Ultrasonic Keyboard

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Introduction

Statement of Purpose

Our goal is to recreate the previous hardware-based piano project using a PCB and an arduino in order to make the final product look more polished. The arduino can transfer serial output to MIDI, which we can then run through a MIDI software like GarageBand or Mainstage. We will use ultrasonic sensors instead of keys and implement LEDs for each sensor to make it more visually appealing. We want to get a functional prototype for EOH. Afterwards, we can continue to improve and refine the design.

Background Research

Because of the strong mathematical relation between math and music, we as a group have looked into the relationships between frequency and its respective key. This is important because in order to make a piano that can play chords, we need each key to be at an appropriate pitch for it to be harmonious.

While researching approaches for executing the project, we found that the use of an arduino would probably be our most efficient technique. [1] Using an arduino and MIDI will allow an easy way to add more sounds to the keyboard. Arduino serial output can be converted into MIDI using a software called Hairless, which is specially designed for this purpose. [2]

While researching for a general parts list, we have come across many similar projects in theory (a piano utilizing arduino), but we want to take a different approach for ours. Rather than have a piano that is played by touch, we will have a piano that is played without actually making physical contact with the instrument. This will be done with ultrasonic sensors as the input for our design.

Design Details

Block Diagram

System Overview

A laptop will power the arduino and run the serial to MIDI conversion into GarageBand. The arduino will receive input from the 12 ultra sonic sensors, and then output information to the 12 LEDs.
Parts

- Arduino/PCB arduino
- 13 ultrasonic sensors
- 13 LEDs
- resistors
- wires
- chassis material for base

Possible Challenges

One possible challenge will be learning how to design a PCB and getting it printed. Another challenge will be getting a prototype ready in time for EOH. A third challenge will be successfully interfacing the arduino with the software to convert the serial output to MIDI output.

References
