

## Abstract

Arduino is an open source microcontroller that interacts with the user. The objective is to program the Arduino to display multiple images, such as the iconic Mario, with bright, consistent colors throughout the entire panel. This was done by programming the library and connecting the code into the hardware. Several errors that occurred during this experiment were the voltage drop and the flickering lights. These errors were diminished by increasing the power supply output and adding more resistors. Improvements include creating various features to make the Arduino more user-friendly.

## Introduction

Arduinos were first introduced in 2002, but was officially developed in 2005 by Hernando Barragan in Italy. Arduinos are created to be relatively cheap and easy for beginners to use. However, Arduinos are also powerful, in terms of versatility, for people who are more familiar and knowledgeable about these projects to develop and create more functional additions to improve previous or future projects. Arduinos are a great way to start developing skills for anyone who is interested in building interactive hardware and to test a student's knowledge of the basics of software programming and their creativity to design the hardware.

## Materials

- Arduino
- Power Supply (AC to DC)
- Connecting Wires
- 60% Acrylic panel
- Foam Board
- Wood

## Methods

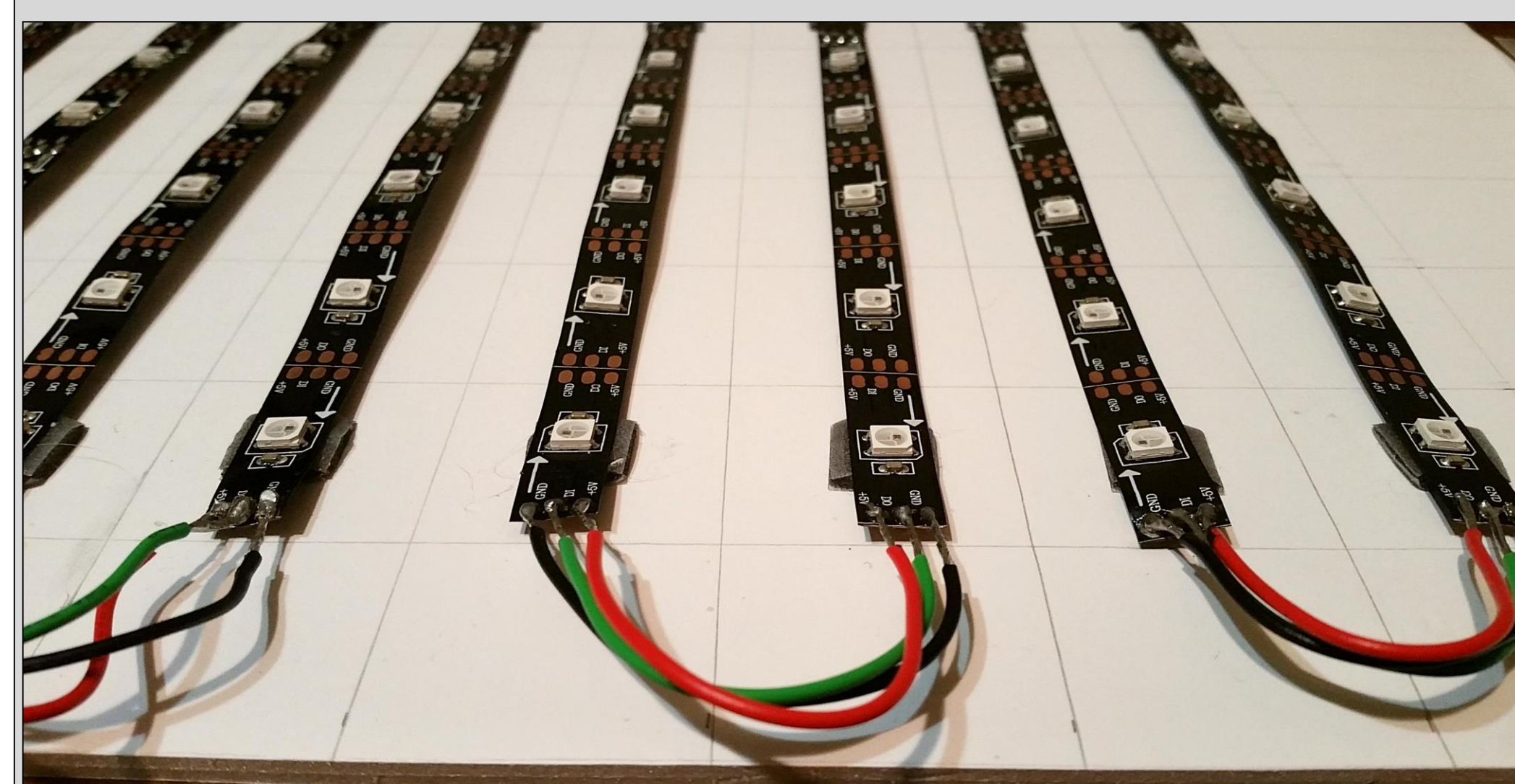
Programming the Arduino

1. Download the Neo Pixel Library
2. Create function, void setup, to initialize pins and set post-width-modulator
3. Create function, void loop, to constantly check whether or not to turn on the LED lights
4. Upload program into Arduino
5. Test run

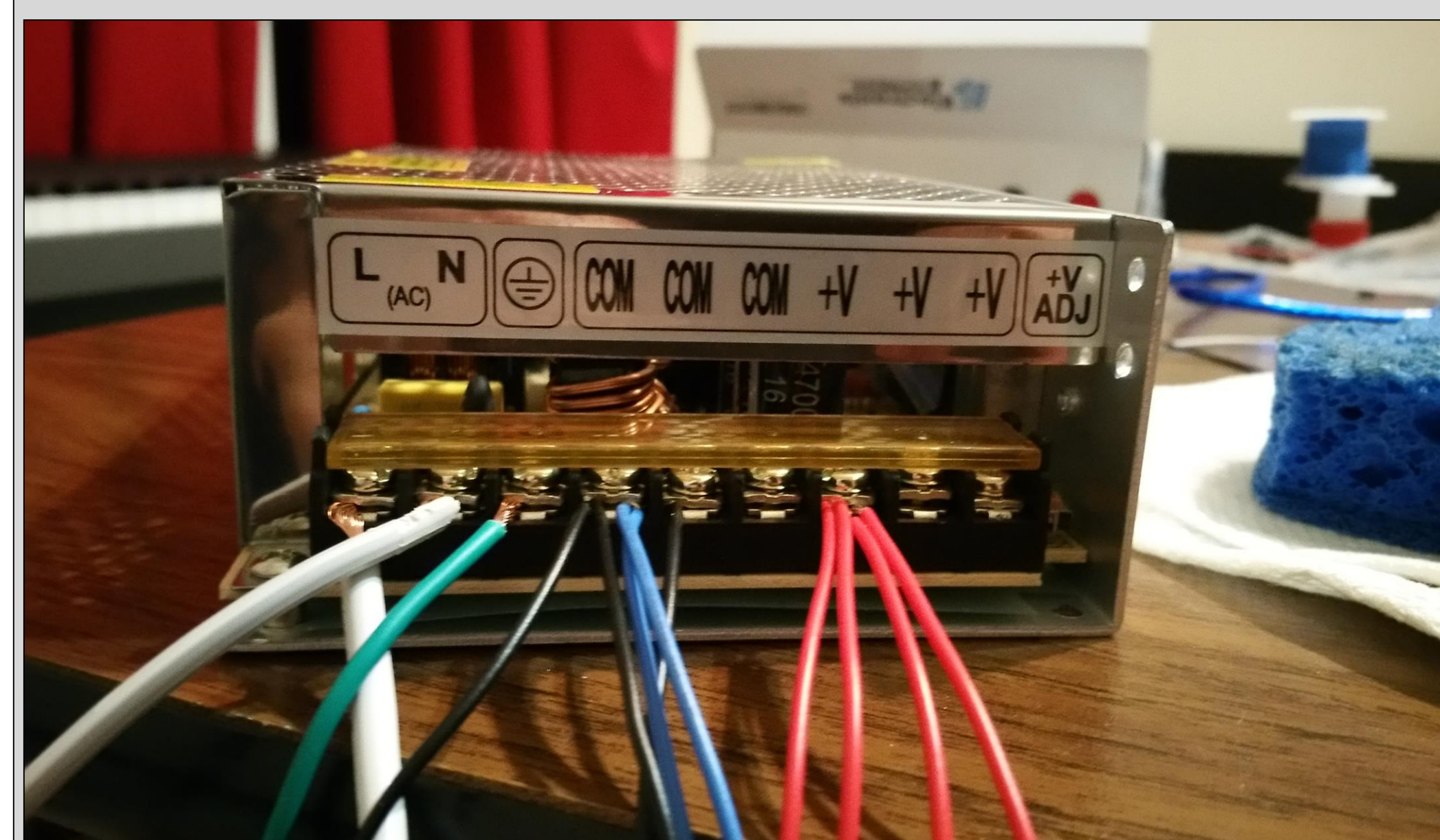
Creating the Display

1. Draw gridlines on cardboard
2. Glue LED strips onto cardboard
3. Create boxes to hold grids
4. Apply 60% Acrylic panels onto box
5. Connect Arduino to LED and plug into outlet

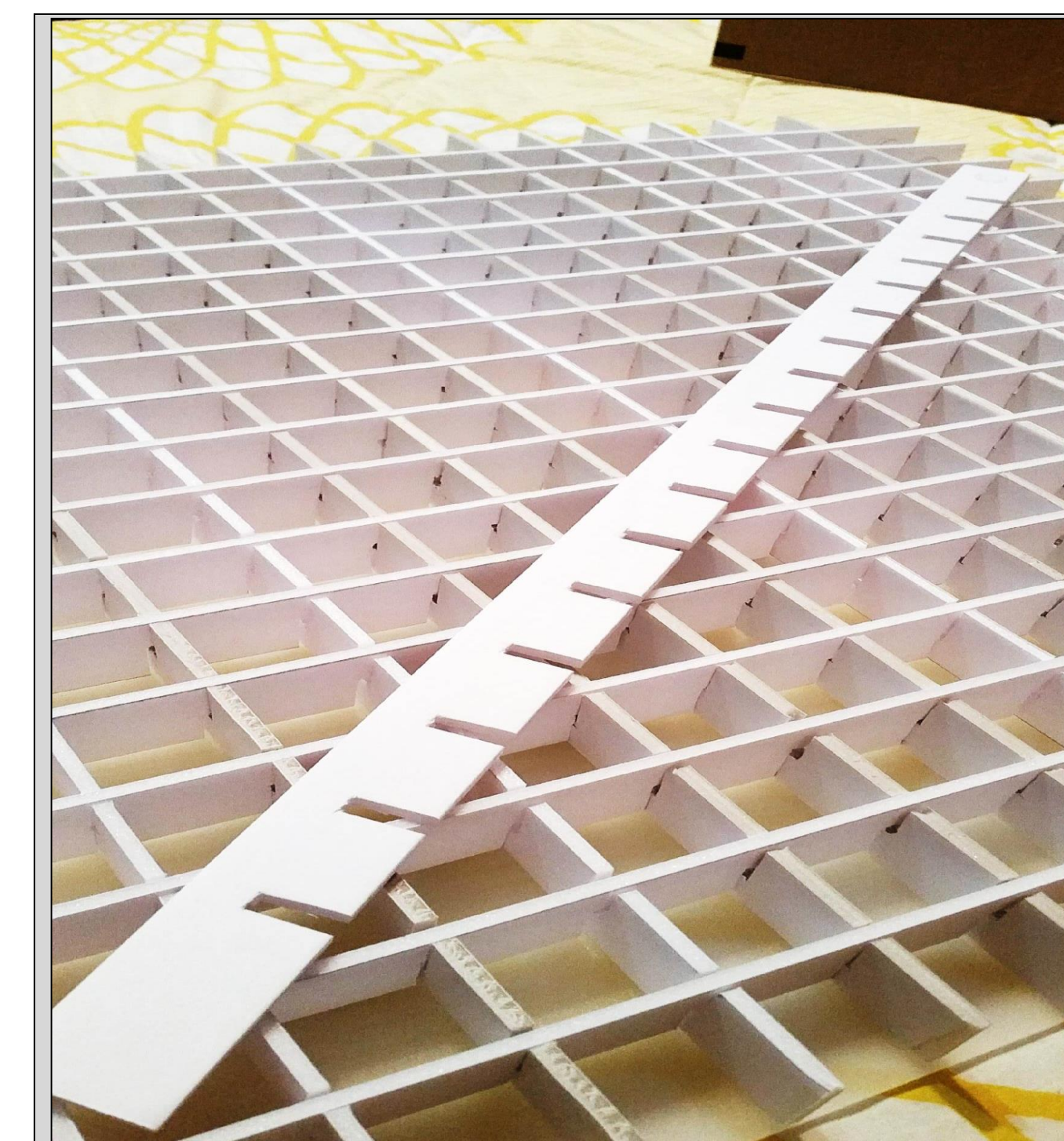
## Results



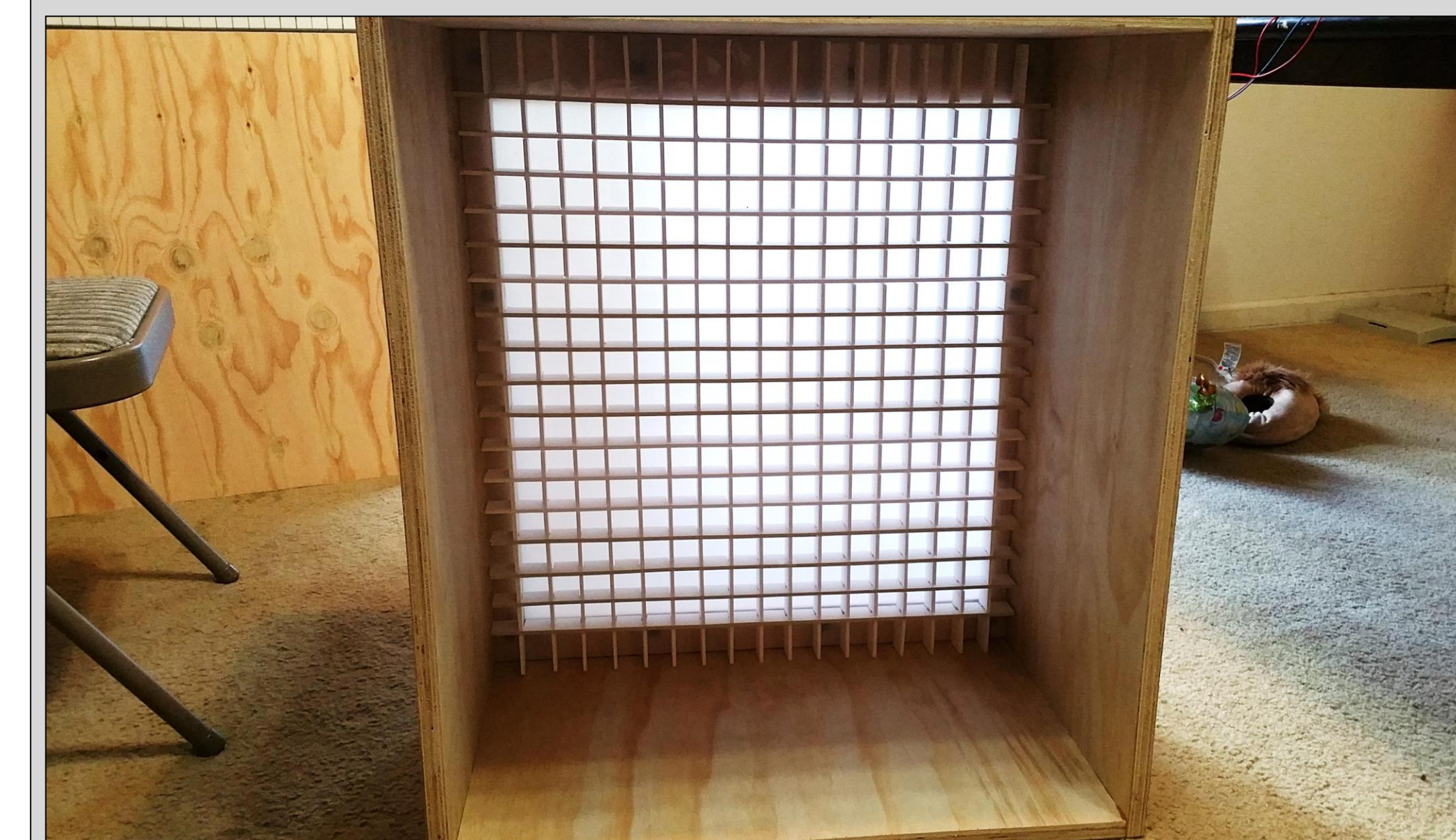
This display the gridlines drawn on the cardboard. The LED strips glued according to the gridlines.



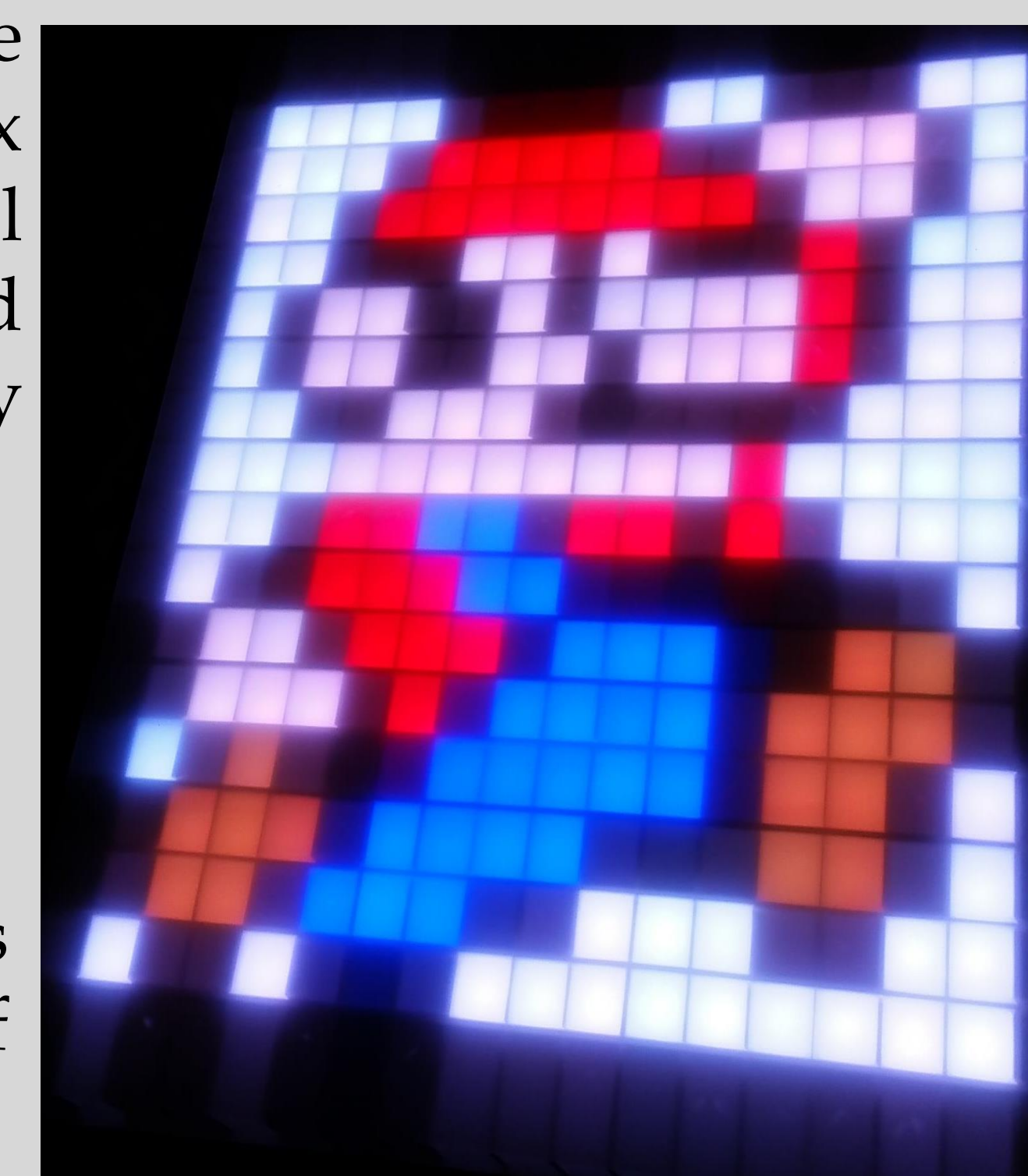
This connects the wires from the power supply to the LED lights.



To the left, the heightened grid boxes is glued on top of the cardboard to hold the 60% acrylic panels.



The image of the wooden box above holds all the Arduino and the display inside.



To the right is the outcome of this project.

## Discussions

An error that occurred is that the colors, especially white, were not bright or vibrant. One explanation of this is that there is a voltage drop. According to the Ohm's Law,  $V = IR$ , the voltage drops were due either the insufficient current or resistors. We increased the both amount of

## Discussion (continued)

current and the resistors to reduce the voltage drop. Another error is that the LED lights were flickering. A single power supply at the end of only one strip will cause a huge source of voltage within the first two to three strips; however the rest of the strips will be dimmed. Therefore, instead of having one power supply at the end of the LED strips, we distributed the power supply to different ends of the LED strips to create an even level brightness throughout the entire LED lights.

A major improvement would be to install a circuit board to enable different functions and more features. Another improvement is that we should focus on the design process, rather than jumping into project. This would also increase the precision of our measurements. There are cheaper alternatives compared to the materials we used that could function as well as ours.

## References

- "Arduino.org." Arduino. Arduino S.r.l., 2016. Web. 21 Apr. 2016.
- Durfee, William. "Arduino Microcontroller Guide." Arduino Microcontroller Guide. University of Minnesota, 2011. Web. 21 Apr. 2016.
- John. "Story and History of Development of Arduino." *Electronic Circuits and Diagram Electronics Projects and Design*. Circuits Today, 26 Mar. 2014. Web. 21 Apr. 2016.

## Acknowledgements

We would like to thank MESA for creating this opportunity and Jimmy Cao for his guidance and support.