# LightBot

Summary:

This project builds on a wonderful light painting tutorial from Adafruit using an Arduino and a dense strip of NeoPixels. We have added functionality to power the project off of the robot's internal battery and use the wheel encoder information to ensure that your images are displayed at the proper rate. Also, should trouble rear its ugly head, error codes are displayed on robot's LED display.
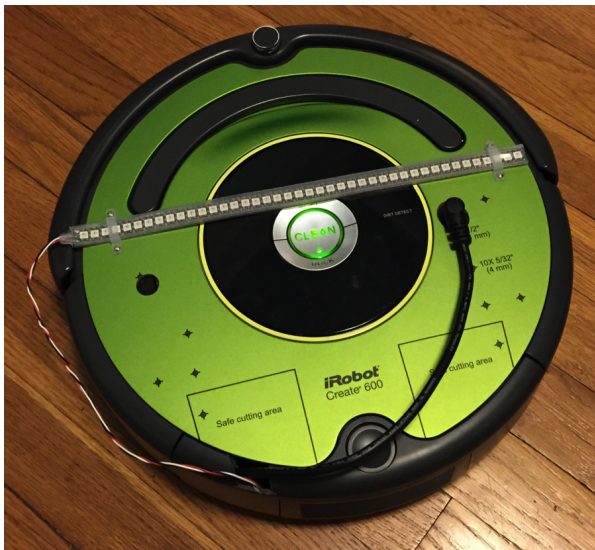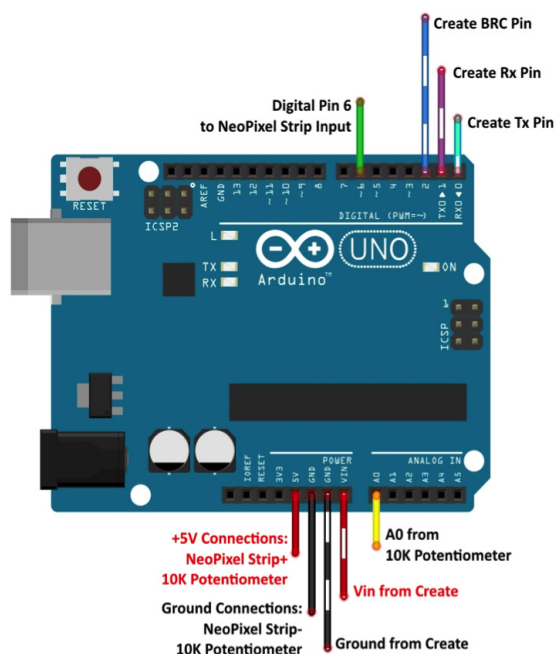

Parts & Materials:

Part Description	Quantity	Where to Buy
3D-printed Create® 2 high-capacity bin bottom (OPTIONAL)	1	Download Here
Arduino Uno microcontroller	1	http://goo.gl/FBeFdq
Adafruit Data Logging Shield (or other shield/breakout with SD or microSD card slot)	1	http://goo.gl/KfvdBc
NeoPixel strip (1m long, 144 LEDs, will be cut down to ~13" long)	1	http://goo.gl/EjOeY1
SD card (or microSD with adapter), FAT-formatted	1	http://goo.gl/ez0tPv
Silicone Clips and Screws for NeoPixel LED Strips	Set of 5	http://goo.gl/7ZU8q7
18-8 Stainless Steel Flush-Mount Captive Nut, 4-40 Thread Size, .062" min Panel Thick	Set of 25	McMaster-Carr Part # 94674A490

Tools & Equipment

- Soldering Iron
- #1 Phillips Screwdriver
- Rotary Cutting Tool
- Heat shrink tubing or electrical tape
- Flexible wire
- Camera with a long-exposure mode, plus a tripod
- Imaging editing software that can output 24-bit BMP files (e.g. Photoshop, GIMP, Pixelmator)

Procedure

1. Head over to Adafruit's wonderful NeoPixel Painter tutorial http://goo.gl/Mrt1lx and read through all the steps. This is a challenging project, so make sure you understand what you are getting yourself into for before beginning.

2. Start by following our tutorial on creating an Arduino-to-Create® 2 communications cable: Arduino Tutorial. This cable will also provide power to the Arduino and the NeoPixel strip, eliminating the need for auxiliary batteries.

3. Follow Adafruit's tutorial up through the "Test NeoPixel Strip" step and then come back here. It is important that you verify the functionality of your electronics at the end of each step to avoid headaches at later steps. We used a 43-pixel long NeoPixel Strip on our robot and the sketch is setup accordingly.

4. Make the electrical connections shown in the diagram below. Note that the SD Shield isn't shown in this wiring diagram for clarity. We recommend using pins and headers to make the connections removable.

5. Once you get your wiring completed, upload Adafruit's NeoPixel-Painter sketch to your Arduino and make sure that images are displaying properly. This sketch looks for a button between A1 and Ground to trigger the light display. Either install a temporary switch between these points or you can simply put a short length of wire in A1 and briefly touch it to a Ground connection. Error messages are displayed to the Serial Monitor on your computer to help troubleshoot any issues.

6. Layout your NeoPixel strip on top of your Create faceplate and position the silicone clips as desired. Mark the screw holes with a pen or marker, remove the faceplate from the robot, drill mounting holes with a 5/32" drill bit, and install threaded inserts into the faceplate from the backside. Reinstall the faceplate to the robot, position the NeoPixel strip and brackets, and screw into place. See this tutorial for more details: Create 2 Deco Cover Modification

    a. Alternatively, you can mix up a small amount of two-part epoxy and use it to adhere your NeoPixel strip to your Create 2 faceplate. The reason to use epoxy is because NeoPixel strips are covered in a silicone sleeve and almost nothing bonds well to silicone.

7. We are going to use the Arduino's serial port to communicate with Create 2 and send it commands, which means that we have to disable the error messages in Adafruit's sketch. If these messages aren't commented out, then they will be sent to Create 2, which will confuse it and put it into a bad state. We have created a modified sketch that removes these messages. Error messages will be displayed on the robot's LED display, which can be traced back to comments in the sketch for troubleshooting. Download this sketch to the robot.

Create BRC Pin
Create Rx Pin
Create Tx Pin
Digital Pin 6 to NeoPixel Strip Input
+5V Connections: NeoPixel Strip+ 10K Potentiometer
Ground Connections: NeoPixel Strip- 10K Potentiometer
Vin from Create
Ground from Create
A0 from 10K Potentiometer

8. Remove the dust bin from your Create 2 (shown with the optional 3D-printed high-capacity bin bottom) and use a rotary cutting tool to cut the following areas out of the top housing to route the cables out.

9. If using the high-capacity bin bottom, install your Arduino and shield with four screws to secure the electronics in place.
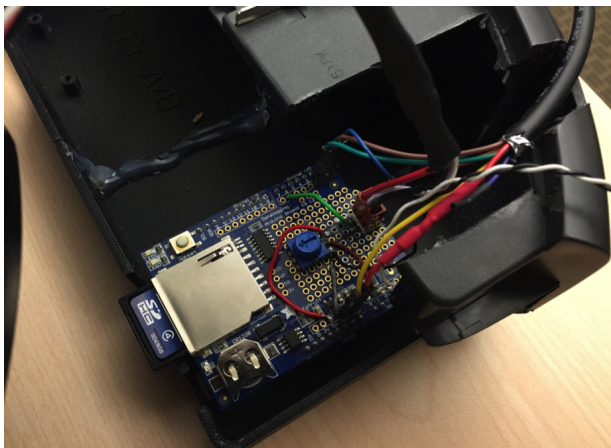
10. Route the Create-to-Arduino and NeoPixel strip cables out of the back edge of the bin and reinstall in the robot. Connect the communication cable to the Create 2 serial port and wait for the Clean button to pulse red twice indicating it is ready to drive forward and display your image.

11. Position your robot with enough room to drive forward for several feet, press Clean, and enjoy the light show! Capture long-exposure photographs using the Bulb setting on your camera.
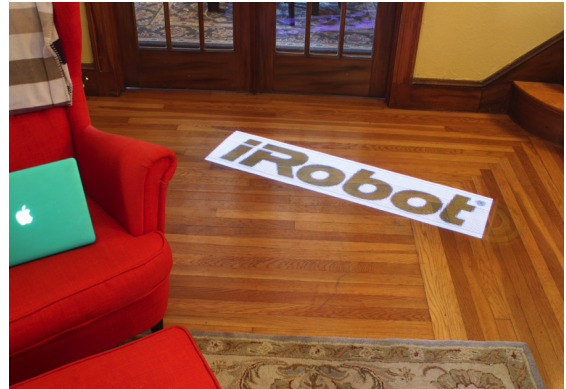
Optional Upgrades

• Use a 3D printer to make the Create 2 bin bottom, so you can mount your Arduino securely inside your bin to keep it from rattling around.
• Mount your NeoPixel strip vertically on a mast sticking off the top of your Create 2 to paint out images in thin air.

Acknowledgments

A huge thanks to Phillip Burgess at Adafruit Industries for doing the heavy lifting on this one: http://goo.gl/Mrt1lx