blue lead

On to the demo

- Demo the project to one of the TAs or Bina
- Click for another cool demo:
  - https://www.dropbox.com/s/p3gjon61sqd5q95/20141209_193420.mp4?dl=0

http://www.wooditwork.com/wp-content/uploads/2012/02/thank-you-computer-keys1.jpg

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  - Youtube channel: http://www.youtube.com/user/TCRobotics
- https://learn.adafruit.com/adafruit-microphone-amplifier-breakout/measuring-sound-levels