PULSATING EYE GOGGLES HOW-TO

As requested, here is a how-to for how to make the pulsating eye goggles I created for my home haunt costume this past Halloween (2014). One caveat, though. The goggles I made do **not** have holes in the eyes for visibility. I wore them on my forehead, over a black morph mask, so they were positioned just above my eyes. They could be done a little differently so you could wear them over your eyes like regular goggles, though you would certainly have somewhat limited visibility. Also, I've described how I made these, but this could certainly be simplified.

BTW, the Arduino sketch I wrote for this just makes the eyes pulsate red. However, the NeoPixel ring LEDs are RGB LEDs, so they can display any color. Fiddling with the sketch can make the eyes light up in different colors and patterns.

This is the first time I've tried writing a how-to article.

Okay, first a list of materials you'll need:

1. Goggles. I used a pair of steampunk welding goggles from amazon.com. Here's a link to the ones I used: http://www.amazon.com/gp/product/B002DLYR8A/ref=oh_aui_detailpage_o06_s00?ie=UTF8&psc=1 Note that those are currently not available on Amazon, but there are several other options there as well. Just following the link and pick something similar. The specific pair shouldn't matter much. Main thing is you want ones with the 50mm cup size.
2. A white ping-pong ball, with any labeling scraped off
3. Pair of plastic half-eyeballs. I also got these from Amazon, here is a link to ones similar to what I used: http://www.amazon.com/Generic-Acrylic-Plastic-Eyeball-Halloween/dp/B00EQ28XRK/ref=pd_sim_t_1?ie=UTF8&refRID=0TCFRCKFTC34SY0KRTA9
4. Gloss Mod-Podge
5. silicone glue

6. hot glue gun, a couple glue sticks
7. black sharpie marker
8. small amount of black fabric
9. black electrical tape
10. several feet of 22AWG stranded hookup wire (easiest if you get some red, black, and white colored)
11. small amount of 22AWG solid hookup wire
12. 2 12-LED NeoPixel rings, I got these from adafruit.com: http://www.adafruit.com/product/1643
13. Arduino UNO: https://www.sparkfun.com/products/11021
14. Arduino enclosure box: https://www.sparkfun.com/products/12839
15. battery holder: http://www.amazon.com/gp/product/B000LFVFU8/ref=oh_aui_search_detailpage?ie=UTF8&psc=1
16. battery clip: http://www.amazon.com/gp/product/B00BVVFDFO/ref=oh_aui_search_detailpage?ie=UTF8&psc=1
17. small push button, for example: http://www.amazon.com/Momentary-N-O-Push-Button-Switch/dp/B0002ZPB34/ref=sr_1_10?s=industrial&ie=UTF8&qid=1415561521&sr=1-10&keywords=button
18. 1 10K OHM resistor: https://www.sparkfun.com/products/11508
19. 6 AA batteries

You'll also need a wire stripper and cutter, hobby/utility knife, soldering iron, solder, and a PC or MAC to program the Arduino.

First make the eyes:

1. Cut the ping-pong ball in half.
2. Cut a hole in each half of the ping-pong ball a little smaller than the size of the plastic half-eyeballs
3. Use the sharpie marker to draw veins on the two ping-pong ball halves
4. put the ping-pong ball halfs over the two half-eyeballs (with something under the half-eyeballs to hold it up, I just put it on top of a spray can

cap
5. spread some Mod-Podge over the ping-pong ball and half-eyeballs, let it dry. This will glue them together
6. use the sharpie to extend the veins over the half-eyeballs up to their irises
7. put a couple more coats of Mod-Podge for strength (put some on the inside as well). Let each coat dry

Note that you could skip the plastic half-eyeballs, and just use ping-pong balls. IF you did this, you could just cut a small hole in the middle of the ping-pong ball for the eye pupil, use a color marker to draw the iris, and then draw the veins. Either way, you'll want to coat it with Mod-Podge to make it glossy.

Now wire-up the NeoPixel rings:

1. Cut 3-inch pieces of the 22AWG stranded hookup wire. You'll need 2 black pieces, 2 red pieces, and 1 white piece. Strip both ends of each wire
2. Solder one end of the two black wires to the GND connection on the two NeoPixel rings (insert the wire from the back of the ring, i.e. the side without the LEDs).
3. Solder one end of the two red wires to the 5V DC Power connection on the two NeoPixel rings (insert wire from the back).
4. Solder one end of the white wire to the Data Input connection of one of the NeoPixel rings. Solder the other end of the white wire to the Data Output of the other NeoPixel ring.
5. Cut 3 long pieces of the 22 AWG stranded hookup wire. You'll want these pieces to be long enough to go from the goggles, over the top of your head, down your back, and into your pocket. A little extra length is good to keep slack in the wires. Strip both ends of all 3 wires.
6. Twist together the second end of the two short black wires from above with one end of the long black wire. Solder these together, then wrap them with a bit of black electrical tape.
7. Twist together the second end of the two short red wires from above with one end of the long red wire. Solder these together, then wrap

them with a bit of black electrical tape.
8. Solder one end of the long white wire to the Data Input connection of the second NeoPixel ring (this is the ring that has the short white wire soldered to its Data Output connection)

Assemble the goggles:

1. Place the two eyes you made earlier over the two NeoPixel rings, with the LED side of the rings inside the eyes. Put a few small dabs of silicone glue around the edges to hold the rings in the eyes. Let this dry.
2. Put the two eyes into the cups of the goggles. Put a few blobs of silicone glue around the eyes to hold them in the goggle cups. Let this dry.
3. Use pieces of electrical tape to wrap and secure the wires from the NeoPixel rings. You want to have the wires running to the middle of the goggles, between the two eye cups. You should end up with the 3 long wires (one black, one red, and one white) hanging from the middle of the goggles.
4. Stretch out the 3 long pieces of wire, and use pieces of electrical tape to hold them together
5. Cut some pieces of black fabric, and use the hot glue gun to glue them to the back side of the goggle eye cups. You're basically trying to cover the back of the cups to prevent light from leaking around the back side of the goggles, and to cover over the wiring.
6. Cut another piece of black fabric, around 12 inches long. Wrap it around the wiring coming from the goggles, and use the hot glue gun to secure it in place. This part will go over the top of your head while wearing the goggles.

Now you can wire up the Arduino.

1. Put the Arduino into the bottom half of its case. It should snap into place.
2. Cut a hole in the top of the case to mount the push button, insert the button and secure it.

3. Cut 3 pieces of the 22AWG solid hookup wire, strip both ends of each piece.
4. Solder one end of the 10K OHM Resistor and one end of one of the first hookup wire to one of the push button switch terminals
5. Solder one end of the second hookup wire to the other end of the 10K Ohm Resistor
6. Solder the third hookup wire to the second terminal of the push button.
7. Insert the other end of the first hookup wire (the one from step 4 above) into pin 8 of the Arduino.
8. Insert the other end of the second hookup wire (from step 5 above) into one of the GND pins of the Arduino.
9. Insert the other end of the third hookup wire (step 6 above) into the 3.3V pin of the Arduino.
10. Cut 3 more short pieces of the 22AWG sold hookup wire, strip both ends of each piece.
11. Solder one end of each of those 3 pieces to the ends of the 3 wires from the goggles (the red, black, and white wires). Run these wires through the top of the Arduino case (there is a slot in the top of the case).
12. Insert the black wire from the goggles into one of the GND pins of the Arduino
13. Insert the red wire from the goggles into the 5V pin of the Arduino
14. Insert the white wire from the goggles into pin 12 of the Arduino.
15. Snap the Arduino case together.
16. At this point, you'll want to program the Arduino and make sure everything is working. Once you have it working, you'll want to secure the wiring to the Arduino case. I just wrapped it with a bunch of electrical tape.

Now program the Arduino:

1. Download and install the Arduino IDE software (current version when I wrote this is 1.0.6): http://arduino.cc/en/Main/Software#toc1
2. Download and install the NeoPixel library from github. Go to https://github.com/adafruit/Adafruit_NeoPixel, and click on the Download ZIP button on the right. Unpack the ZIP file, and follow the

instructions on the github web page to install. Basically you have to rename the folder, and copy that folder into the Arduino IDE library folder.

3. Download the goggles Arduino sketch from github. Got to https://github.com/dblapps/PulsingGoggles, click on the Download ZIP button on the right. Unpack the ZIP file.
4. Plug a USB type A cable into the Arduino, and into a USB port on your PC or MAC.
5. Launch the Arduino IDE. Load the sketch you downloaded in step 3 (click on the File → Open menu item, find the sketch and open it)
6. Select Tools → Board from the IDE menu, and select the type of Arduino you are using (Arduino UNO if you are using the same thing I used)
7. Select Tools → Serial Port from the IDE menu, and choose the appropriate port for your Arduino (just play around until you get the right one)
8. Hit the Upload button in the IDE toolbar (the round button with an arrow pointing to the right). This should upload the sketch to your Arduino. You should then see the eyes light up and start pulsing.
9. Clicking the button should make the eyes fade in or out.

Once you have it working, unplug the USB cable from the Arduino. Put 6 AA batteries in the battery holder, connect a battery clip to the battery holder, and plug it into the power plug on the Arduino.

Put them on and go scare somebody!