Luminous Echo

A LIGHT-BASED MUSICAL INSTRUMENT WITH ARDUINO

- Preethi Somayajula

CONTENT

ABSTRACT

Six coffee cups, one for each note of the musical scale, constitute the Luminous Echo, a light-based spatial instrument. Six photoresistors — one at the bottom of each cup, wired to an Arduino Uno are used to construct the instrument. The PC uses ChucK, a musical programming language, to synthesize notes based on the data that the Arduino receives from the light sensors. With the cups serving as light funnels and concealing cables to draw attention to sound, the physical design is crucial to delivering a positive experience. Sensors can be used in music technology to provide greater sensitivity, greater selectivity, and perhaps superior stability at more affordable prices. One example of this is the Luminous Echo.

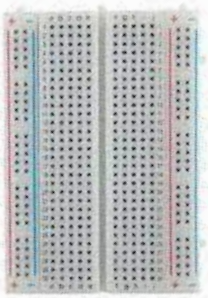
INTRODUCTION

Musical instruments are almost universal components of human culture. So, this is a small example of how musical instruments are used in sensor technology. Luminous Echo is a light-based spatial instrument built using Arduino UNO.

Enter the Luminous Echo, one can play this instrument by waving their arms around. It’s made from six coffee cups, each of which sounds a different pitch. Light levels determine volume and vibrato of this instrument.

COMPONENTS USED

- Photoresistors – 6
- Arduino UNO – 1
- Breadboard – 1
- Alligator clips – 12
- Connecting wires
- Disposable coffee cups – 6
- Cardboard box – 1
- Laptop - 1



DESCRIPTION OF THE COMPONENTS

Photoresistor

- It is an electronic component that changes its resistance with respect to the intensity of the incident radiation.
- It means when its dark around, there is hardly any current flowing through the device. But when light hits it, more electricity passes through the LDR / photoresistor.

Arduino UNO

- It is a popular type of microcontroller board, which is like a tiny computer that can be programmed to do various tasks.
- The UNO has a bunch of input and output pins that can connect to different electronic components, like sensors, lights, or motors.

DESCRIPTION OF THE COMPONENTS

Breadboard

- It is like a playground for electronic circuits.
- It is a rectangular plastic board with lots of tiny holes in it, and underneath each hole, there is a metal clip to hold wires or electronic components to test out ideas quickly without making any permanent connections.

Alligator clips

- They are small metal clips with serrated jaws like an alligator, used to make temporary connections between different components or wires.
- One end of the clip has a metal jaw that can be opened and closed by squeezing it, and the other end usually has a wire attached to it.

Connecting wires

- They are used to establish electrical connections between different components in a circuit.
- They link various components enabling them to communicate and functions together as intended.

SOFTWARE USED

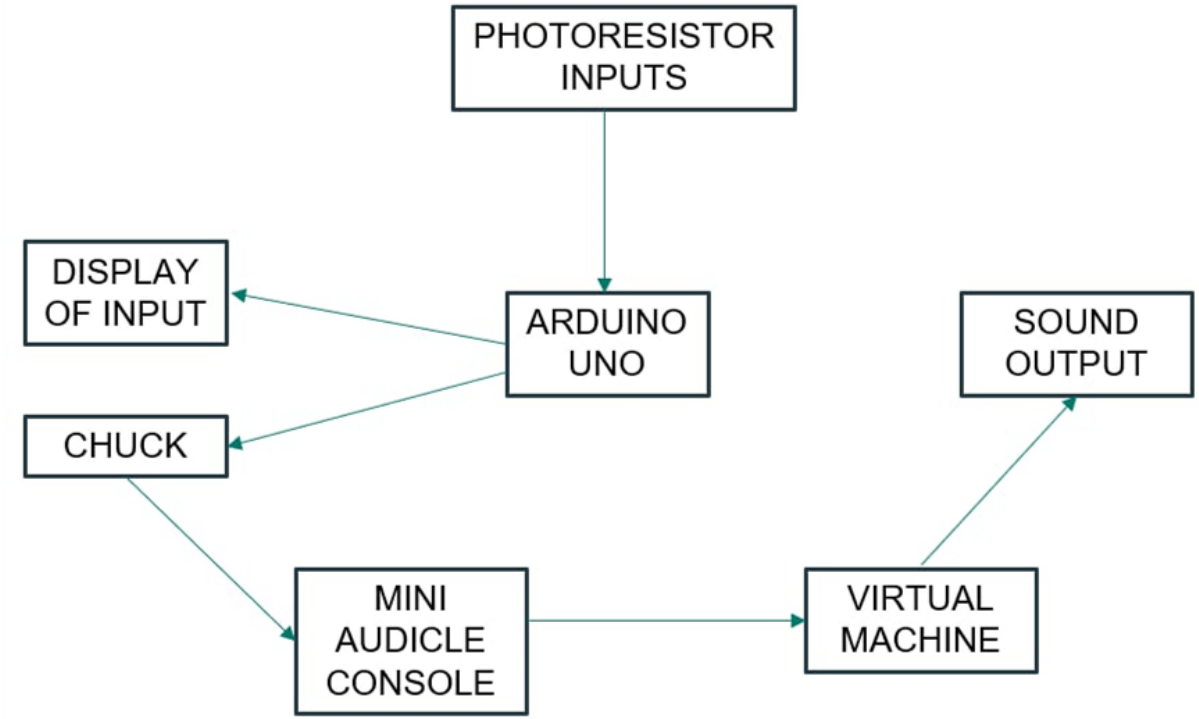
ARDUINO IDE

- The Arduino Uno software provides an IDE where one can write, edit, and upload code to Arduino Uno board. It includes features like syntax highlighting, automatic code completion, and a serial monitor for debugging.
- Arduino Uno software comes with a vast collection of libraries containing functions and commands that make it easier to interface with various sensors, actuators, and other electronic components.

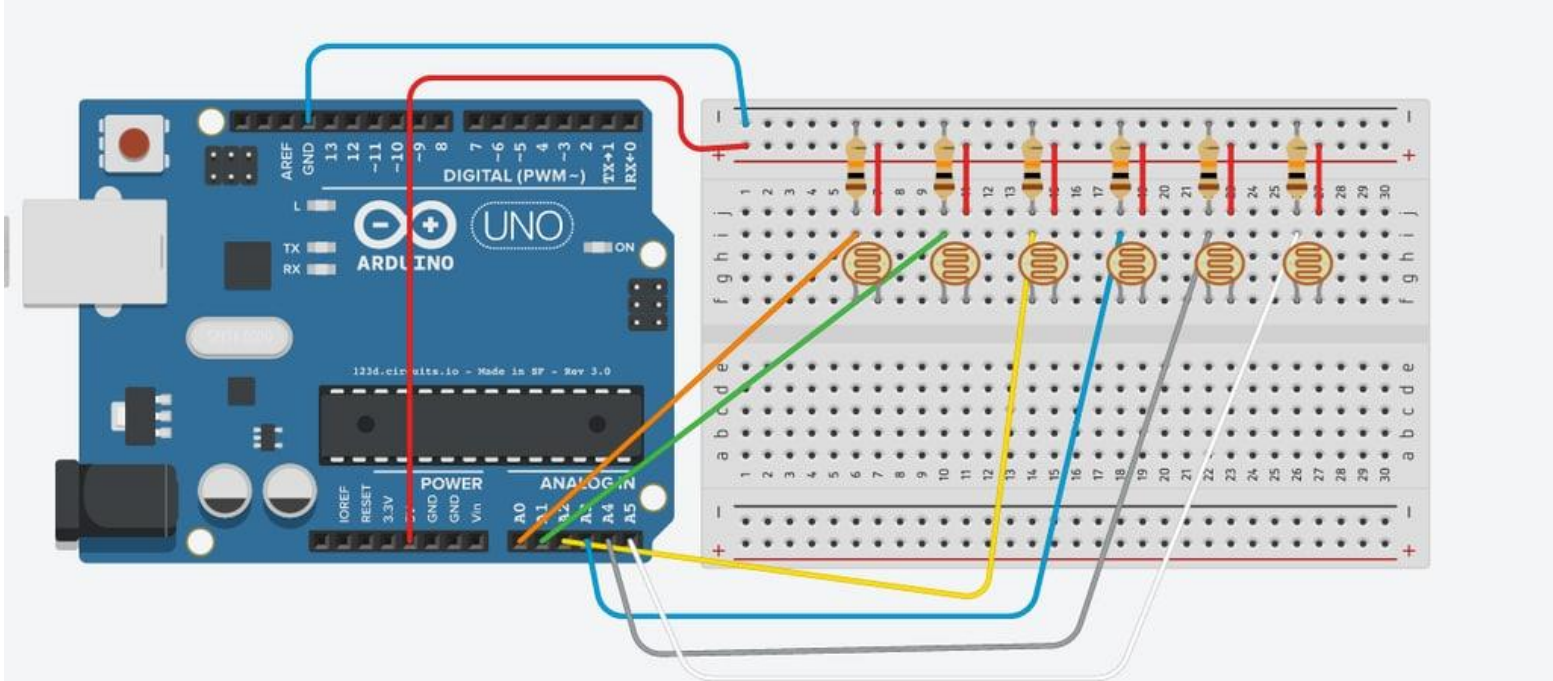
CHUCK

- Chuck software is a programming language and environment specifically designed for real-time audio synthesis and processing.
- It employs a concurrent programming paradigm, which means that multiple processes can run simultaneously and independently. It also supports precise timing and synchronization, essential for creating tight musical performances.

BLOCK DIAGRAM



CIRCUIT DIAGRAM



ARDUINO CODE

```
float analogPins[] = {0, 1, 2, 3, 4, 5};

void setup()
{
  Serial.begin(9600);
}


void loop()
{
  for (int i = 0; i < 6; i++)
  {
    int val = analogRead(analogPins[i]);
    Serial.print(val);
    Serial.print(" ");
  }

  Serial.println();

}
```

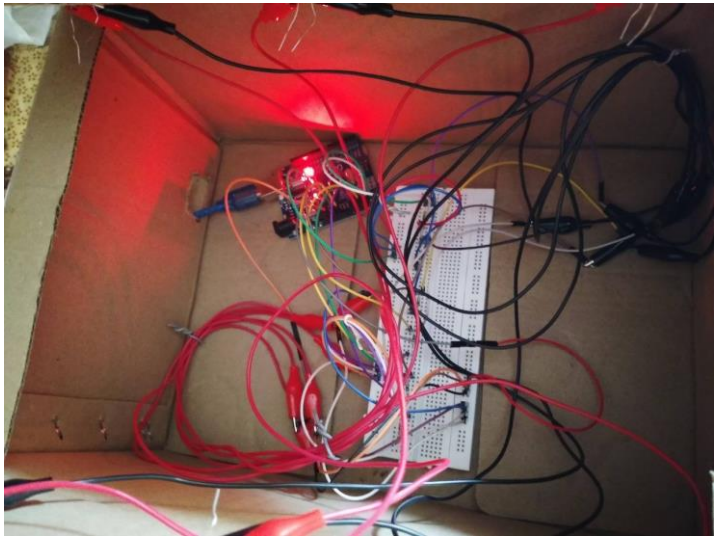
EXPLANATION

- Luminous Echo is a light controlled musical instrument. In other words, it's an electronic musical instrument.
- Arduino is a microcontroller used for serial communication.
- LDR is a light dependent resistor whose resistance fluctuates based on visible light.
- Depending on the environment, a photo resistor is able to sense the fluctuations caused the movements.
- Chuck is a musical programming language which is used for music libraries i.e., for sound generation.

EXPLANATION

- In this setup, wave your hands over the LDR to trigger the notes; light level controls the volume and vibrato. Each LDR represents a different note.
- The Arduino reads in the data from the light sensors and sends it to the laptop via serial communication, which then uses chuck to synthesize the notes as appropriate.
- Correct number of the serial port has to be provided in the chuck which is known as MiniAudicle.
- One should calibrate the setup carefully as the sketch is ready to run, so as to hear any noise.

PROTOTYPE PICTURES



REFERENCES

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- https://www.instructables.com/Happy-Birthday-With-Arduino/