# Music Cubes E23

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Overview

The Music Cube project seeks to connect the roll of a dice to a corresponding musical action for example playing different music samples based on the roll. This is accomplished using the XIAO nRF52840 Sense microcontroller which has Bluetooth and gyroscope capabilities and is very compact. There is a software aspect to coding the microcontroller and a hardware aspect to designing and wiring the microcontroller. The scope of my work was in hardware with the design of a larger cube, encasings for additional cubes, the addition of dipswitches, and the addition of an RBG LED.

Electronic Adjustments

Xiao Layout

The Xiao Sense used has 6 analog pins and 11 digital I/O pins which are all PWM capable (these pins have more capabilities but for the sake of this discussion they will not be explored). There are also ground, 5v, and 3.3v pins.
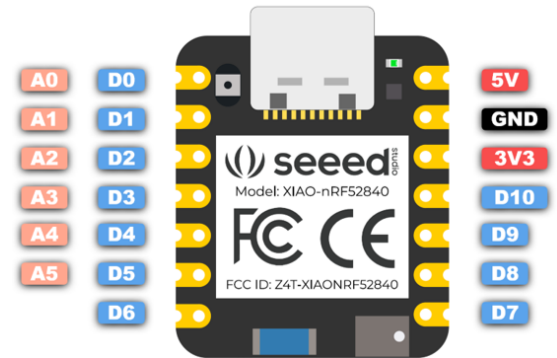
Dipswitches

Dipswitches are on-off switches. Their addition to the design is significant because of the number of possible settings just a few switches offer. The number of settings is given by 2^n where n is the number of switches on the dipswitch. I added a 4-switch, box-type dipswitch to the design. The Circuit diagram created used a 220Ω resistor as seen in the diagram below on the right. Pins 10 to 7 are used to read the outputs.
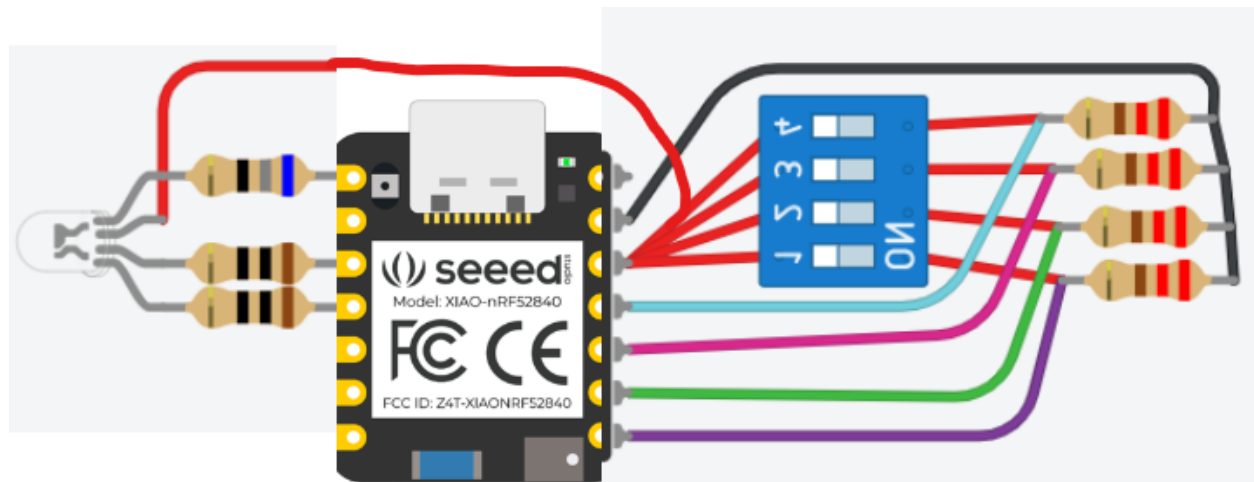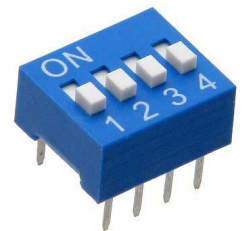
RBG LED

The addition of the RBG LED was an addition to the circuit that allows for more visual interactivity. The LED is the NTE30153 which is an anode LED. Given the specs of the RBG LED, a 68Ω resistor is used for the Red LED and 10Ω resistors for the Blue and Green LED. The pins used are all PWM and can control their respective color.

Shells

This concept is a way of taking the 6-sided die (D6) and turning it into a multisided die. This is a D10 that encases the D6. This increases the options for actions that can be taken. It is intended to be held together with velcro.
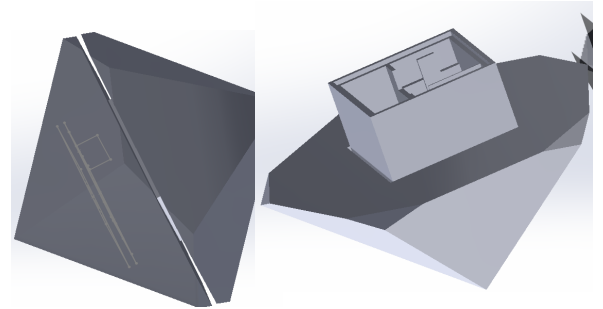
Cube Design

Design Changes

The previous cube designs used the C23 model which was an inch cube. The cube pursued was an inch and a half in size. Since the volume of a cube increases to the cube the volume increases by more than three times giving a much larger work area.

The other change was in adding a top and bottom that would be able to be removed and added allowing more ability to access the circuitry.

To allow for circuitry shapes had to be made for the pieces to slot in: for the battery, the dipswitch, and for the Seeed. In an earlier design for the LED too but that was found to be unnecessary as the LED could be soldered directly to the Seeed. It is sandwiched and held together with a standard ¼ nut and bolt.

Improvements

Future improvements next step for a group would be PCB design. Improving the circuitry and using an analog system that reduces the pin uses to one. This redesign would allow for a more compact design that could be inserted into different cubes; cubes that would be designed to have the small PCB inserted into cubes designed for it.