Flash LEDs to Beat of Music with Arduino

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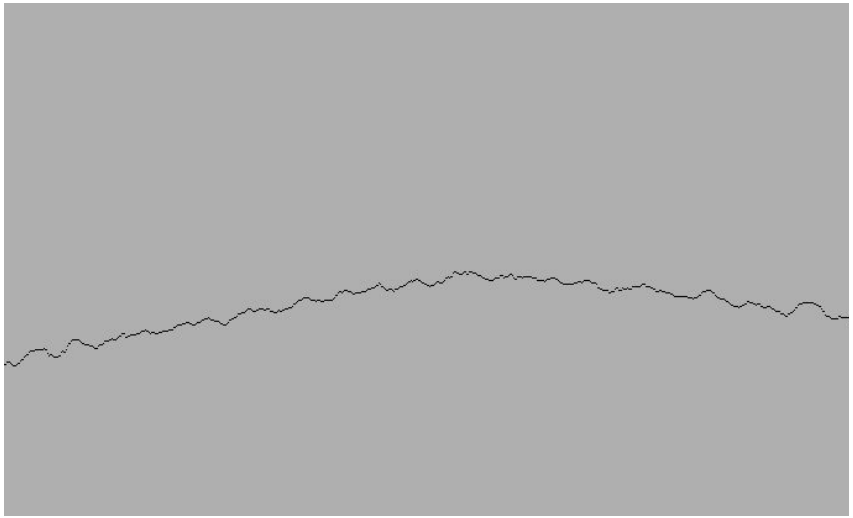
Project Goals

Our goals for this project were to hook up a strip of LED lights to a Raspberry Pi and make them light up to the beat of the song, and after figuring this out, we wanted to edit our code so that we can send it over Bluetooth using serial. Also, we wanted to teach ourselves more about programming hardware.

Process

At first, we started out by using the Processing example Lesson04_SamplePlayer, this produced a wave of the intensity of the music. This was a good proof of concept, but we needed to get the beat of the music.



Process cont.

Next, we started looking at the Raspberry Pi forum LightShow Pi. In this forum people post their code about how they got their Christmas lights to light up to Christmas songs. Unfortunately we didn't find anything on their that would have helped us.

Process cont.

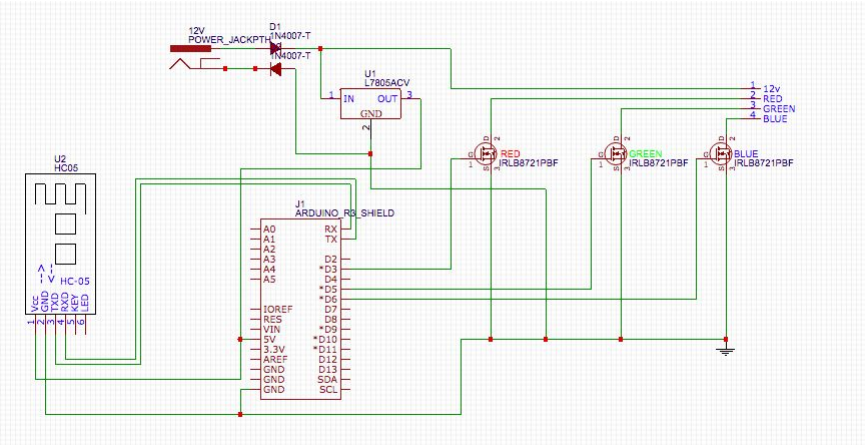
Then, we decided to switch to using an Arduino because we found a project on instructables.com that was similar to what we were doing. We took this project and edited the code posted and made it into something we could use for our project.

Process cont.

After getting it to work with a USB connection, we tried doing this over Bluetooth. This didn’t take very long but we found out that the Arduino couldn’t process the data fast enough to make the lights flash to the beat real time.

Design

We used EasyEDA to design a working circuit and from that to design a PCB to attach to an arduino and handle all aspects of the LEDs that we were looking for. From there we used these designed to print a PCB and order all the parts we needed.



Technologies

- Arduino Uno
  - Custom Bluetooth and LED Shield
  - EasyEDA Circuit/PCB Design
- Processing
  - Arduino(Firmata) Library
  - Minim Library
  - Serial Library
  - Java
- Arduino IDE
  - StandardFirmata
  - Serial Library
  - C++

Differences

Via Bluetooth:

- Custom code written in Arduino IDE using Serial library
- Used Serial.write() in Processing by sending a string
- Works but can’t process the data fast enough so is very slow

Via USB Connection:

- Used StandardFirmata code from Arduino IDE
- Used Analog.write() is Processing by sending int values
- Can process real time

Lessons Learned

- Basic wiring using a breadboard in conjunction with an Arduino
- How to flash code to an Arduino
- Coding with Processing and learning how to have it communicate with an Arduino using the Arduino Library in Processing
- How to use the Minim library in Processing for real-time audio analysis
- How to properly write serial values to a bluetooth module and convert those values to a signal powering the corresponding LED’s
- How to draw a circuit and PCB schematic
- Basic Soldering