



# Motion Sensing Infinity Table

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## BACKGROUND

Our project stems from our love of light and the desire to create something both entertaining and functional. A motion sensing infinity table with mobile application capabilities provides a solution to all of these requirements. Ordinary end tables usually provide functionality and sometimes beauty but most do not include built-in entertainment. It was our desire to design an interesting and unique optical twist into an ordinary end table. The addition of the motion sensor and a mobile application was desired for both the functional and unique aspects of the design. With the motion sensor, the lights will be activated with any movement that occurs immediately in front of them. The mobile application is designed to over-ride the motion sensor and to change the color and design of the lights if desired by the user.

## PROPOSED SOLUTION

Our proposed solution consists of a string of addressable LED lights, an Arduino Uno Microcontroller, and a motion sensor. Through the careful combination of these the motion sensing and infinity illusion would be achieved in the design. We then added a Bluetooth Module to the list of necessary products as it was necessary for the connection of the mobile application to the lights and over-riding the motion sensors. Our design diagram can be seen in Figure 1.

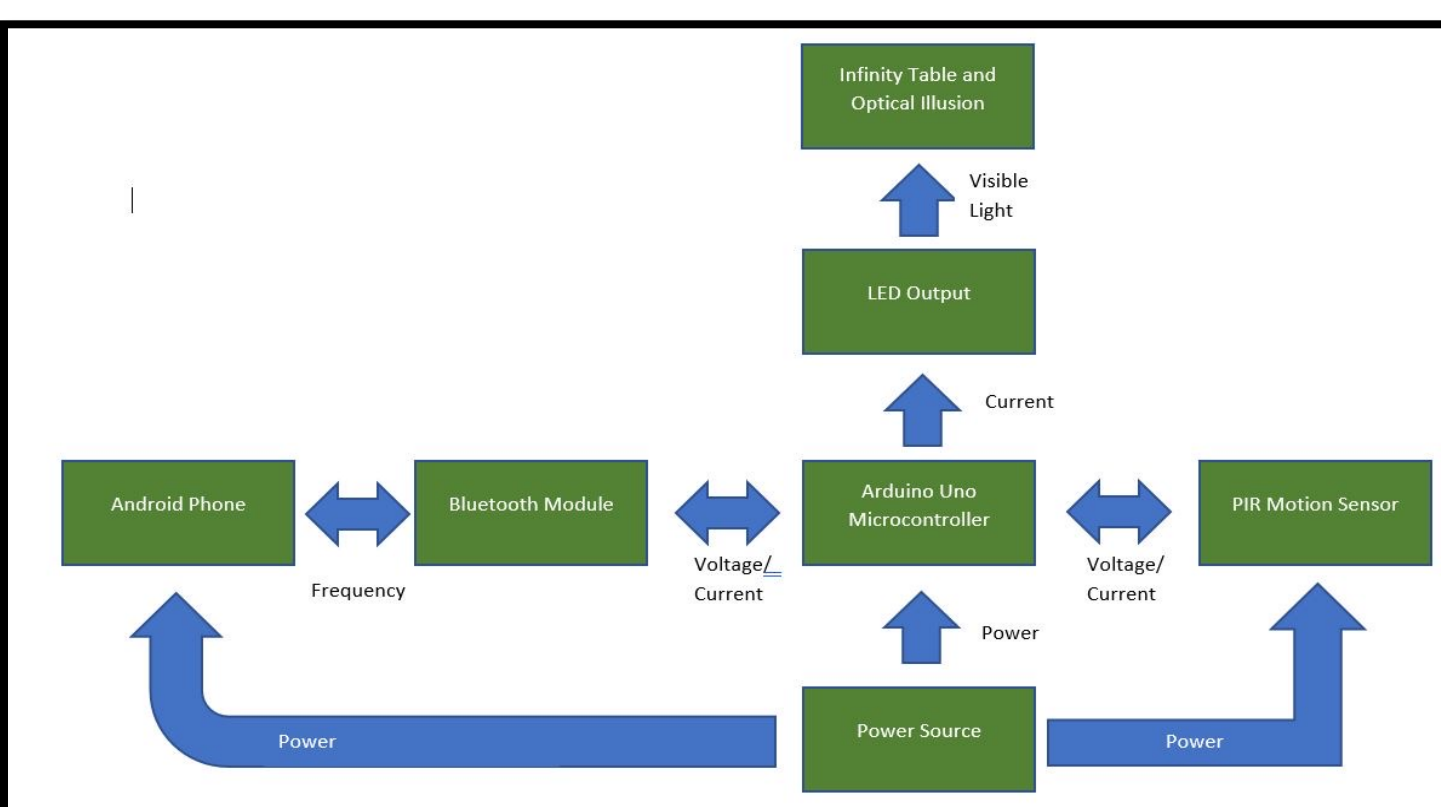


Figure 1

## SYSTEM DESIGN

**The system consists of 4 major parts.** The motion sensor, the LED lights, the Arduino Uno microcontroller, and the Bluetooth module which allows for the use of a mobile application.

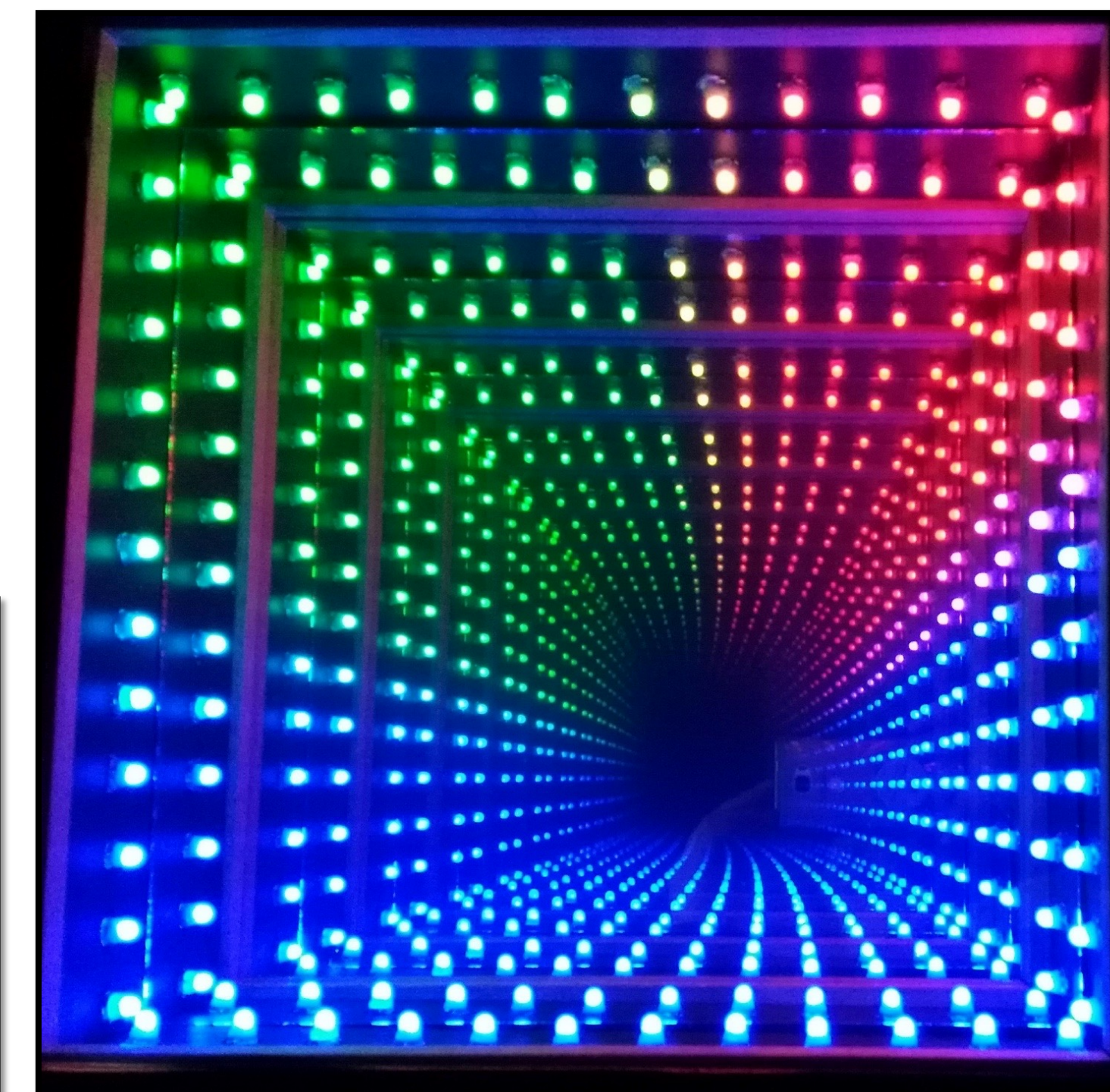
**The Microcontroller:**  
The microcontroller which was chosen is an Arduino Uno. The Uno has the capability of connecting with a Bluetooth Module and a motion sensor. The Uno also possesses the power to drive 50 LED's with the help of an additional power source.

**The LED Lights:**  
The string of LED lights chosen is comprised of 50 WS2811 Individually addressable LED lights. These features of the LED's allow for each LED to be programmed individually. These lights operate with the assistance of a 5V power source.

**The Bluetooth Module:**  
The HC-05 Bluetooth module was chosen to have a way to connect between the mobile application and the Arduino Uno. The part is concealed within the table.

### The Motion Sensor:

A PIR (Passive Infrared Sensor) measures the Infrared light radiating from objects within its field of view. The 'motion' is detected when this measure of IR light changed suddenly. This then triggers the LED lights. The motion sensor is attached to the side of the table with connections made on the inside of the table.



The Infinity Illusion is created using a special property of optical physics: Total Internal Reflection. The illusion is comprised of the LED lights sandwiched in-between a regular plate mirror and a two way mirror. With the lights on the inside of the two way mirror we are able to see through the top of the table when the lights are on. The reflection of the lights on the two mirrors creates the illusion of infinite depth.

## FUTURE DIRECTION

- Incorporate more LED designs and colors into the coding
- Revamp the power supply and have everything contained within one power source.
- Code the mobile application to change the LED color and pattern
- Make the mobile application more aesthetically pleasing to the user.
- Adhere the top mirror to the table
- Disguise the motion sensor to make the side of the table more aesthetically pleasing.

## REFERENCES

<http://www.instructables.com/id/Warping-Infinity-Mirror/>  
<https://github.com/FastLED/FastLED/wiki/Pixel-reference>  
<http://www.instructables.com/id/Android-Bluetooth-Control-LED-Part-2/>

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