

RGB LED Cube



5x5x5

Sound → Light Capabilities

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Overview



- œ Project has two main components:
 - LED matrix and logic construction
 - Sound → light algorithm
- œ Building the cube
- œ Coding the program
- œ Testing, debugging, changes
- œ Future implementations

Cube Design



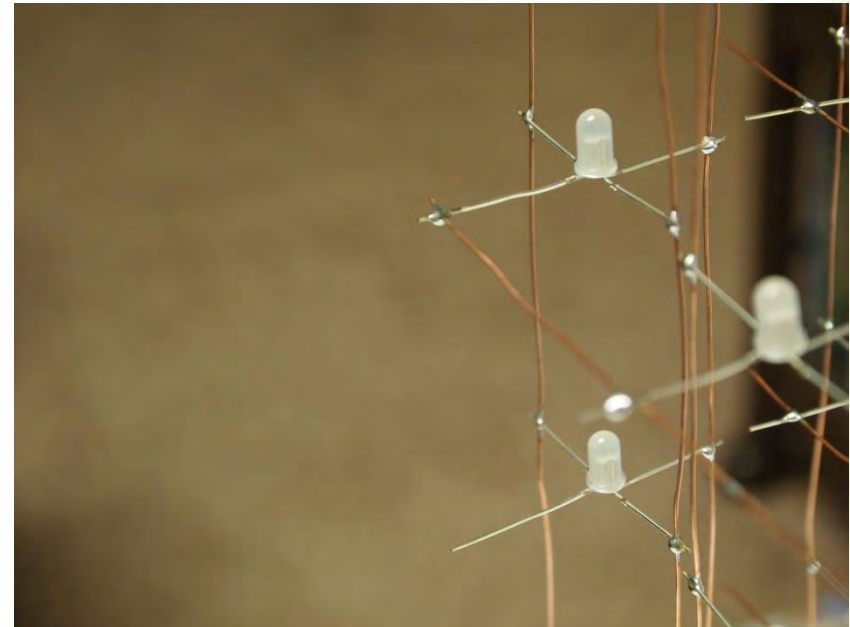
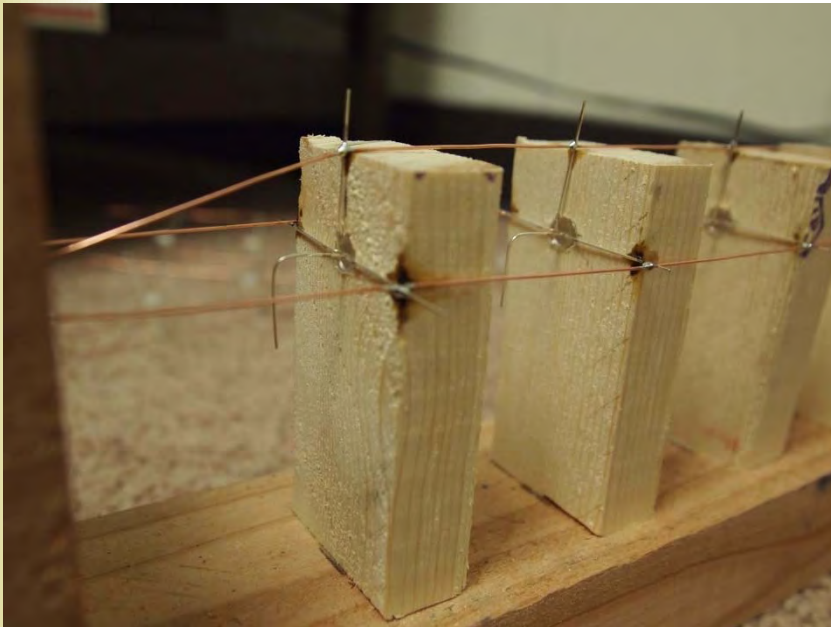
∞ Part 1: LED Matrix

∞ 125 RGB LEDs

∞ Sectioned into columns of 5 LEDs sharing cathodes

∞ Layers of 25 LEDs sharing anodes

Cube Design



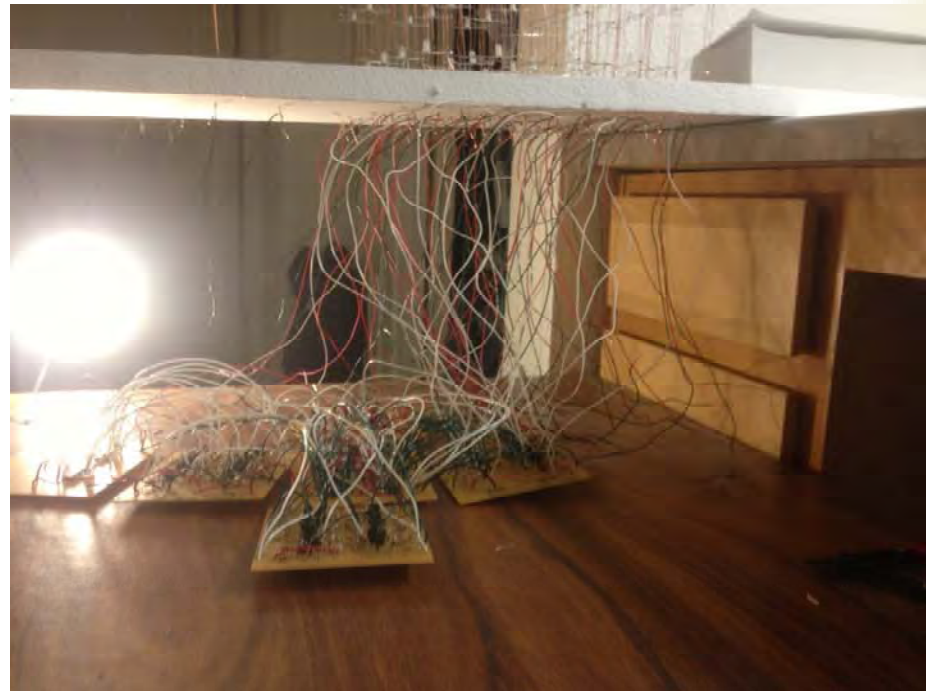
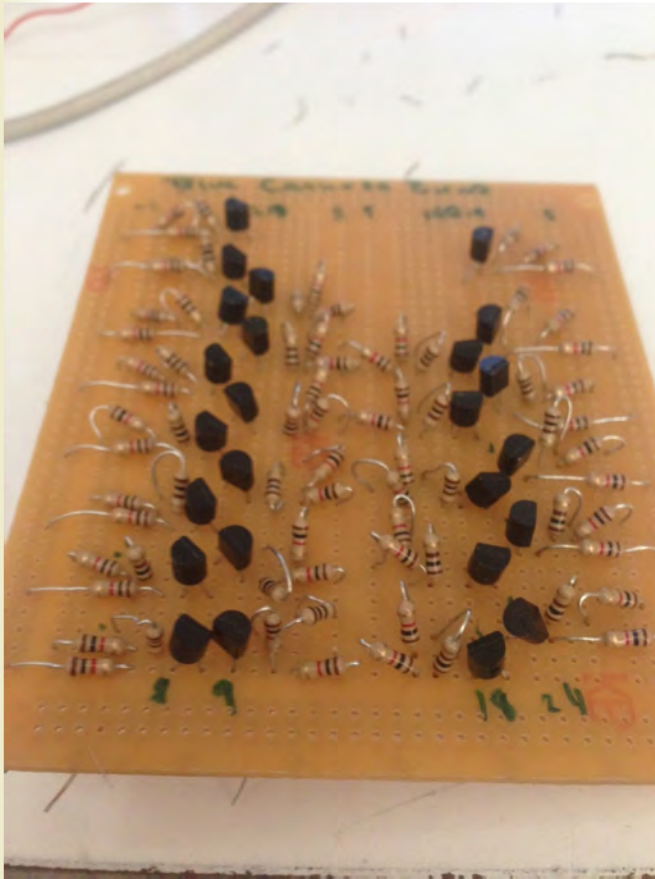
Cube Design



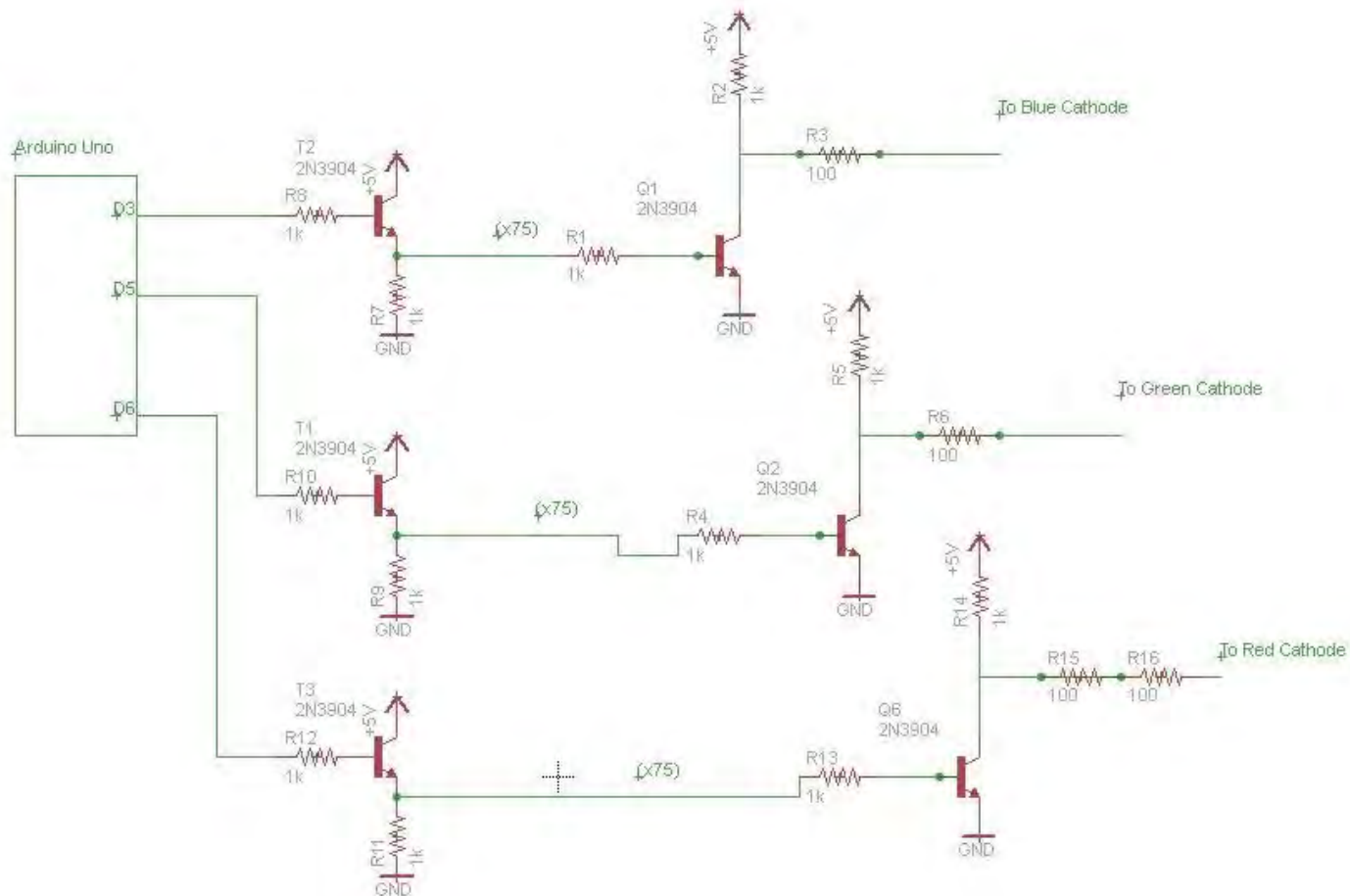
❧ Part 2: Logic Circuitry

- ❧ Microcontroller, USB interface
- ❧ Shift Registers
- ❧ Transistors
- ❧ External power supply

Cube Design



Cube Design



Coding



⌘ Research

- Hardware vs. software

⌘ C++ language

⌘ Pre-loaded audio solution via openFrameworks

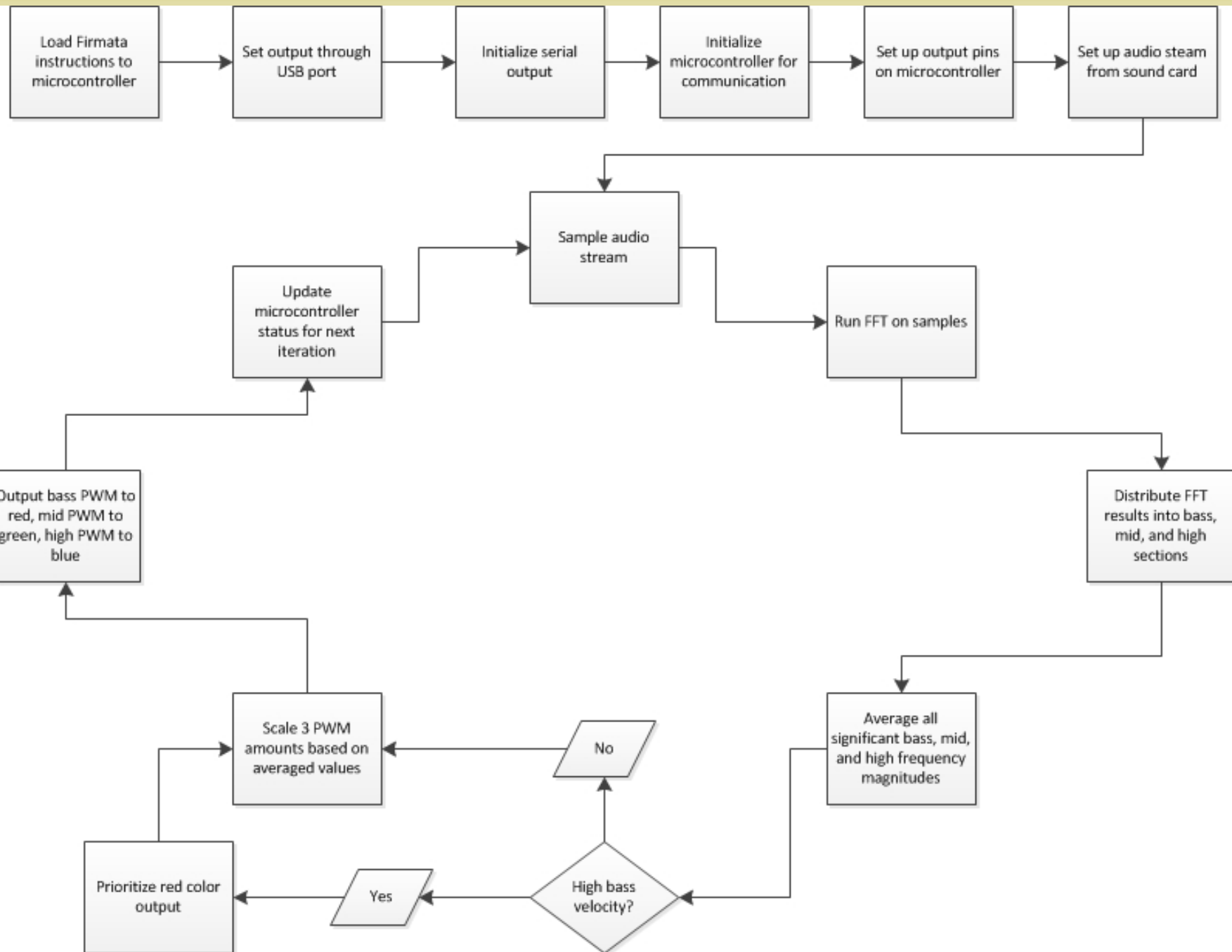
⌘ Visual feedback

⌘ Color design featuring RGB

Coding



- œ Beat detection and color fading via sound velocity
- œ Real-time audio support through soundcard
- œ FFT library
- œ Power Spectrum generation
- œ Audio averaging and PWM generation
- œ A/V delays
- œ Firmata protocol tying languages



Load Firmata instructions to microcontroller

Set output through USB port

Initialize serial output

Initialize microcontroller for communication

Set up output pins on microcontroller

Set up audio steam from sound card

Sample audio stream

Update microcontroller status for next iteration

Run FFT on samples

Distribute FFT results into bass, mid, and high sections

Output bass PWM to red, mid PWM to green, high PWM to blue

Scale 3 PWM amounts based on averaged values

Average all significant bass, mid, and high frequency magnitudes

No

High bass velocity?

Yes

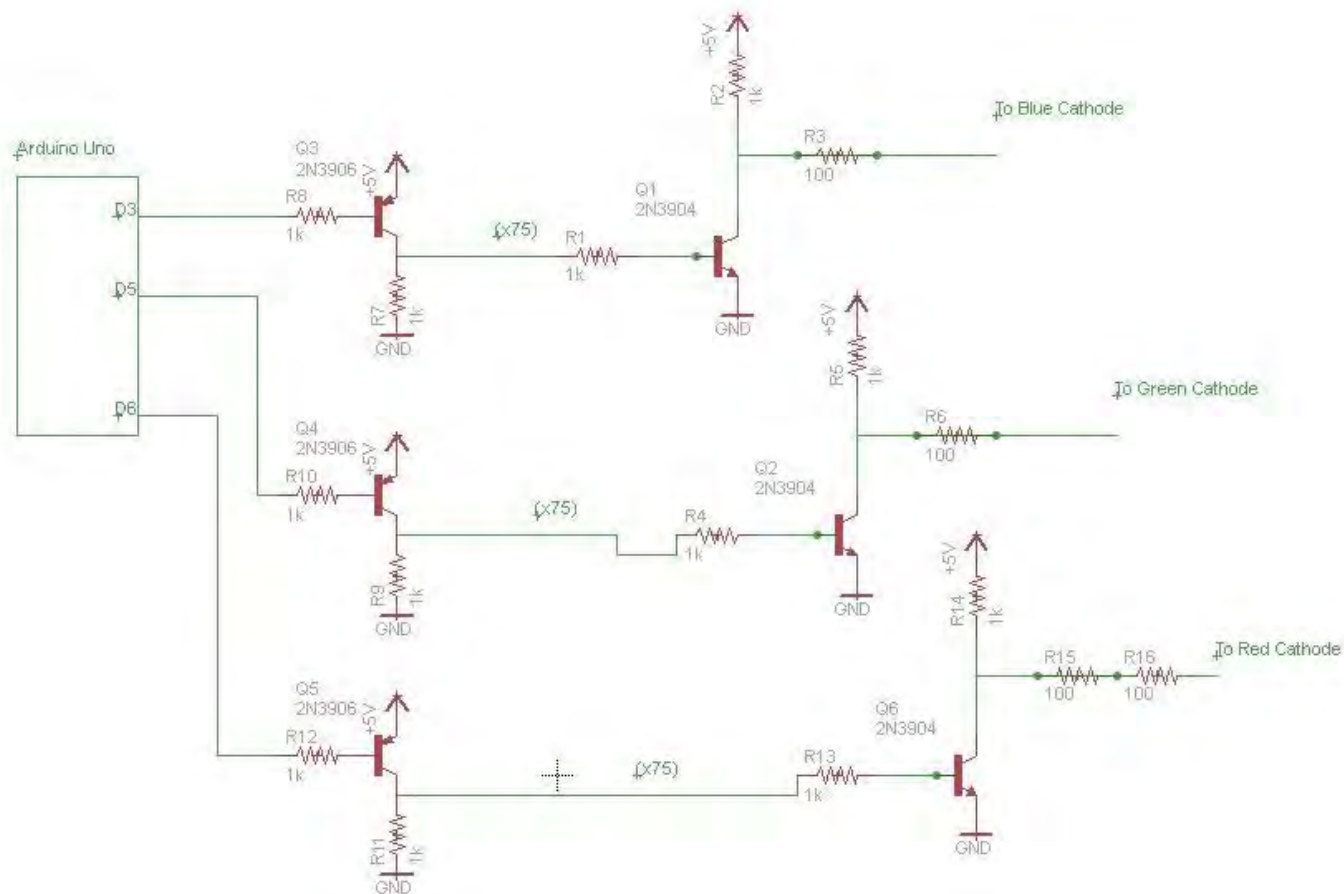
Prioritize red color output

Debugging



- ⌘ Shift register / wiring problems
- ⌘ Direct lines from digital outputs to columns
- ⌘ Transistors provide necessary current to drive LEDs

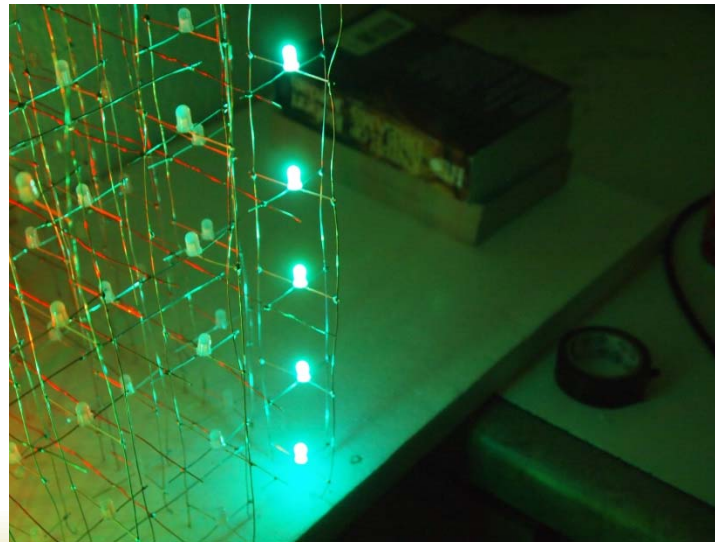
Debugging



Debugging



- ❧ Effect is same as original design
- ❧ Loss of individual LED control
- ❧ Program adjusted to suit LED brightness levels



The Future



- ⌘ More sophisticated beat detection / audio analysis possible through faster controllers
- ⌘ Re-implement shift registers, or other single LED control mechanism
- ⌘ User input to control cube brightness
- ⌘ Stand-alone functionality

Questions?



☞ Anybody?