Personal UV HotSpot Parasol

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https://learn.adafruit.com/personal-blacklight-uv-parasol

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Overview

Create a personal blacklight spotlight under this UV parasol.

Most parasols are designed to keep UV light out. This one is designed to bathe you and your snazzy outfit in ALL the UV light, and make you glow like the Rockstar Candy Raver you are.

This guide details how to work with UV NeoPixels and make a very sturdy and festival-proof prop. It will still keep the harsh rays of the sun away during the day, but flick the switch at night and let the UV pixels underneath light up and put you in the spotlight.

There is a good bit of soldering and wiring required for this project, so be sure you're comfy with a soldering iron. The code, however, is incredibly simple - we'll just turn the pixels on as bright as they'll go! Using the Circuit Playground Express gives you lots of options to add sound or motion sensitivity with no additional wiring or add-on sensors. Make your UV umbrella react to your environment in a way that suits your style.

Parts

1 x Circuit Playground Express
Circuit Playground Express Microcontroller

https://www.adafruit.com/product/3333
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<tr>
<th>Quantity</th>
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<td>Adafruit NeoPixel UV LED Strip with 32 LED/m</td>
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<td>Fluorescent Pigment</td>
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<td>Fluorescent Pigments in Various Colors</td>
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<td>1 x</td>
<td>Battery Extension Cable</td>
<td><a href="https://www.adafruit.com/product/1131">https://www.adafruit.com/product/1131</a></td>
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<td></td>
<td>JST-PH Battery Extension Cable - 500mm</td>
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Here's another option for the on/off switch and extension cable. You don't have quite as much control over where the switch will end up, but it does save you a lot of soldering -- this switch is great because it's just plug & play!

| 1 x      | Extension Cable with Switch                                                       | https://www.adafruit.com/product/3064     |
|          | JST 2-pin Extension Cable with On/Off Switch                                     |                                           |

Also Needed

- Umbrella or Parasol - [I used this one](https://adafru.it/MCN)
- Devcon Silicone Glue ([https://adafru.it/MCO](https://adafru.it/MCO))
- Hot Glue Gun ([https://adafru.it/MCP](https://adafru.it/MCP))
- Heat gun
- Soldering iron & accessories
- Needle & thread or sewing machine

You'll also need a fabulous black light reactive costume -- but if you're making this project, you've probably already got that in the bag! The brighter your fluorescence, the better this project will work. The fluorescent pigments linked above work great to enhance your favorite accessories.
Since we want these lights as bright as possible, it's best to connect the battery in the middle of the circuit instead of powering from one end. Power flows both ways, but degrades if it has to travel a long way, so hooking up the battery halfway through the strips will give you the most bang for your buck in terms of brightness.
The Circuit Playground Express needs to be connected at the IN end of the strips, since, unlike power, data can only flow one way. So we'll put it at the beginning of the very first strip.

- CPX VOUT --> NeoPixel +5V
- CPX G --> NeoPixel G
- CPX A1 --> NeoPixel IN

Then, we'll connect each of the strips' OUT end to the IN end on the next strip: 5V to 5V, G to G, and OUT to IN.

The on/off switch will be put inline with the red wire (5V) halfway through the run of strips.

**Code with MakeCode**

The easiest way to get the lights on bright is using Microsoft's MakeCode editor. It just takes a few minutes to drag and drop code blocks to get your Circuit Playground Express up and running.

Head to [https://makecode.adafruit.com/](https://makecode.adafruit.com/) to get started.

The code we're writing is simple: we'll tell our Circuit Playground that we have a strip soldered to pin A1, with (in my case) 112 pixels. We'll set it to full brightness, then set all the lights to bright white.

Note: making your pixels full brightness will suck your battery dry really quickly. I've recommended a pretty beefy battery, but if you're planning to take this out for more than an hour, you might want to get two batteries so you can keep your glow at maximum brightness.

Here's the finished code in case you want to just download and go!

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Blacklight Parasol MakeCode Project

[https://adafruit.it/ESq](https://adafruit.it/ESq)
1. From LOOPS: drag an instance of `on start` into your workspace.
2. From NEOPIXEL (click LIGHT tab to make this appear): drag `set strip to create strip on A1 with 30 pixels`. Change the 30 to reflect the total number of pixels you have.
3. From NEOPIXEL: drag `set strip brightness` and change to 255 for full brightness.
4. From NEOPIXEL: drag `set strip all pixels to red` and change `red` to `white`.

That's it! Click the "Download" button to download the code. Plug your Circuit Playground Express into your computer via the USB port, and a drive will appear called CPLAYBOOT. (If you don't see it, try clicking or double-clicking the onboard reset button.) Drag the file you just downloaded onto this drive to program the board.

If you're having trouble, head over to this MakeCode tutorial (https://adafru.it/wWd) for some troubleshooting tips.

More Ideas

MakeCode has lots of easy to use options to spice up your project. Play around with using the onboard sensors (accessed under the INPUT tab) or create light animations (from the NEOPIXEL tab) to see what kind of fun things you can make your parasol do.
Electronics Assembly

Here's how the strips will be laid out on the parasol. My parasol has 16 spokes, so I'm using 8 strips that are slightly shorter than the spokes (so they're not too crowded in the center). There will be a strip along every other spoke. The Circuit Playground Express will be attached near the outside edge, and the battery will live up in the center, out of the way. The on/off switch will be placed close to the outer edge as well.

On/Off Switch Assembly

This shows how to assemble the on/off switch using the clicky tactile switch and extension cable. Another way to do this is to simply use this JST cable with switch (https://adafruit.it/sPa) already included. You don't have quite as much control over where the button ends up, but it can save you several steps and some soldering!

If you've got the tactile switch and extension cable, here's how to set up the switch.
Find the end of your battery cable with the female connector (it's the one that plugs into the Circuit Playground). Clip the red wire a few inches from this end. Leave the black wire intact.

Trim the two leads coming from your switch. Strip a little shielding off the ends and solder to your battery extension cable. Now the switch will control power running through this cable.

Put this aside for now. We'll add it halfway through the assembly of the NeoPixel strips.
Prepare UV NeoPixel Strips

Measure against your parasol to decide how long you want each strip to be. Cut 8 strips to length. Count your LEDs on each strip and multiply by 8 to get your total number of LEDs.

As you lay these out, pay close attention to which end is IN and which end is OUT. You must connect the data wires in the right order or the strips won't work.

It may save you time if you trim the strips from the middle instead of from the ends. It can be tricky to solder wires securely to these strips, and there are already wires soldered to both ends! You can take advantage of this and use those wires. Just trim out the middle few pixels instead of chopping off the ends of the strips if they're slightly too long for your parasol.

Cut a piece of clear heat shrink for each open strip end. Slip it over the silicone tubing on each strip, but don’t shrink it down yet -- it’s just best to get all the heat shrink on before you start soldering so you don’t forget it. Later we will fill the ends with hot glue and shrink the heat shrink to create a waterproof and dust-proof seal.

Time for soldering! Make sure you're starting from the IN end of the first strip. If you're using the pre-soldered wires, trim them to about 2-3 inches. Solder red to VOUT, white to A1 and black to GND. Trim off any other extraneous wires.
Grab your 4 strand ribbon cable and find the wire with the white stripe on it. This will always be our 5V wire (so imagine it's red!). Remember: striped wire = red (5v) power wire. Be consistent with this or you'll end up with a world of hurt.

Grab the fourth wire (the one on the opposite side from the striped wire). Pull it off the ribbon cable entirely, so that you now have a 3-wire ribbon cable and a spare black wire. Save the spare wire for another project.

Cut a 3-4'' piece of your new 3-wire ribbon cable. Solder the striped wire to 5V on the open end of your first LED strip. Then solder the middle wire to OUT and the remaining wire to G.

Take the other end of the ribbon cable and solder the striped wire to 5V, the middle wire to IN, and the remaining wire to G on your second strip.

Plug your battery into the Circuit Playground's battery port and test to be sure your strips light up. Test each strip as you go to make sure all your solder connections are good and solid. One bad connection will cause all the lights downstream to fail.

Unplug your battery before making any more solder connections. The fastest way to fry your Circuit Playground is to solder on strips while the power is on.

Notice how the first strip only needs a few inches of wire at the end to connect to the next strip since they'll be close together near the center of the parasol. The second strip will need a longer run of wire since it will be going along the outside edge of the parasol. You want to get as close as possible to the right amount of wire, so you don't end up with a lot of extra wire flopping around.. but you also don't want the wire pulling taut when you open the umbrella.
Cut a longer piece of ribbon cable, the right length to reach to the third strip along the outside edge of the parasol. Solder the wires in the same order as the strips before.

If there are pre-soldered wires on the end of your strip, you can splice the ribbon cable to the wires instead of soldering to the strip itself. Be sure your striped wire goes to red, the middle wire to white, and the remaining wire to black. Plug in the battery and test!

Solder on your fourth strip with a shorter piece of ribbon cable. Then solder your longer ribbon cable to the far end, in preparation for going to the fifth strip. At this point, STOP and take a break! We're halfway through the strips, and it's time to add the battery and switch connections.

Find the switch assembly you made earlier. Snip off the female JST connector (the one that fits into the Circuit Playground).

Also snip the striped wire and the third wire (5V and G) on the ribbon cable coming out of strip #4. Leave the middle wire (the data wire) intact.
Splice the wires from the battery cable as shown: the striped wire will get twisted with the red wire, and then both striped wires get soldered back together with the red wire incorporated. The black wire will get incorporated in the same way into the third wire from the ribbon cable.

Plug your battery into the other end of the battery extension cable and flick the switch. The lights should turn on and off. If they don't, check your wiring again!

Continue wiring up the last 4 strips the same way you did the first 4. Once all 8 strips are solid, and turning on and off nicely with the switch, seal the ends of the strips by tugging the clear heat shrink you put on earlier over the solder connections. Squirt some hot glue into the end of the strip, then use a heat gun to shrink the heat shrink down around the wet hot glue. When it dries, you'll have a nearly unbreakable connection that's weatherproof and dust proof.
Final Assembly

We'll use silicone glue / sealant to affix the strips to the inside of the parasol. Silicone glue is about the ONLY thing that will stick to the silicone sleeves on the outside of the strips. Krazy glue won't work. E6000 won't work. Hot glue won't work either. It's gotta be silicone.

My favorite is the DevCon brand, but this kind from Loctite will work too (and it's available at most hardware stores).
Start with your Circuit Playground Express along the outside edge of the parasol, then lay out the strips where you want them. You'll need to do some threading in and between the spokes of the parasol. I found it worked best to place the 8th strip first, then the 7th, and so on, threading the wire all the way around and through the spokes so it all ends up inside the head of the parasol.

Once you're happy with strip placement, glue the strips to the parasol using copious amounts of silicone glue. Don't skimp on the glue. You may need a couple tubes of it, but if you don't apply it thick enough the strips will peel off.

Once the glue is dry, use a sewing machine with a wide zig zag stitch, or a needle and thread, to secure the long wires down along the outside edge of the parasol.

Use hot glue to secure the Circuit Playground Express to the parasol as well. Placing it along the edge gives you easy access to the buttons or capacitive touch pads, as well as the accelerometer inside. We didn't use these features in this guide, but it would be fun and easy to add functionality that triggers when you spin the parasol or press a button on the CPX.

If you're taking this out in the rain or to the Playa, you can place the CPX inside a plastic bag and glue the plastic bag to the umbrella, to keep dust and rain off the board.
Wind the battery extension cable around one of the spokes so the connector is near the center, up underneath the parasol. Wrap a piece of industrial strength velcro around the battery. Place a strip of the soft side of the velcro inside the crown of the parasol and press it down firmly to stick.

Thread the battery up inside the parasol's crown as far as it will go and stick it down with the velcro. It should be very well protected from the elements up there, but still removable for charging.
Now, take your fluorescent pigments and go crazy with your outfit! These are not meant to go on skin, but they work great on fabric. Just mix a bunch of water with a paintbrush and brush it on. You can also add these pigments to dyes or resin to create fancy glow effects.

For skin, there are some really great black light reactive body paints available. My favorite brand is Kryolan (https://adafru.it/EV9) - these pigments really pop!