Rippling Bananas

by Joyce Wang & Jett Vaultz

F'16 16-223: Introduction to Physical Computing

prof. Garth Zeglin

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Abstract

Rippling Bananas is a board consisting of a 3x3 grid wooden tiles where each tile has a banana-shaped light. At rest, each banana is lit up as one color. As one presses on any of the tiles, a color-changing ripple will form and spread from that tile. The project did not get finished. When we got to the point where fabrication and the code were done, we connected everything for testing, and there was a short circuit somewhere that burned the Arduino board and the laptop we used. Due to horrible project management, we lost the Arduino code, and the computer is now being fixed in the Apple Store.

Objectives

The ultimate goal of the project is to invoke wonder in a child. We want it to be something that is interactive, colorful, and fun; something that engages a child's attention, triggers their curiosity, and satisfies their natural tendency towards aesthetics and hands-on exploration. We want to make something that the children can relate to as well, because the sense of familiarity is conducive to comfort and engagement.

It all started off with Jett's "obsession" with the bananas. Bananas are such a fun concept, and it is definitely one that children are very familiar with. Then we decided to make a whole floor panel with a grid of bananas, and the bananas will actually be LED lights that create rippling effect when one steps on one of the bananas. The final product may look like a board, which was originally designed to have 5x5 tiles, but due to limited time, materials, and unsuccessful project management, the size was reduced to 3x3. Every tile has a banana shape on it, and it is lit up in a certain color by the LED behind it. As a child or adult exerts pressure on a tile, the LED on that particular tile will change into a new, random color, and then activates the surrounding tiles to change color subsequently, thus creating a ripple.

Implementation

The overall idea of the implementation is this:

The tiles are made of plywood and have a grid structure underneath, all made of whole sheets of wood—ideally, we did have to partition some of the layers due to material constraints. All nine banana tiles act as individual switches, and when one presses or punches a tile, they will activate the switch and send a signal to the Arduino, which will then program the LED strip in the grid to create a ripple effect.

Fabrication:

Figures 1 and 2 below show how we set up our panel and circuit, respectively.

Arduino code structure (actual code lost when the computer fried):

- Each of the nine switches is connected as an input on the Arduino
- The code uses object oriented programming, and implements the Banana class, and the Ripple class. The grid is represented as an 2D array of Banana objects. And there is a vector that keeps tracks of all the Ripples present at any arbitrary

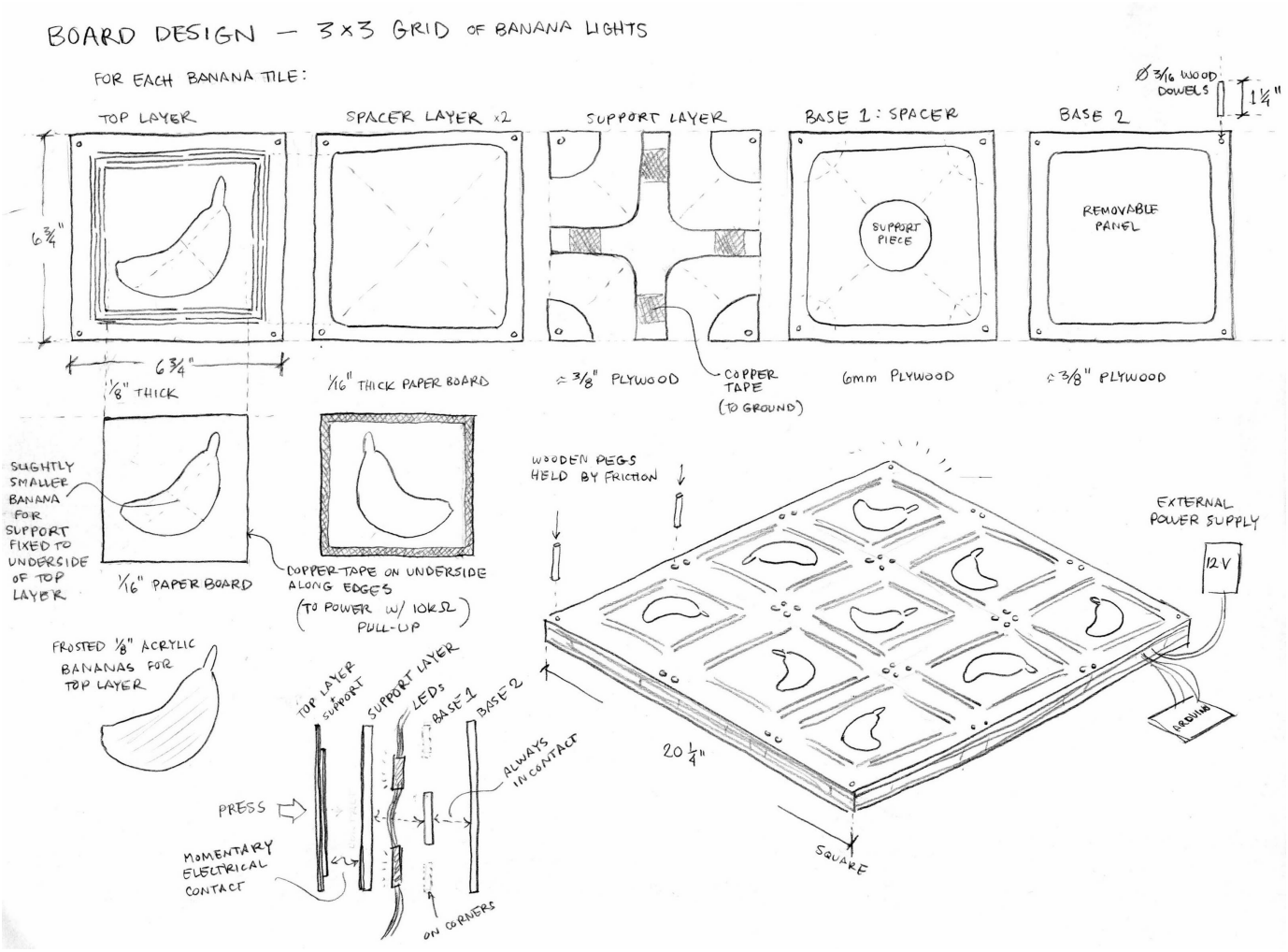

Figure 1: Panel Design

moment. When the program starts, the grid of Bananas are initialized and no Ripple exists. The loop() function first checks all nine switches. When a switch is turned on, a new ripple object will be created and added to the vector. Then loop() will update every Ripple, and the Ripple will call its expand() method which will make the ripple bigger by changing the colors of the Banana objects. When the Ripple is bigger than the board, it will be deleted from the vector. In the end, loop() will change the color on the LED strip based on the colors of the Banana objects.

- The code uses the WS2801 library to program the LED's.

Outcomes

The project did not go to completion. We finished the code and fabrication and connected the circuits for testing. Everything worked for two minutes, but there was a short circuit somewhere and fried the Arduino and the computer that was connected to it. The code

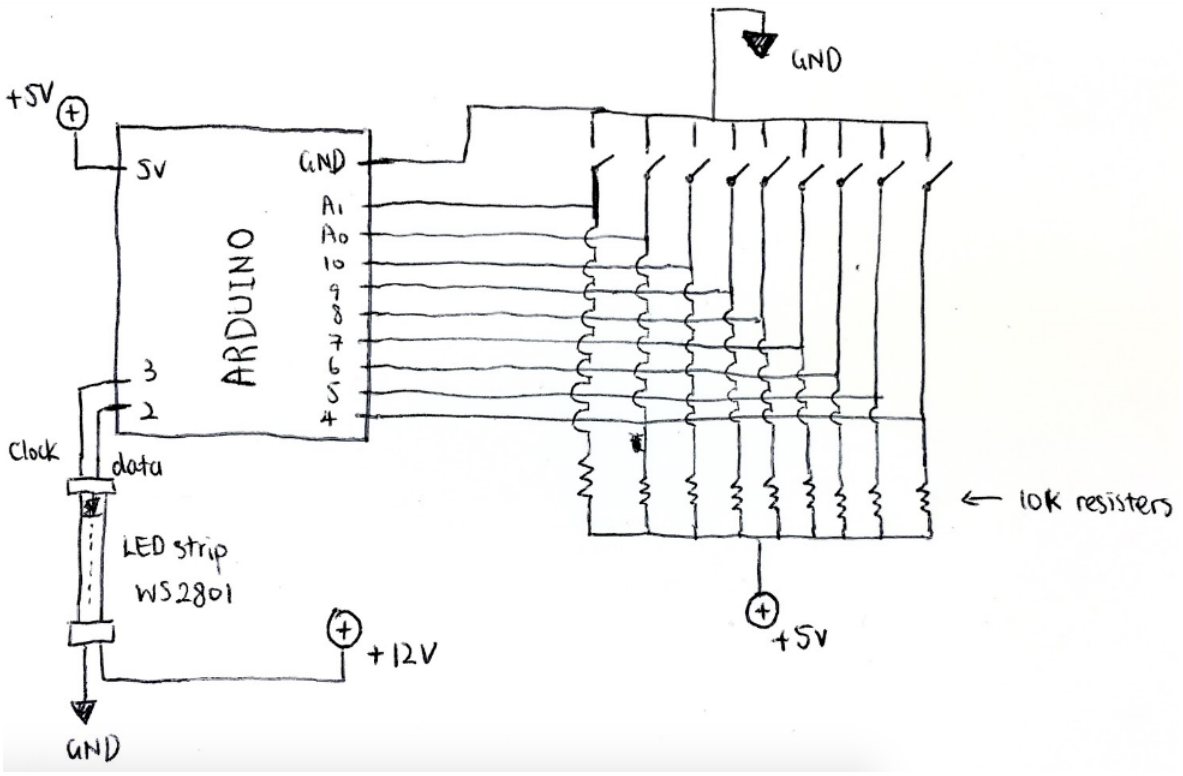

Figure 2: Circuit Diagram

is lost with the computer, too, unfortunately, so we couldn't keep testing the project with another computer.

One major mistake made here was that we did not back up the code, or do version control. Another mistake was that we could have been more careful when we built the circuit. The wires were too close to each other, and they could be touching each other when connecting the circuit to the power. Another general mistake – the most important and most fatal one – was in project management. We could have made more detailed plans early on and adhered to it, so we wouldn't have to do everything last minute and have too little time for testing and troubleshooting.

Contribution

Jett Vaultz

- Grid structure design
- Circuit design and testing
- Modeling and fabrication for the boards and bananas
- Assembled and wired the final structure

Joyce Wang

- Design grid structure

- Arduino code and testing
- Assisted in assembling and wiring the final structure and circuit

Photo Documentation

Figure 3 shows our product after fabrication.

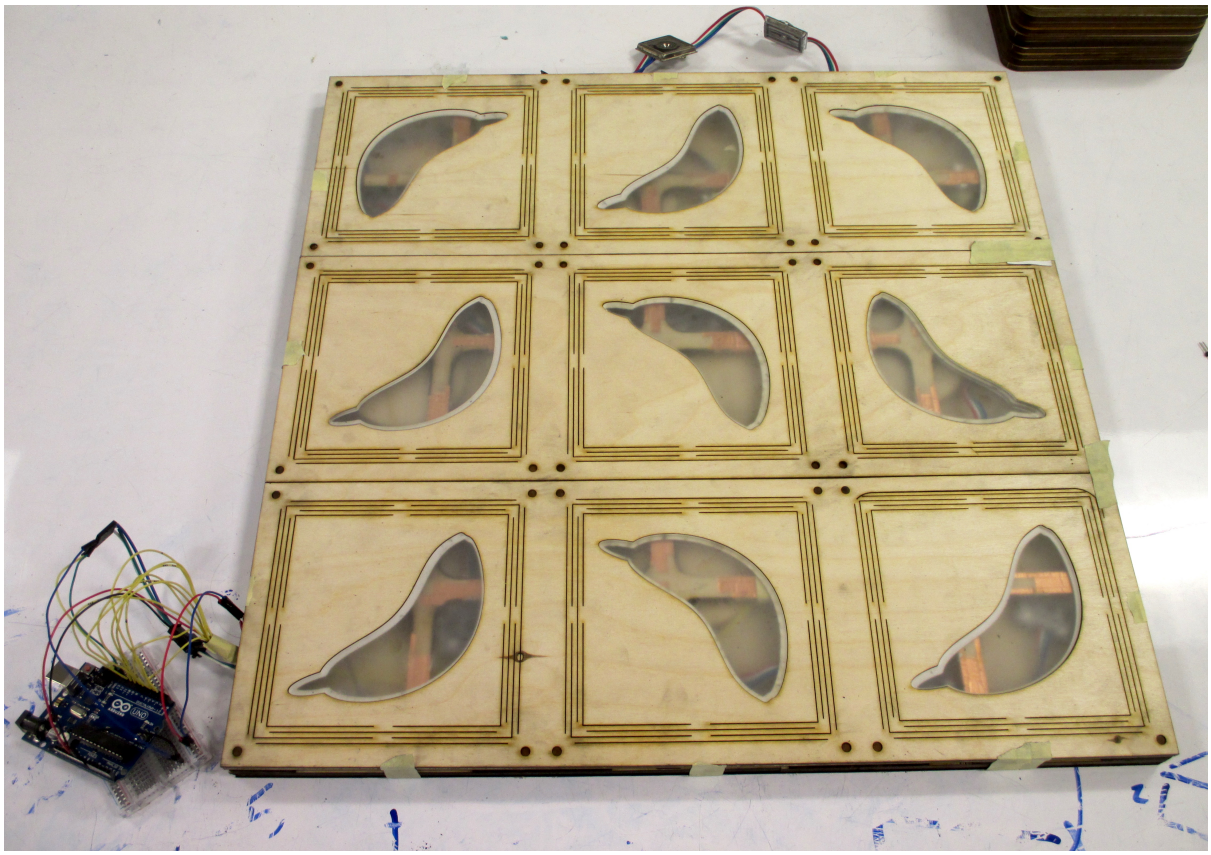

Figure 3: The finished 3x3 board.

Citations

1. WS2801 library for Arduino.
2. Thank you to prof. Garth and to Zach for suggesting the keyboard structure for the button, and the idea for the button design.