Project Proposal

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Abstract

My proposal is for an audio frequency spectrum visualizer. It will take a signal from an IPod or Mp3 player. That signal will then be split into multiple ones based on the frequencies. The range of frequencies that we can hear is about 20 Hz to 20 kHz. Each division will only accept a certain range of frequencies, thereby covering the entire audio spectrum. It will split the audio into two channels, and analyze seven bands of audio on each channel, totaling 14 bands total. The range of frequencies being played in the music will be expressed as a voltage. The strength of each band will be shown as a column of leds lighting up.

Technical Merit

Although I've always had a passion for music, I've never had the chance to study and research the physics of audio circuits. This will be my most challenging self-made project because I will be navigating through the entire design process from step one. A few skills I will develop from this are: frequency analysis, designing PCB in Eagle, and controlling multiple LEDs with a microcontroller. A lot of the challenges with this project will take the skills I've learned in the robotics club to the next level as I go through the design process independently.

Broader Impact

The final goal of the project is to have a very aesthetically pleasing music visualizer. It would make a great recruitment tool at robotics club events as an example of projects made by members. It would be easy to take to club events and a great display to leave up in the lab. Those who see it might become inspired to build one, or their own project. There is also the possibility of selling the visualizers as a product, or a kit. A kit would be a great mentoring tool for incoming robotics club members who are looking for a fun way to become involved and learn about audio electronics. By building from a kit, a lot of great skills would be learned, including programming microcontrollers, controlling LEDs, and frequency analysis. I plan to document my entire build process for anyone wanting to build one on their own.

The skills I develop will also make me a better asset to the robotics club. Currently, PCB designing is a skill in high demand and few people in the club are proficient in Eagle or Pads. My goal is to fill that gap. Over the summer, I worked on revising the flight control board for the aerial team in Eagle, so I plan on developing those skills further with this project. Programming microcontrollers and controlling LED's are two other valuable skills that transfer well into many kinds of projects around the club.

Budget

Audio in &Amplification:	Low voltage Op-Amps (LM324)	$1
	3.5mm Stereo Female Audio Jack	$1.34 x 2
Filtering:	MAX263 pin-programmable filter	$11
Antilog and LED Control:	Arduino	$30
Display:	Leds	$13.41 for 500
	Acrylic Tubes	$35
	Frosting the Tubes	$10
	Mount	$15
Other:	Resistors, Capacitors, etc.	$10
	Custom PCB Development	$50
	Testing and PCB Revision	$70

Therefore, the estimated budget is about $250.

Schedule

January:

Split Channels and audio amplification – 5 days

Band pass filtering – 30 days

February:

Antilog conversion on Arduino – 10 days

Led Control with Arduino – 20 days

March:

PCB Design Prototype – 15 days

Prototype completed with single band – 10 days

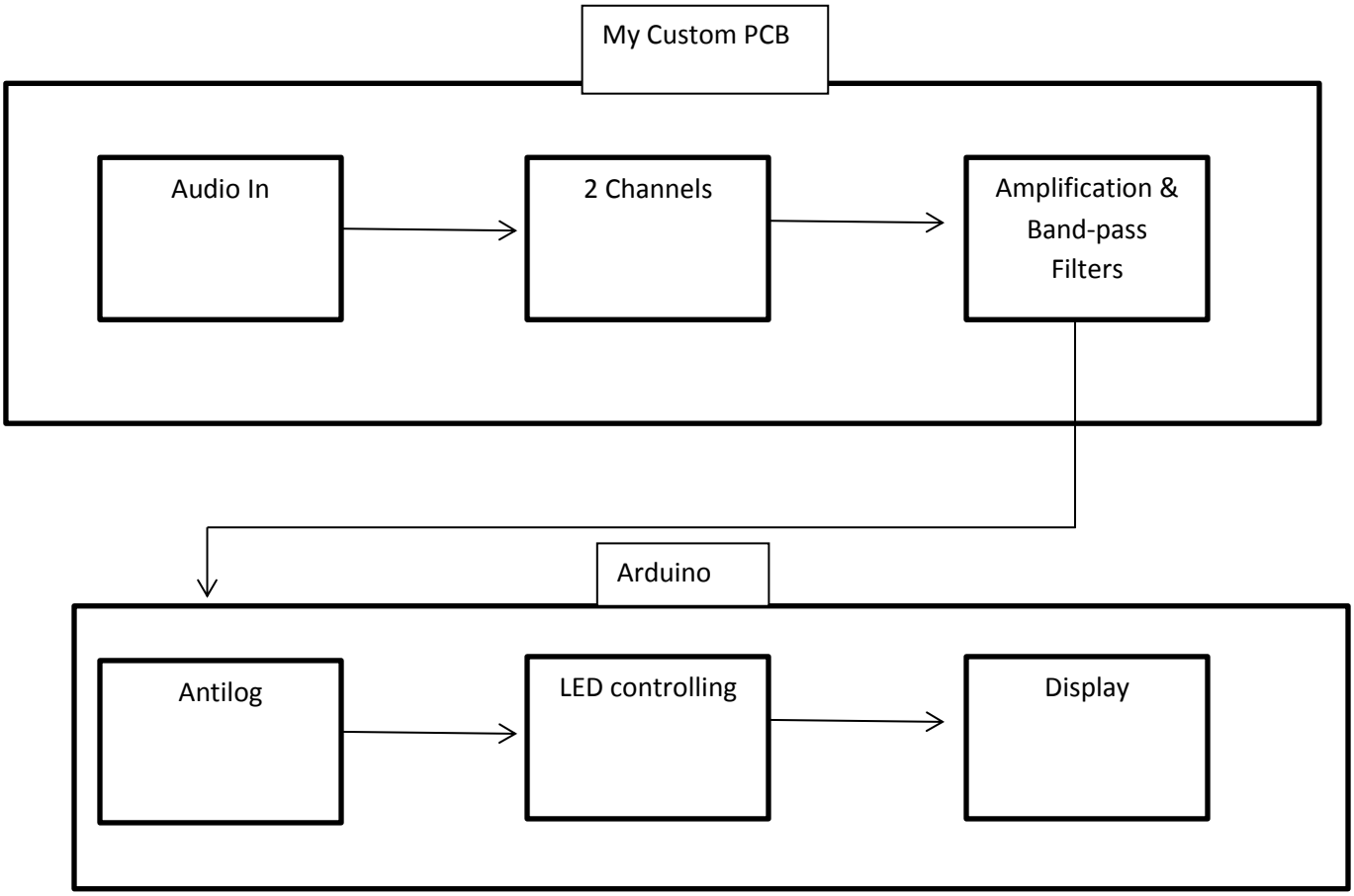
LED Display construction – 20 days

April:

Final PCB Revision – 5 days

Final Assembly and Testing – 5 days

Appendix - Block Diagram



(A sample music visualizer by Senator Penguin on Instructables.com)

My display will be acrylic tubes that I will give a “frosted” look. This will diffuse the light like in the picture to the left; however, the leds will light up from the bottom showing how strong each specific frequency is. Each led will have a partition above it, stopping the light from traveling too far up the tube.