Vibe Check Music Controller: Iterative Design

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Abstract
The purpose of this project is to explore unique manners to create music without using traditional methods and instruments to generate it. We wanted to discover other methods to produce music. Usually, music production needs a minimum of knowledge in the field in order to produce a piece. Whether it is by playing an instrument, having experience with audio software, composing, etc. We wanted to break the conventional methods to produce music through computational interactions such as using sensors, transforming them into instruments. This kit allows users to explore unconventional manners to produce music. This kit brings the users to engender their creativity by finding unique ways to understand music production. This kit is accessible to everyone because it does not require any skills, which breaks the conventional requirements of music production.

Introduction
Interaction methods vary from an activity to another. We wanted to have a hands-on interaction between the user and the machine to generate different sounds depending on how the user proceeds with using our project. This type of interaction can be very accessible to a wide range of people as long as they have the tools like the sensors they would like to use for it. It can also be used for different purposes and activities. There is almost an endless amount of creative music generators project that can be done using this program. We were able to achieve this intention by creating and proposing a standardization that gives the user the tools and sources such as the build of the circuit and the code to create a unique and different interactive way to generate the type of music they desire!

We created a multifunctional project as an open process concept as a way for not gatekeeping the technology and resources we built as well as making them able to develop over what we created.

To produce music, we created a DIY(i.e., Do-It-Yourself) kit separated into three main steps: the normal build, the open build and the product build. The three steps guide the user to test, explore and produce music sequences, which is a usual process in the music field.

Desing narrative

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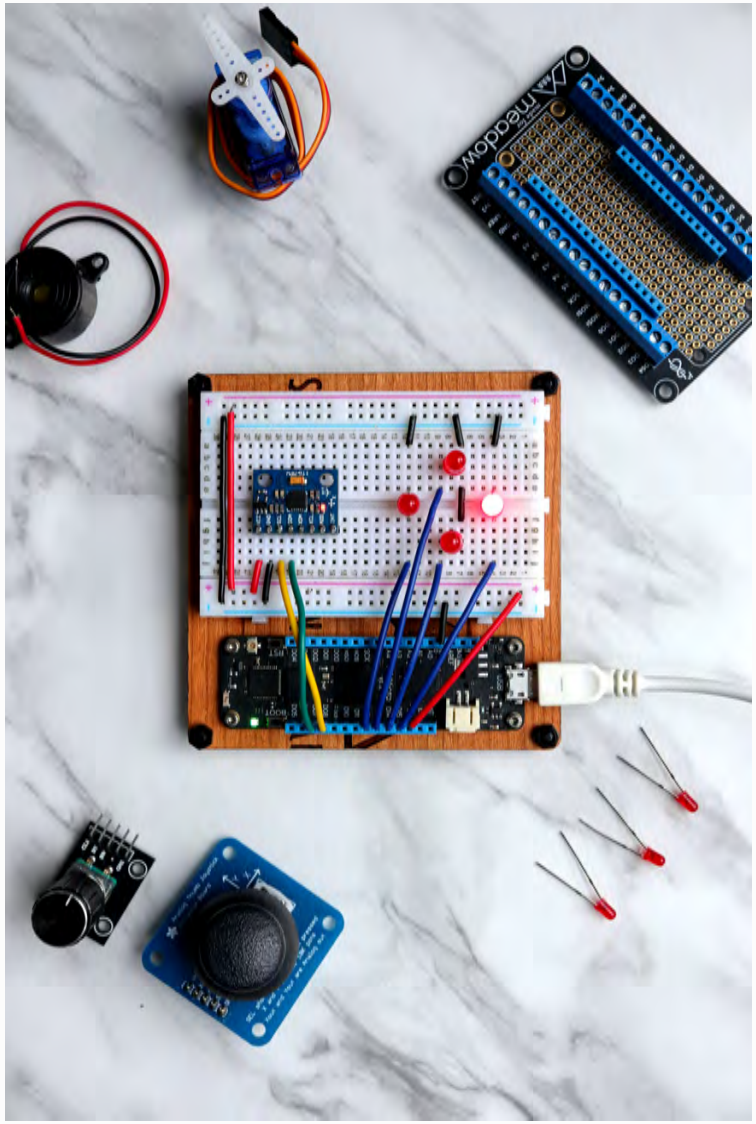
The capacity to read a user's thoughts and foresee their intents is above all expectations in usability, interactivity, functionality, and cathiness. We feel that this is the essence of the open process approach. which is exactly what we want to accomplish.



Where the idea steamed from

After several troubleshoots and brainstorming sessions, we wanted to create an open approach that allows the user to have more freedom with the sensors they want to utilise rather than being limited to one or two. Also, to create something that is more varied, inclusive, and amusing.

Version 1: BPM

Two sensors detect the heartbeat and the body temperature and based on the beats per minute or the value of the temperature it creates different notes using the program Ableton to generate a beat.

Version 2: Dancing glove

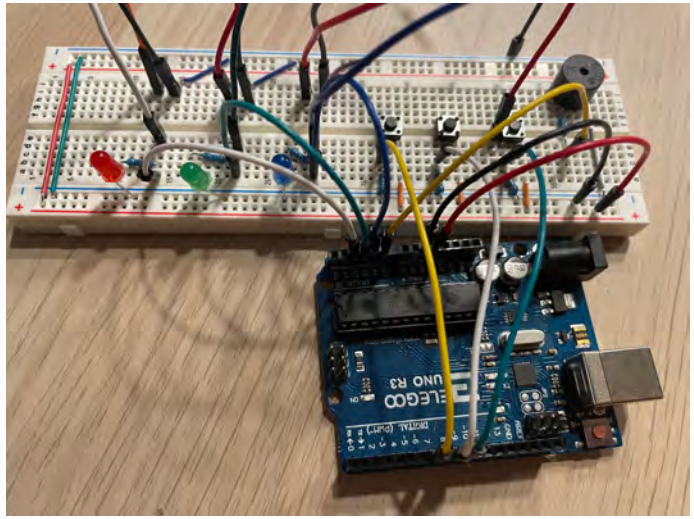
A sewed glove that has a distance - ultrasonic sensor on the palm side attached to the battery, the Arduino and the breadboard. On the other side of the glove, there is a flex sensor. When interacting with these sensors, a note is created.

Version 3: Audio player

It is essentially the concept of the normal build. It is a beat machine that has buttons and adjusters to create a sequence of musical notes when it is interacted by the user.

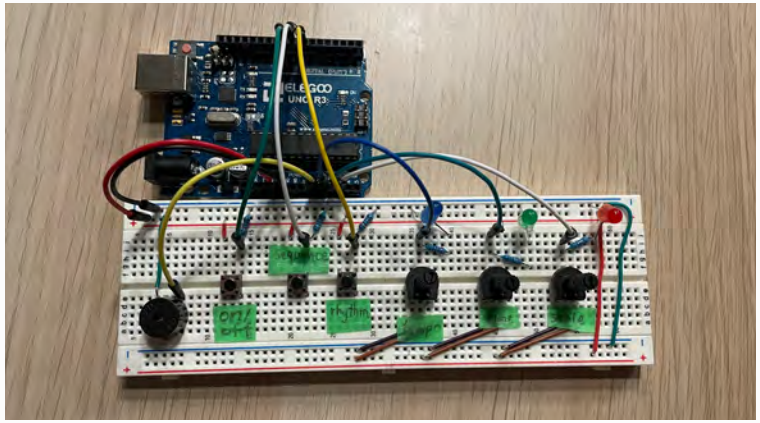
Version 4: Free sensors for all

This concept kind of includes all the past versions where it allows the user to either have a beat machine, a glove with sensors, or any tangible item the user would like to use and whichever sensors they desire.



Prototype Proccess

Once the three builds design conceptualization was set, we processed by building the Normal build first, followed by the “open”build, and lastly the product build which is just the example. Having a variety of work methods allows you to make judgments more quickly. It also demonstrates an increase in retention.

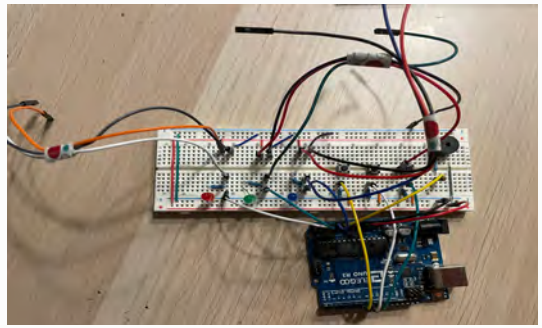


Normal Build

The purpose of the normal build circuit is to demonstrate the functionalities of its ability as a beat machine. It has 3 buttons: 1- on/off 2- iterate the sequence of notes, 3- iterate the rhythm; and 3 knobs. 1- modulate the speed; 2- modulate the pitch; 3- change the “chord”(combination of notes) that’s being played.

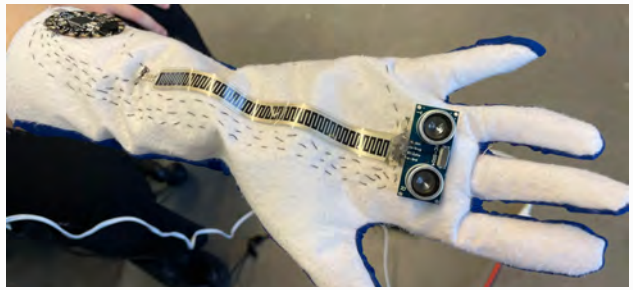
“Open” Build

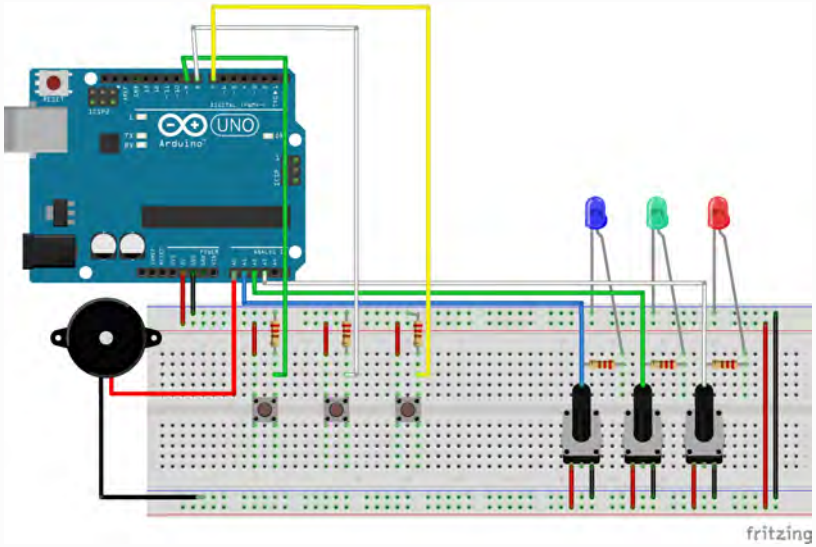
Free for all sensors, the code and circuit are designed to give an output for a range between 0 and 132 for any sensor the user intends on using. This open process concept, speculatives the design to make it fit for all.



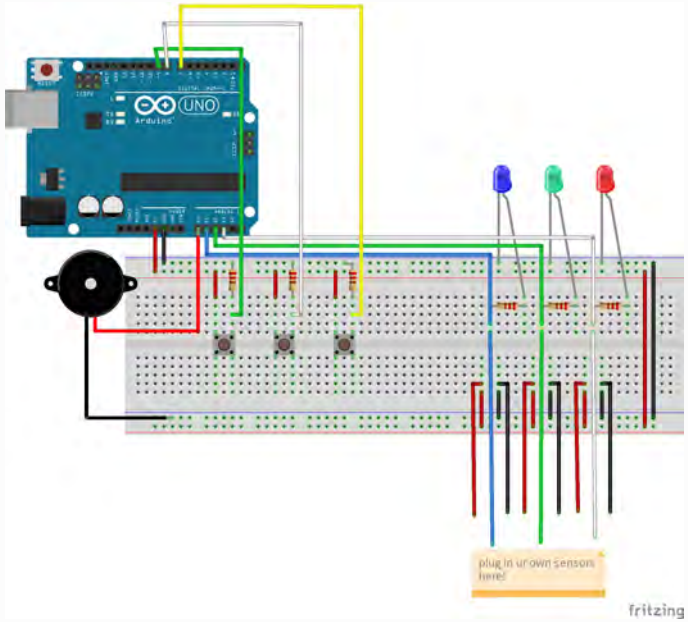
Product Build

A demonstration example of one of many tools a user can use this program with. The glove includes a distance sensor, flex sensor, bend sensor, LED and a speaker all connected with a conductive thread to a microcontroller.

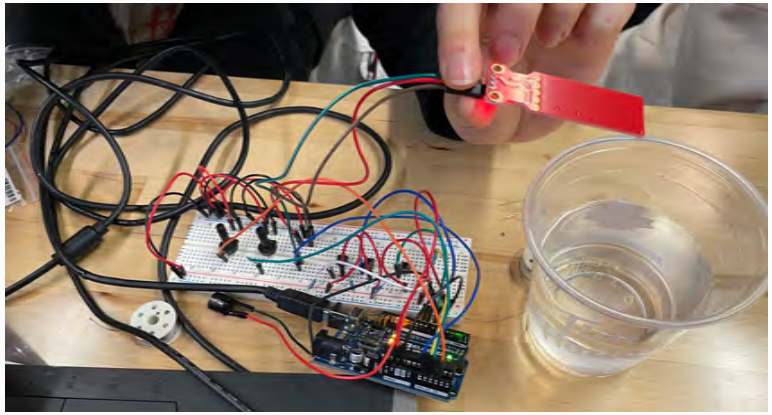


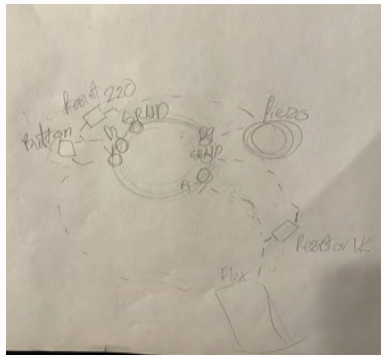


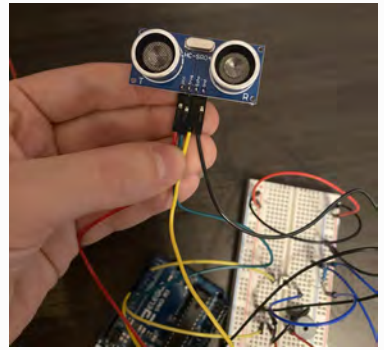
Normal Build - Diagram 1

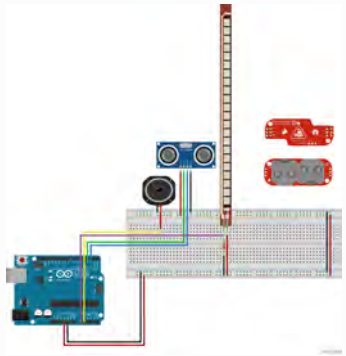


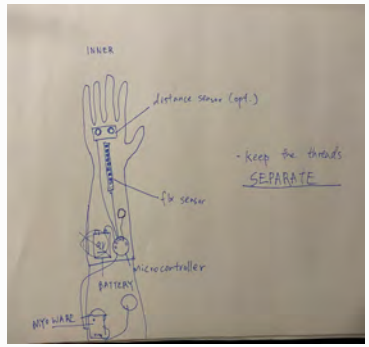
Open Build - Diagram 2





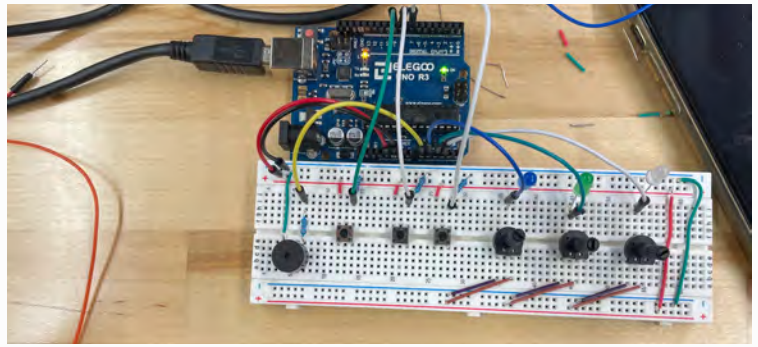






Final Artifact - Testing process

The experience lived by the user with this artifact goes in three steps: testing, exploring, and building. During the first step, the users discover the functions of this artifact by building and testing the circuit. The user will follow the steps given in the kit in order to test this pre-designed circuit. In the second artifact, users will be able to modify the structure of this built circuit by changing the sensors within it. Each time a new sensor will be used in the circuit, it will change the process of composing sound due to their unique characteristics. In the last step, the user will be able to create an unconventional instrument with a chosen interface(e.g., glove), and make it produce sound through their built circuit.



Code snippets

Changable user-friendly code

```
//press button to start/stop

void switchOnOff(){
  while(digitalRead(button_on)==HIGH){
    switch(isPlaying){
    case false:
      isPlaying = true;
      break;
    case true:
      isPlaying = false;
      tempoMax = 0;
      tempoMin = 1023;
      tuneMax = 0;
      tuneMin = 1023;
      chordMax = 0;
      chordMin = 1023;
      break;
    }
    delay(buttonDelay);
  }
}
```

Code snippets

```
//press button to change beat pattern
void switchPattern(){
  if( digitalRead(button_pattern) == HIGH){
    nextPattern();
    delay(buttonDelay);//to prevent retriggering
mode++
    }
}

//press button to change beatDuration pattern
void switchRhythm(){
  if( digitalRead(button_rhythm) == HIGH){
    nextRhythm();
    delay(buttonDelay);//to prevent retriggering
mode++
    }
}
```

Changable user-friendly code

```
void modulateTempo(){
  tempoRead = analogRead(knob_tempo);
  //get max/min to normalize it
  if(tempoRead<tempoMin){
    tempoMin = tempoRead;
  }
  if (tempoRead>tempoMax){
    tempoMax = tempoRead;
  }

  tempoMod =
map(tempoRead,tempoMin,tempoMax,-1,10);
  //tempoMod *=0.5;
  //Serial.println(analogRead(knob_tempo));
  updateRhythm();
}
```

Observations

The open build where the user changes sensors; which affects the music sequence and the normal build are fully functional. The code that allows changing sensors within the same build, creating a modular code is also functional. On the other hand, the E-textile threads are touching at the end of the sensor where the pins are, which ends up creating a short circuit so it does not work yet. The Mozzi library was also hard to figure out in the short time we had. We also intended on using serial communication because of its complexity with the short time we were given.

Although, the program is still functional and delivers what is intended on doing, using the material we initially used which are a basic microcontroller, breadboard, buttons, adjustables, wires, sensors, powersoucre, LEDs, speakers and fabric.

The future of Vibe checke music controller

The future of VIBE check music controller can be expanded and scaled into a lot of different other elements, for example instead of just generating music, it can generate visual elements like lights and colours. We also plan on making it a multi-user interaction activity. For instance, we will have multiple Arduinos connected wirelessly and each can generate a different type of elements using different kinds of sensors.

A scenario of this expanded project could be two dancers each wearing a wearable item with the same sensors but one generates a beat and the other one can be generating lights while it is synchronized to their choreography.

Things to improve

Since our project is speculative, there is always potential for development, but one thing we could improve on is establishing and adding another sound library to give the music notes more variety by providing a larger range of sequences. Improving the final appearance and fine-tuning the details would also provide the user a better experience. We'd also like to enhance the project's interactivity by allowing the user to manipulate and control more components.

Finally, we can further improve the example design by using better fabric (we used felt and flexible material), but further study on E-textile and the best material to utilise is required.