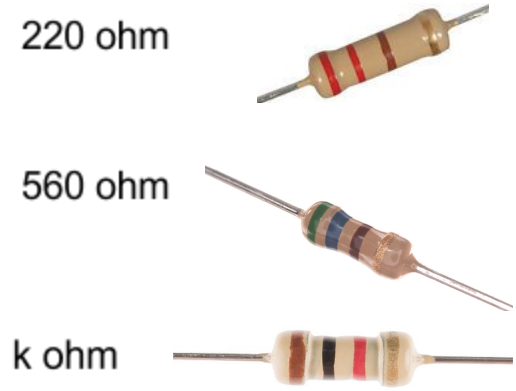
Halloween Workshop 2017:
Make Your Own Box Monster

If you and your group have any questions, or get stuck as you work through this in-class exercise, please ask the instructor for assistance. Have fun!

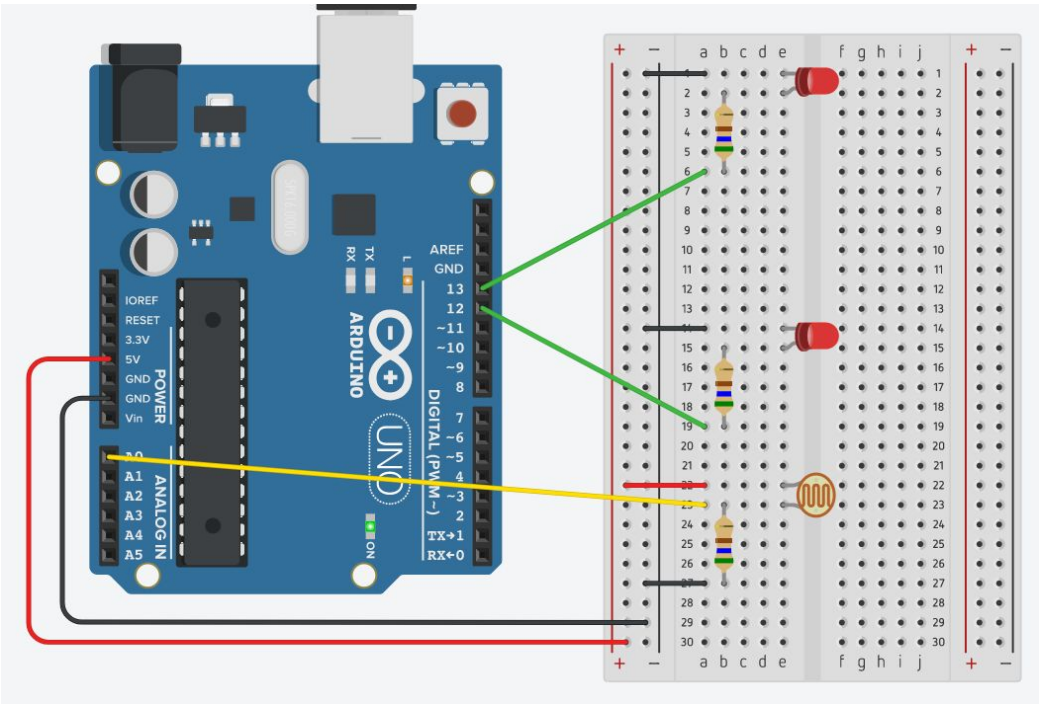
If you haven't already, please go to the Arduino website and download the "Arduino IDE" for either Windows or Mac: https://www.arduino.cc/en/Main/Software and then install the software on your computer.

Materials needed:

a. 2 RGB LED lights (we will set the colour later)
b. A shoebox
c. 1 220-ohm (220Ω) or 560-ohm (560Ω) resistor
d. 6 1kΩ resistors (brown black red gold)
e. 7 jumper wires total: at least 2 of them should be long
f. 4 alligator clips
g. 2 ping pong balls
h. A craft knife
i. 1 8-ohm speaker



Connect the components as shown in this diagram (except for the speaker—we'll come back to it later!):



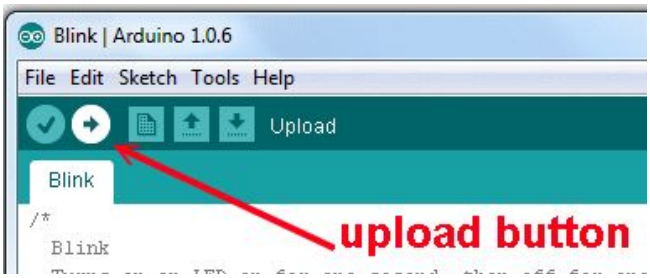
1. Using the provided USB cable plug your Arduino into your computer.

2. Launch the Arduino software (the "IDE").

3. Go to https://goo.gl/33Zugo. Open Arduino and copy/paste the code into a new program (called a "sketch")

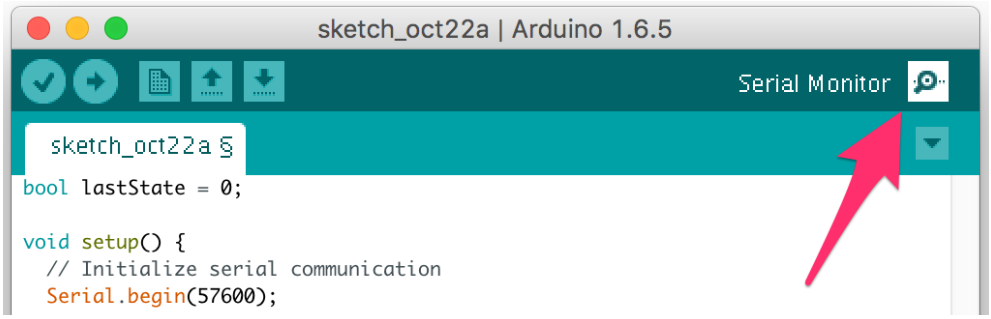
4. We're almost done setting up! Under **Tools > Board, select "Arduino Uno."**
    a. If you have a Mac, go to **Tools > Port and select one that starts with /dev/tty.usbmodem or /dev/cu.usbmodem** (either one should work).
    b. If you have a PC, go to **Tools > Port and select the COM port that ends with "(Arduino Uno)"**

5. Click the "Upload" button (the right arrow in the top left corner).



6. Make sure the LEDs are on. When you place your finger on the photoresistor, the LEDs should turn off and then come on again when you move it away.

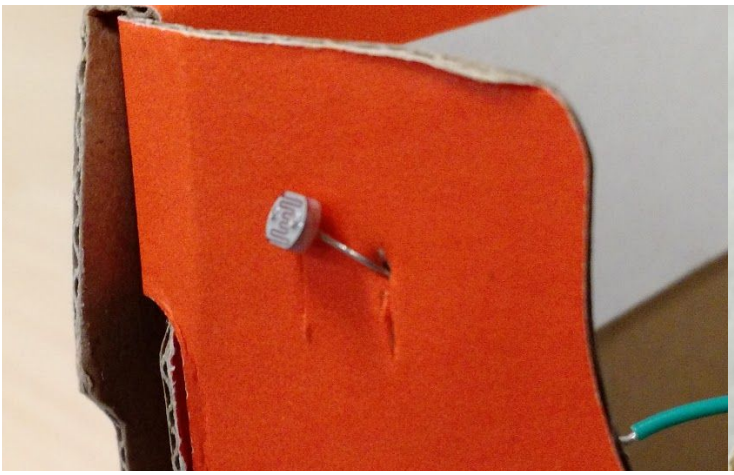
7. Click on the serial monitor icon (see image below). You should see numbers between 0-1023 flying by in the pop-up window. These represent how much light the sensor detects at a given moment. The number should get smaller when you bring your finger closer to the photoresistor and hit 0 when it is completely covered.

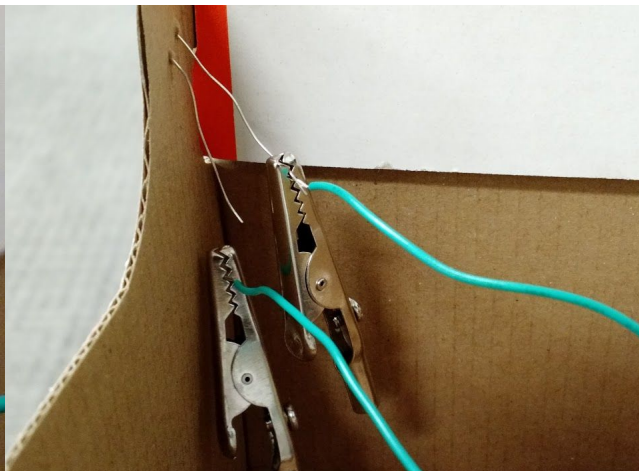


8. Now we will insert the LEDs into your ping pong ball "eyes." Cut some slits in the ping pong balls with the craft knife. I cut an X into the side of the ping pong ball (with the pupil facing up; if there's no pupil, you can draw one with a black sharpie). Take out the LEDs and insert each one into a ping pong ball. Stick the LED legs back into the breadboard in their original position.

9. Take the photoresistor out of the breadboard. We want to detect when the box is open so we want to place it somewhere it will be covered when the box is closed. Cut two slits into the box

under the lip of the lid and stick the photoresistor legs through each slit. Using two alligator clips,clip each leg of the photoresistor to a jumper wire. Then plug each end of the jumper wire into the spots where the photoresistor legs used to be.





10. Test the box monster by closing and opening the lid.

11. You did it—congratulations!

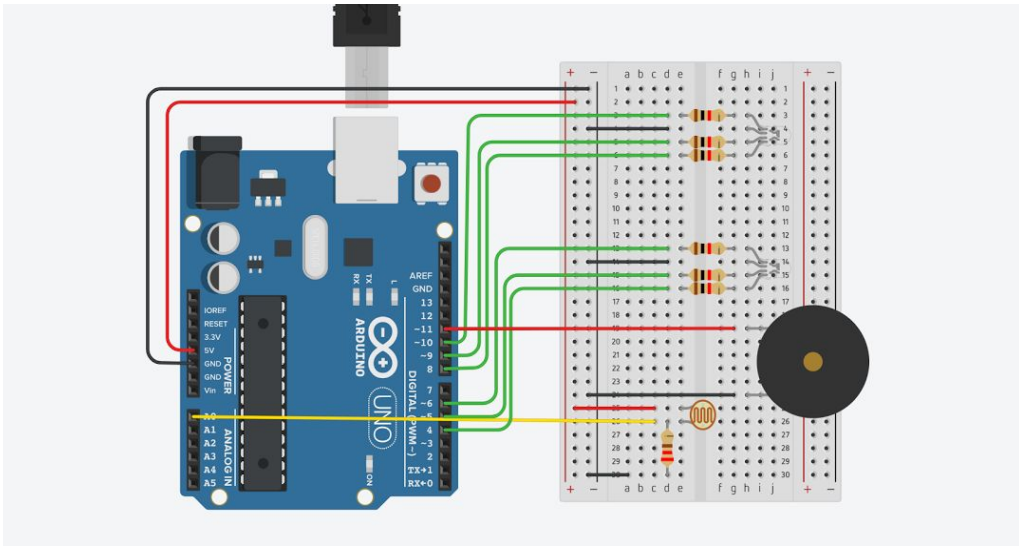
Optional: change the colour of the monster eyes by changing the values in setColor(). For instance, (0, 0, 255) would turn the eyes blue. For more options, google “rgb color picker.” Once you’ve picked a colour you like, replace the 3 numbers in setColor() with the three values inside rgb().

Another option: how could we get the eye colours to change into or cycle through more than one colour? Go to goo.gl/BahchB and see if you can figure it out! (We’re happy to help as well.)

Now let’s add some sound!

Adding a Spooky Noise

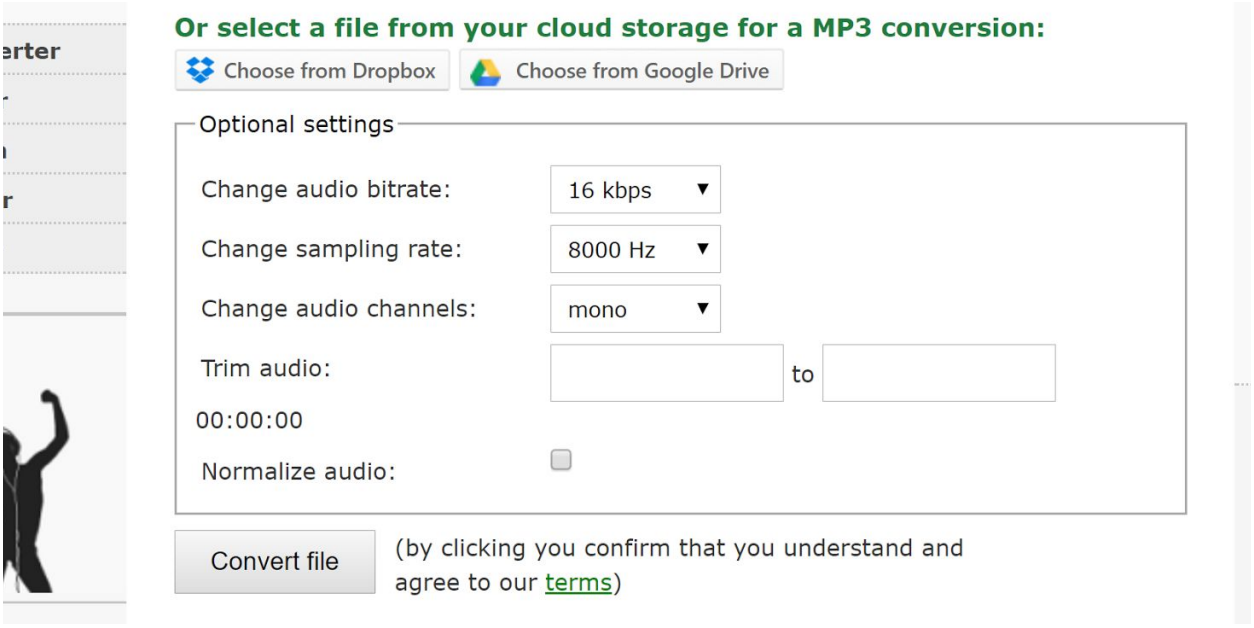
1. Using the remaining 2 alligator clips, connect jumper cables to the red and black wires. Connect the red wire to Pin 11 and the black wire to GND (ground).



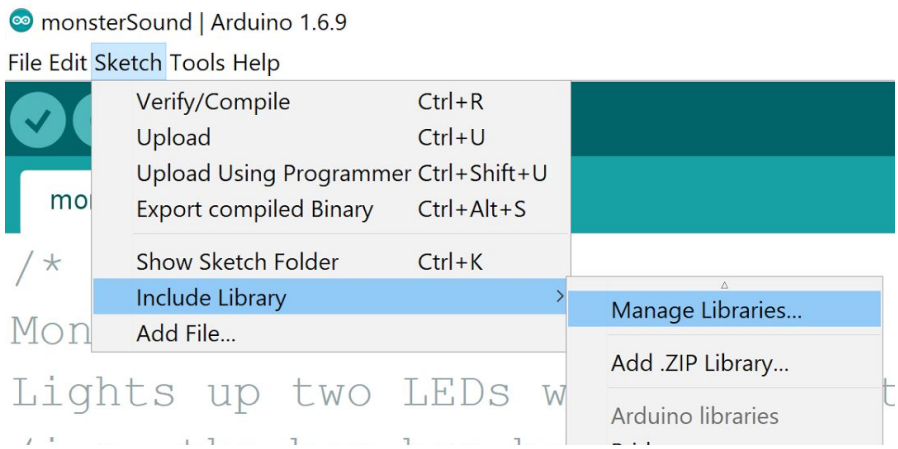
Note: For illustration purposes, the piezo (black circle) represents the speaker. The speaker we're using doesn't have legs.

2. Find a (short) sound file for your monster. For example, you can go to freesoundeffects.com and download a suitably spooky sound. **The sound file should not be longer than 4 seconds** (poor Arduino can't handle that large a file on its own).

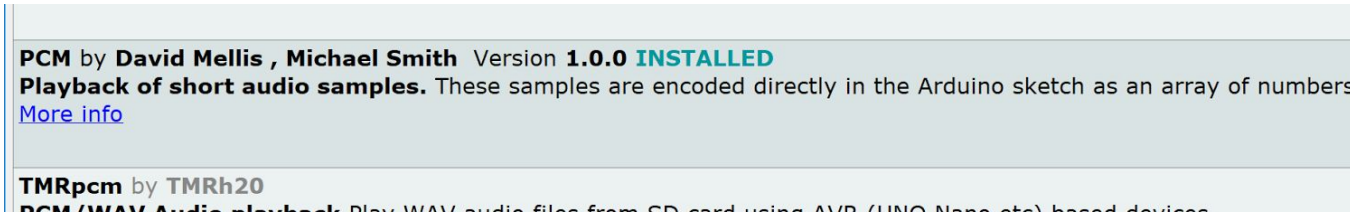
3. Go to audio.online-convert.com/convert-to-mp3. Upload your file and use the settings pictured (on the next page). Download the converted file.



4. Now we need to download the PCM library for Arduino. A “library” in this context means a collection of files and/or instructions that we can point Arduino to. In the Arduino program, go to Sketch > Include Library > Manage Libraries.

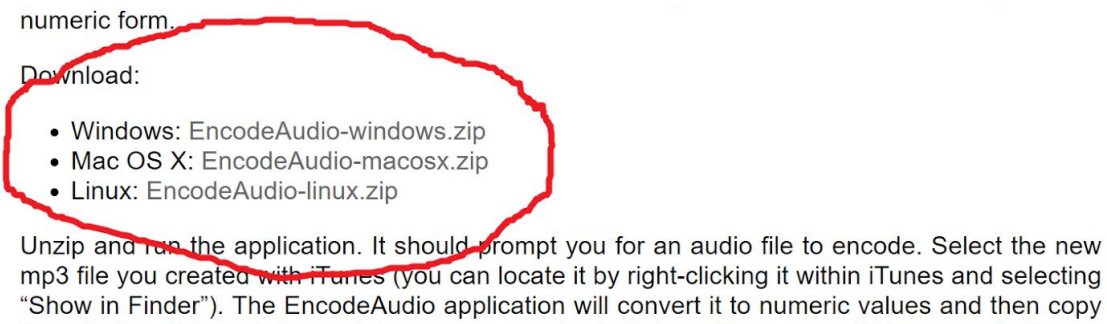


5. Search for “PCM.” One of the results should be “PCM by David Mellas, Michael Smith.” Click on it. Then click on the tiny box in the bottom right corner that says “Install.” After you do this, you will need to reboot Arduino (close the program and then restart it).



6. Go to https://goo.gl/D2HQNm and copy/paste as before. Make sure to replace *all* of the code in the window with the new code!

7. Go to goo.gl/FguCKz and download the EncodeAudio program below. (Note: you will need to have java installed to run this.) This program will translate the audio file into numbers Arduino can read and play through the speaker.


numeric form.

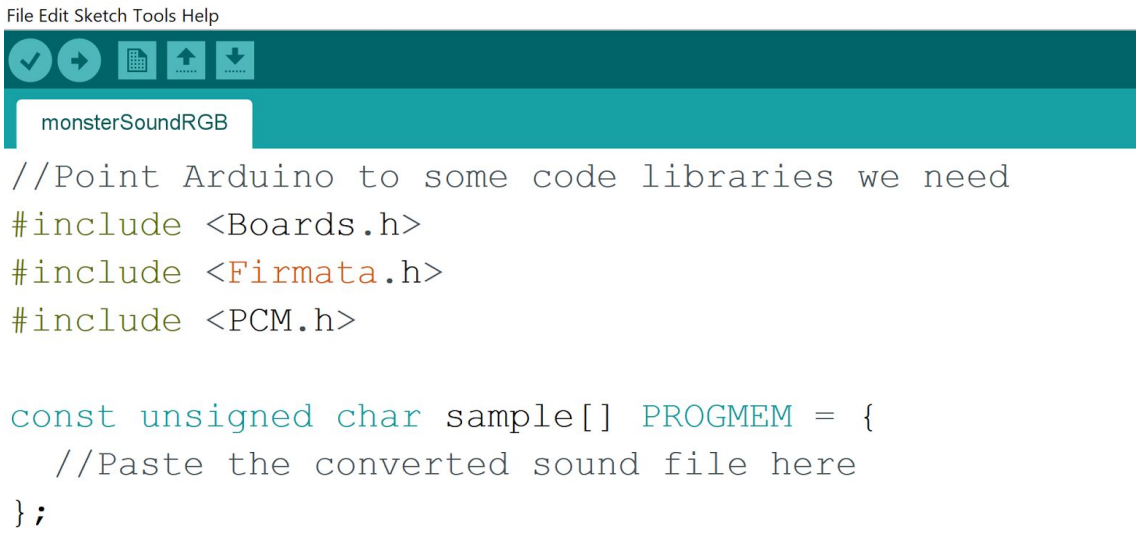
Download:

- Windows: EncodeAudio-windows.zip
- Mac OS X: EncodeAudio-macosx.zip
- Linux: EncodeAudio-linux.zip

Unzip and run the application. It should prompt you for an audio file to encode. Select the new mp3 file you created with iTunes (you can locate it by right-clicking it within iTunes and selecting "Show in Finder"). The EncodeAudio application will convert it to numeric values and then copy

8. When you run the EncodeAudio program, it will ask you to select a file. Select your converted audio file. After you select it, the program will tell you the numbers have been saved to the clipboard.

9. Paste the code between the curly brackets after `const unsigned char sample[] PROGMEM`



10. Upload the sketch to the Arduino board.

11. Decorate the monster and/or box as desired. Have fun!

Note: Feel free to keep the box! If you would like to borrow the Arduino, breadboard, and other components, they can be signed out for a week at a time at the Music and Media desk on the 1st floor (Ask us for more details).