



Create a musical instrument with Arduino

Some sensors and a little imagination !

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Arduino ?? What is it ?

- It's a little blue card with a chip into you can put YOUR program
- It has PINS for connecting electronic parts
- There are two categories of parts
 - Sensors (temperature, luminosity, ...)
 - Actuators, like LEDs, motors, etc ...



Arduino ?? What is it ?

- Why two categories of parts :
 - Sensors convert 'something' to electrical power
 - Actuators convert electrical power to 'something'
- Its the program that controls the parts

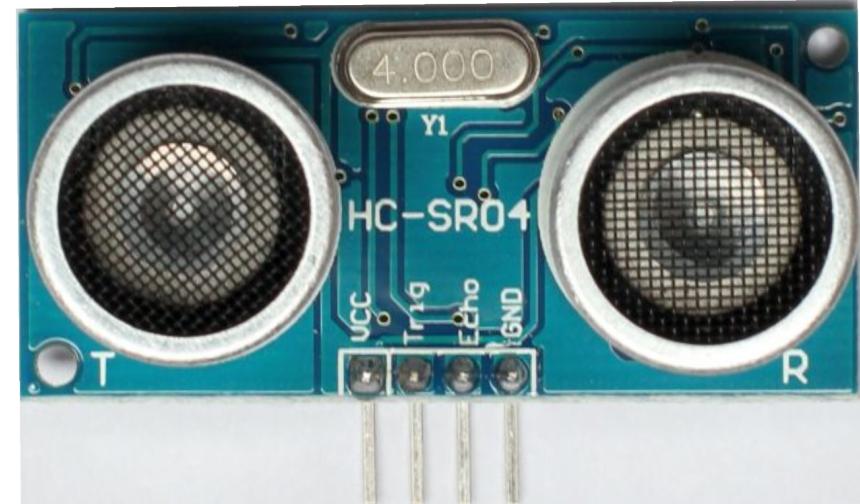


The project

- Creation of a musical instrument
 - No need to blow air into it
 - Less lung-tiring and skill demanding than a trumpet
 - No chords either
 - Thus doesn't hurt the fingers
- Clearly two major advantages
- Have you heard (about) Jean-Michel Jarre ? (contemporary French musician)

The project's principles

- Not numerous and simples :
- Distance sensors mesure distances.
-
- Its that thing
- with two eyes →
- (looking at you)
-
- Cheap, around 2€
- Per unit



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- **The program defines distance intervals.
At first, two intervals.**

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- Distance sensors mesure distances.
- The program defines distance intervals. At first, two intervals.
- Each interval will represent a key
- Thus, we will have two keys per sensor
- **The first from 0 to 30 cm, the second from 30 to 60 centimeters**

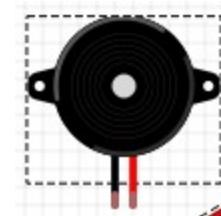


The result

- Ok, its not really the Arduino that will play the music. By design it is not capable of playing music.
- So we will add a buzzer :) ! (piezzo)

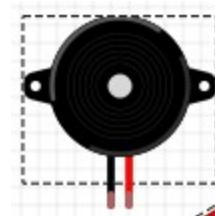
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- A buzzer looks like that -->
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The result

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- A buzzer looks like that -->
-
- Also the keys will be sent to the console (do you know Serial.print?)





The result that you will get today

- Will be **one** possible result .
- You'll can change the setup to do something else
- Hack, dicover, collaborate
- Make it better
- Don't be afraid
- Learn, share

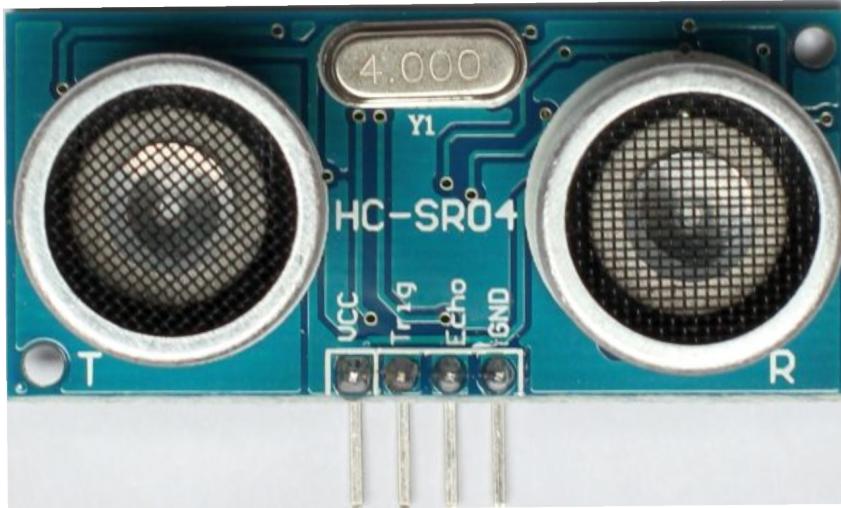
The parts (1/2)

- As the setup is quite simple, only a few parts will be necessary
-
- Parts from the starter kit :
 - Arduino Uno
 - breadboard
 - Wires (red is +, black is -)
 - Pins
 - Jumper wires
 - USB cable
-

The parts (2/2)

- Additionnal parts :
 - 4 sensors (reference HC-SR04) (the same used to create robots)
 - MORE wires (4 x 4 colours)
 - thus 16 wires !

The HC-SR04 sensor



- Sends/receives ultra-sounds
- Four are needed for the project.

- In fact, it measures distances by measuring the time used by the ultra-sounds to come back.

The wires



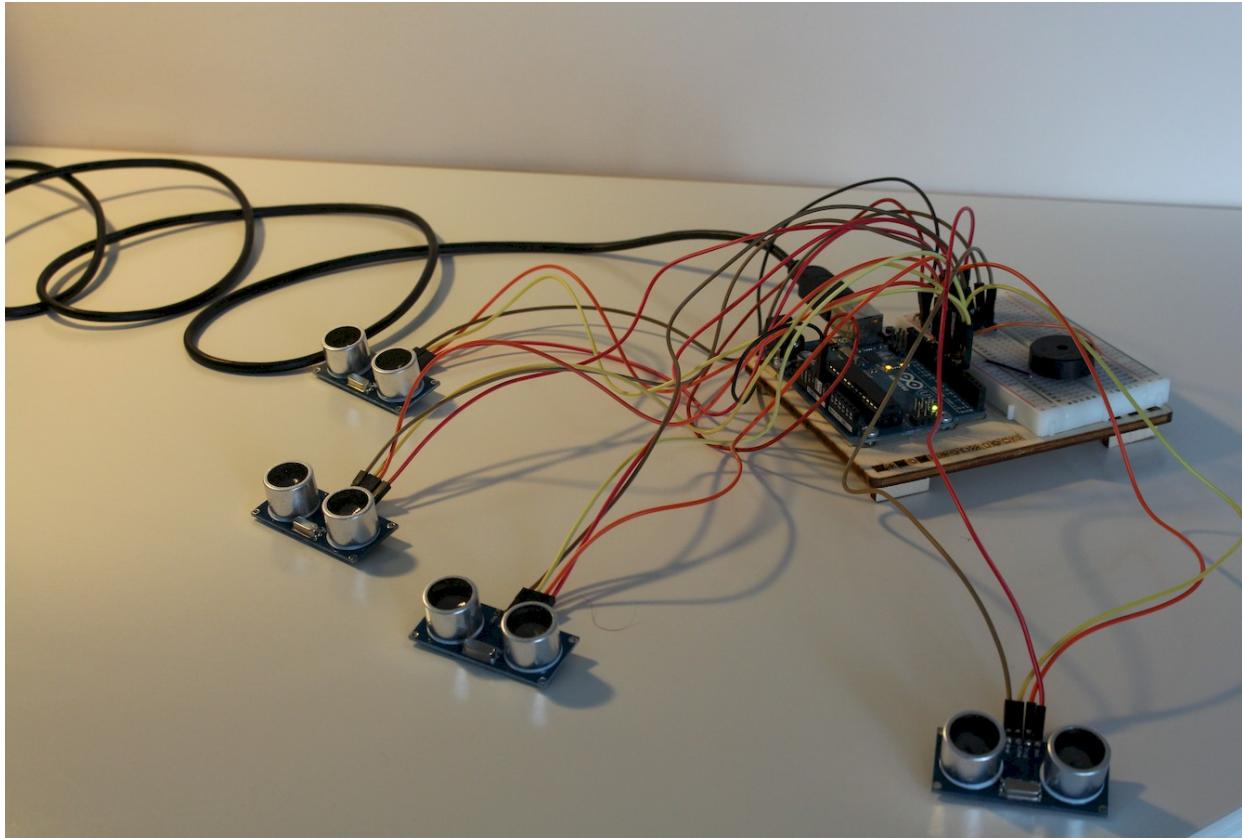
- I used those wires
- They need pins like this to connect into the sockets of the Arduino



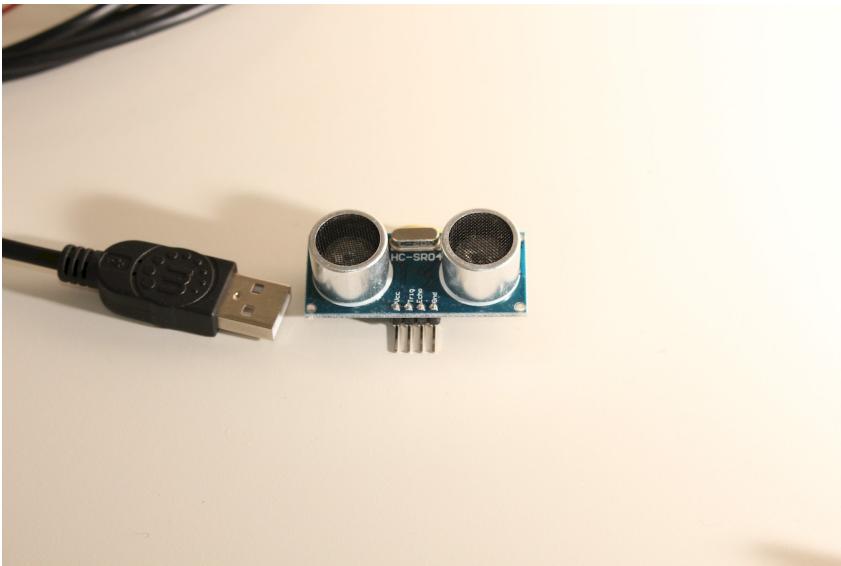


Let's start !

The result will be



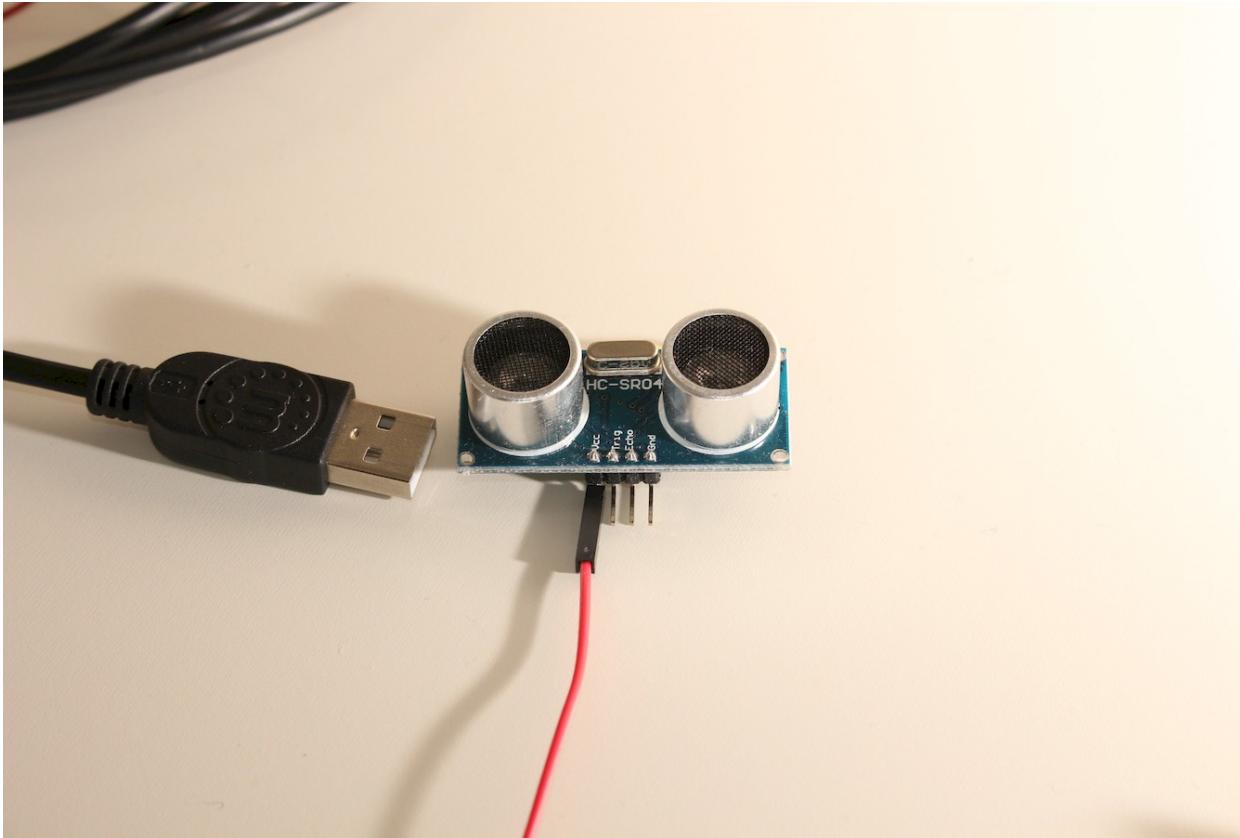
Wiring a sensor



- Hey, dont plug a USB !
- LOL :)
- We'll need four wires of different colors. I used
 - Red
 - Orange
 - Jaune
 - and Maroon

Colors are not important (except the red), what's important is to have four sets of four different colors (16 wires)

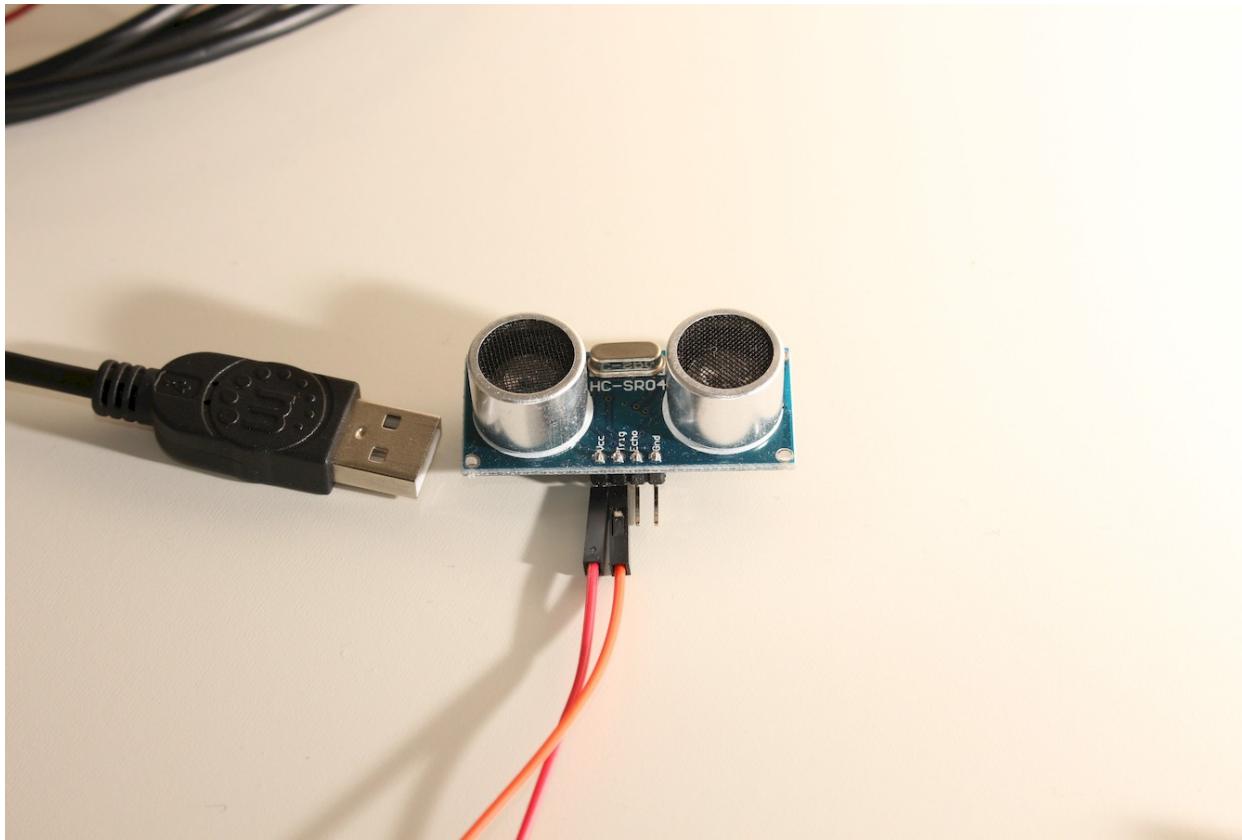
Red on « Vcc »



Apply the tradition to use a red wire for +positive

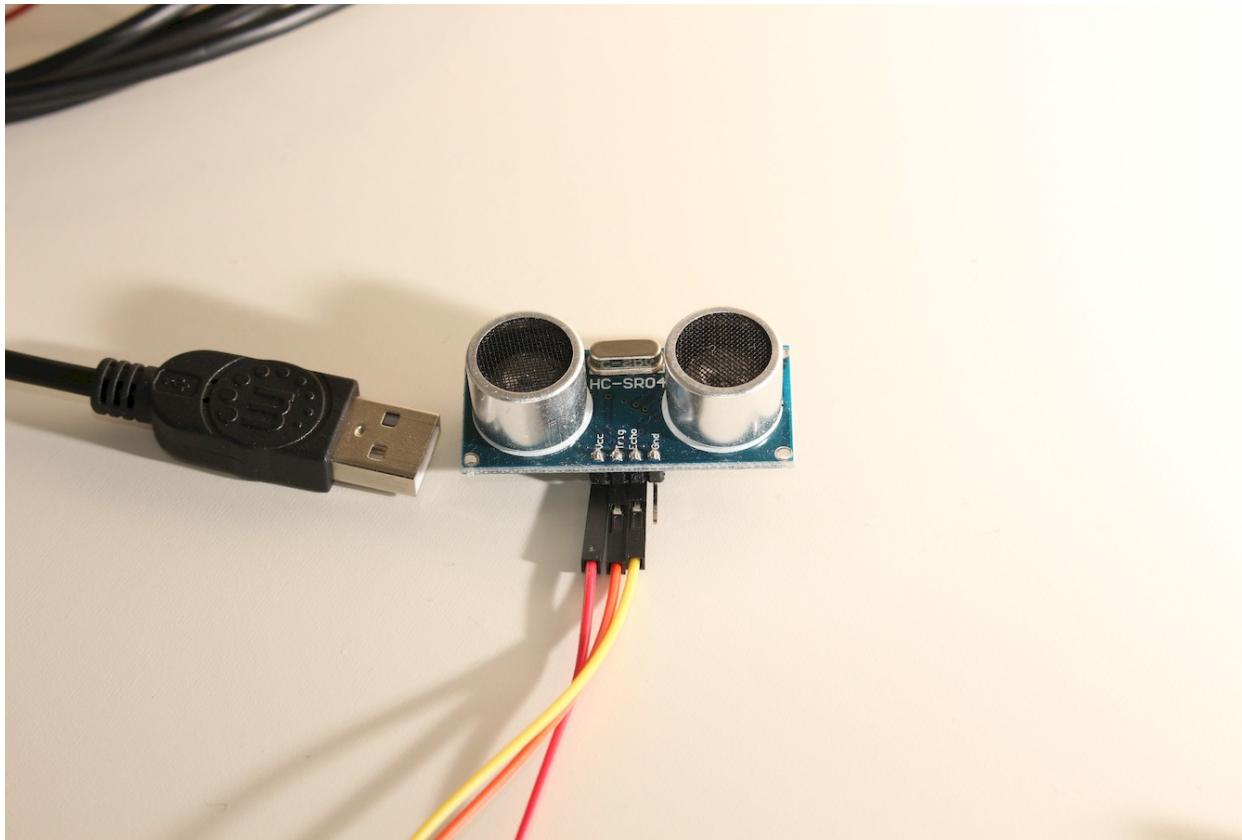


Orange on « Trig »



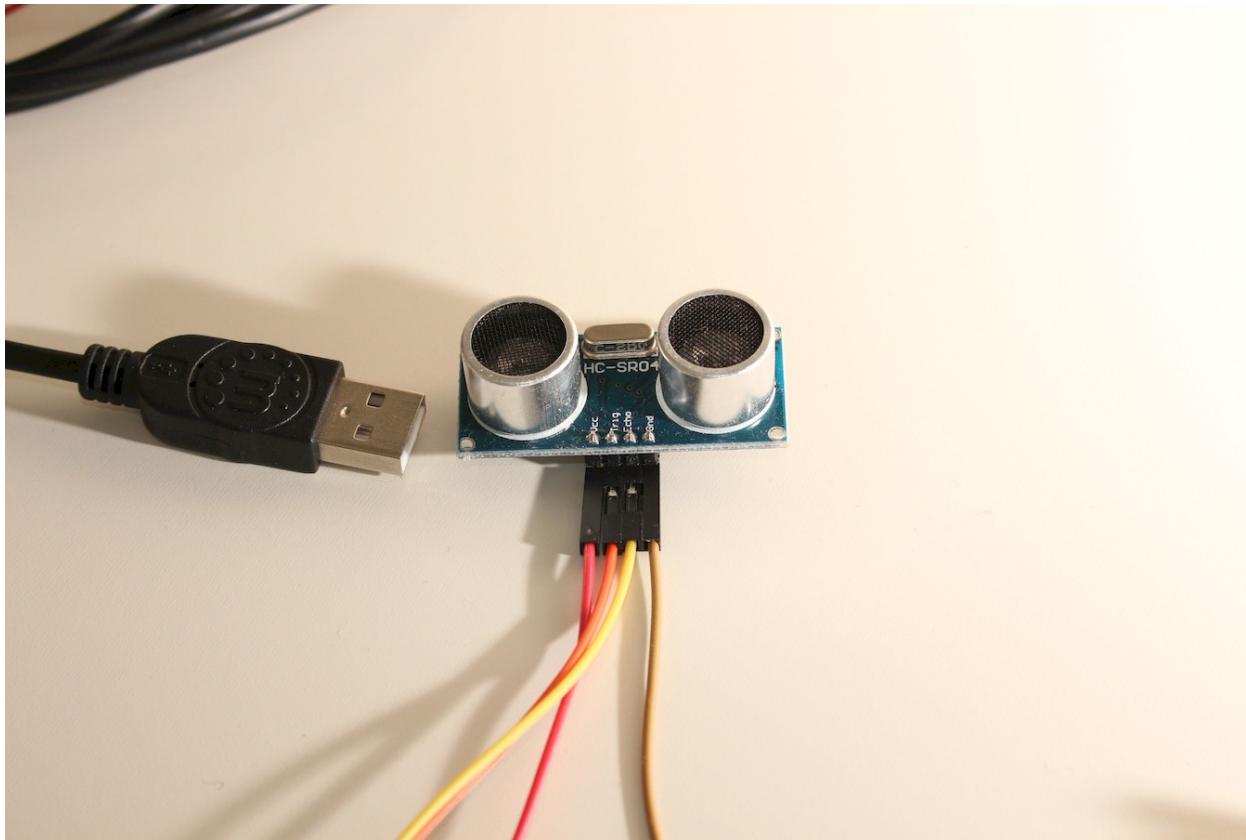


Yellow on « Echo »



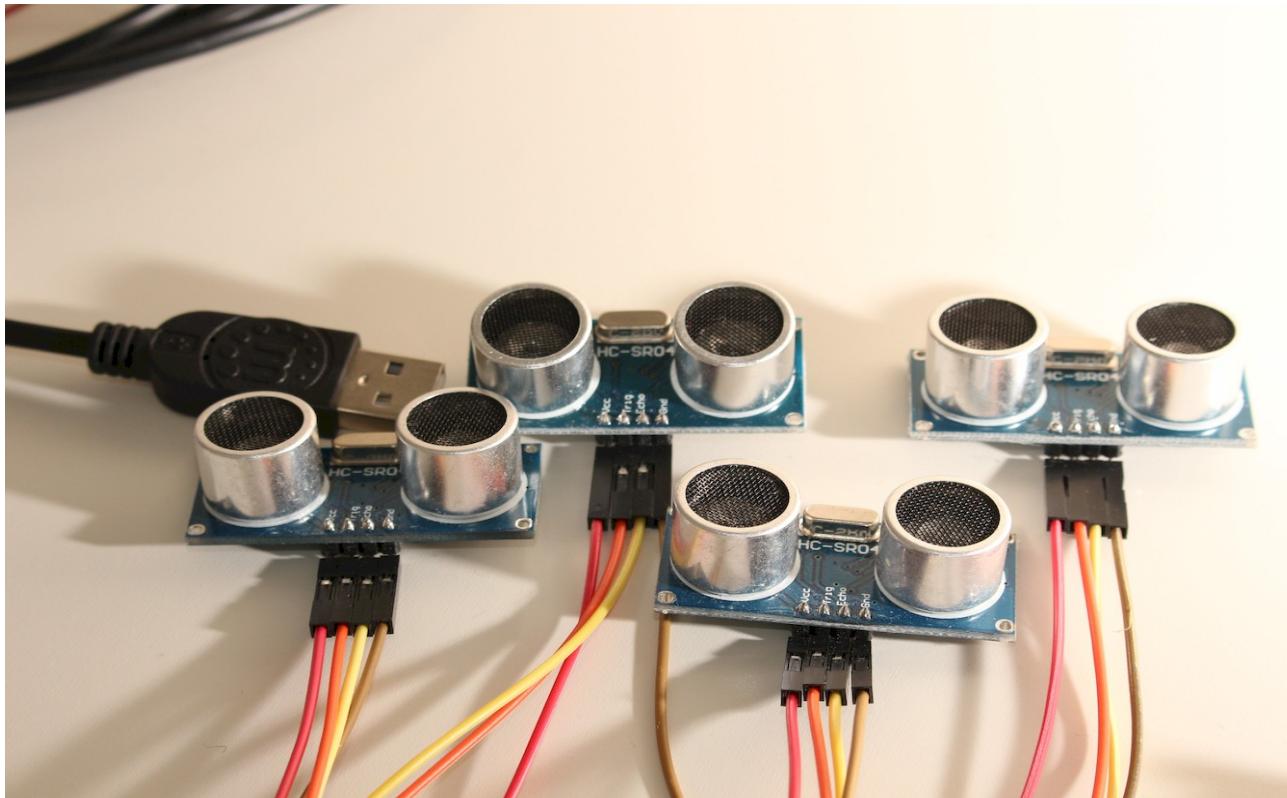


Maroon on « Gnd »

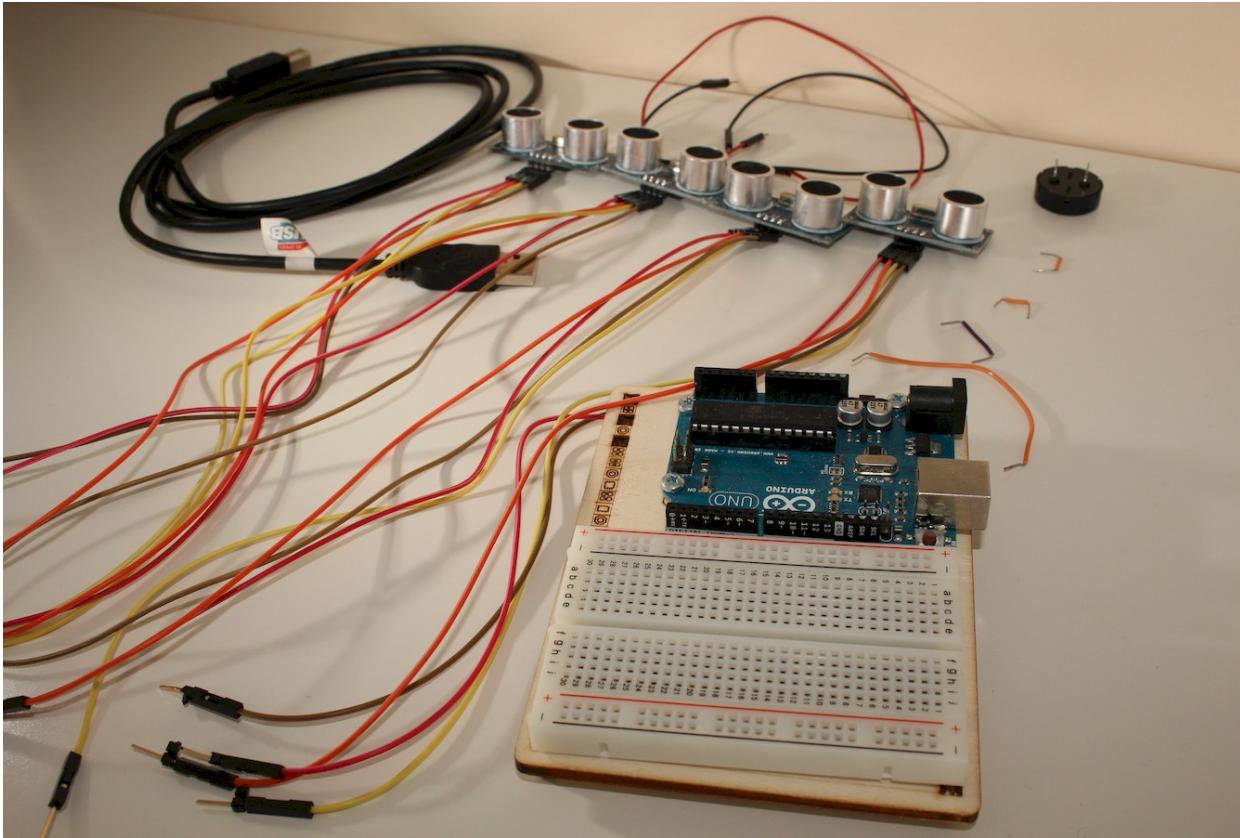


Well Done !

- Remember you need four ? :)



Here is what we have



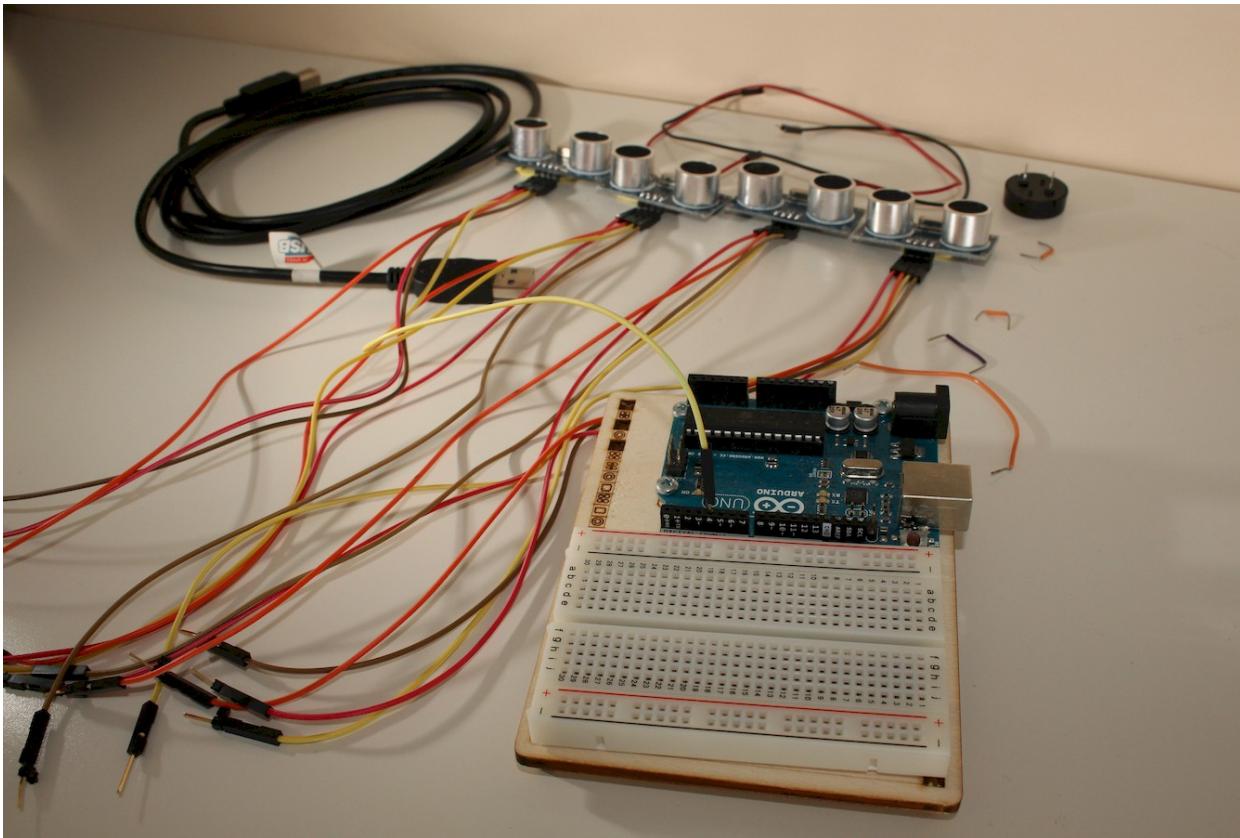
Its all the parts we will use



It's gonna connect

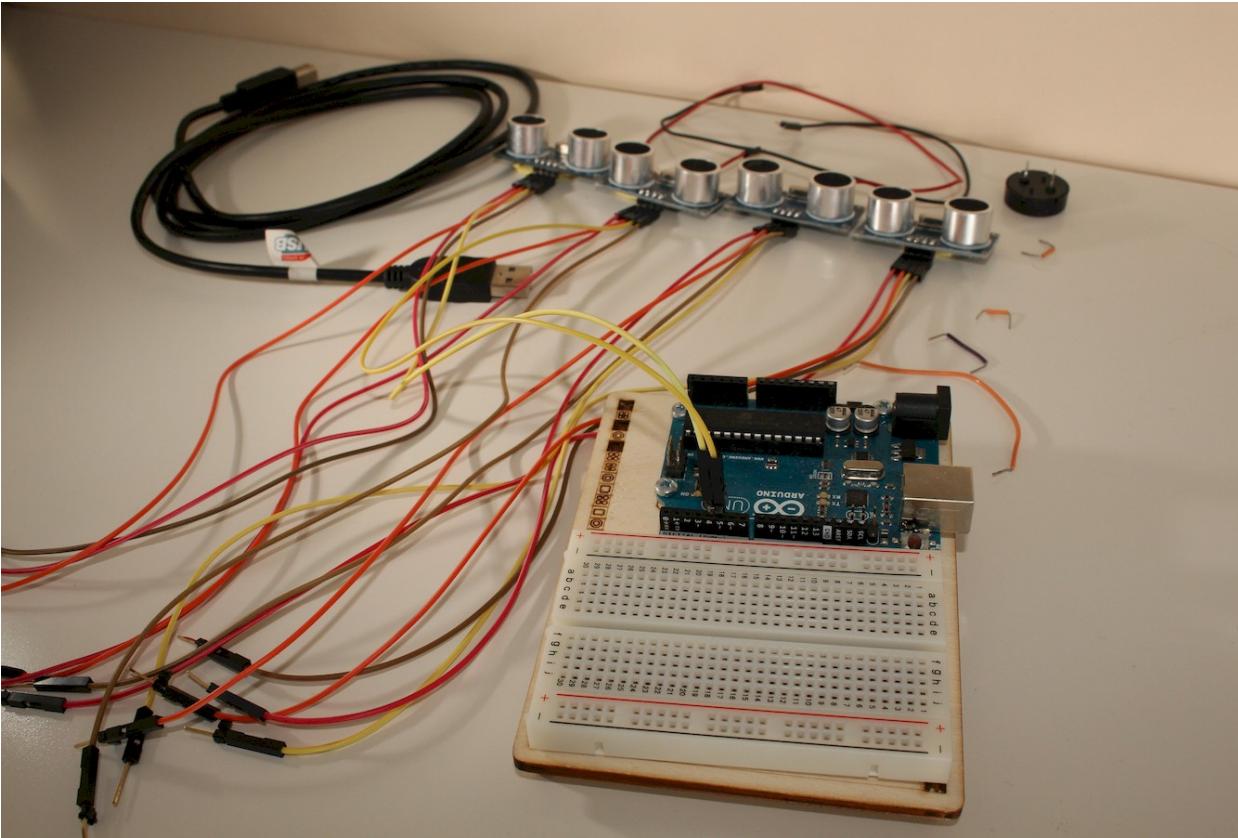
- We will start with the yellow wires
- For each sensor, we will connect the yellow wire in the corresponding socket.
- First goes into socket 4, second in socket 5 (S5), third in S6, fourth in S7

Let's do it one sensor after another, from left to right



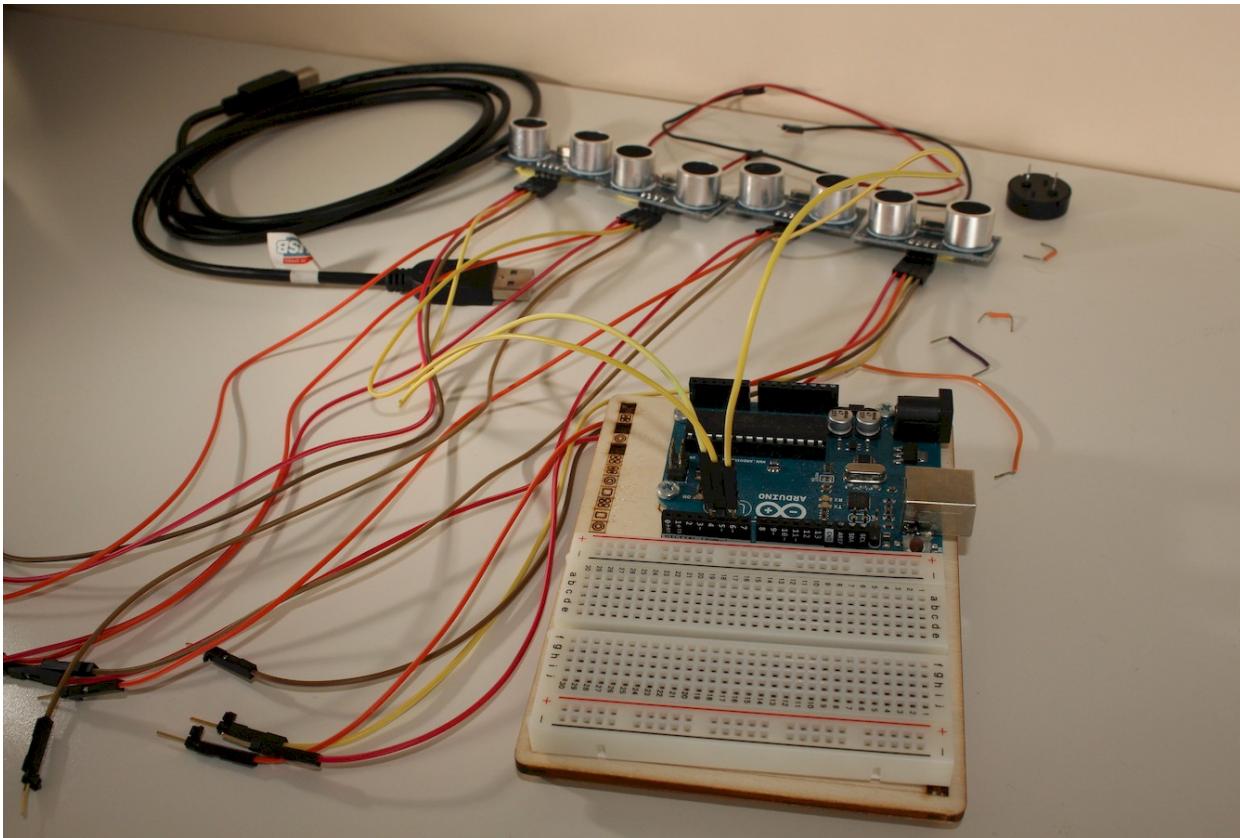
The yellow wire of the first sensor goes into socket 4

2nd sensor, 2nd wire



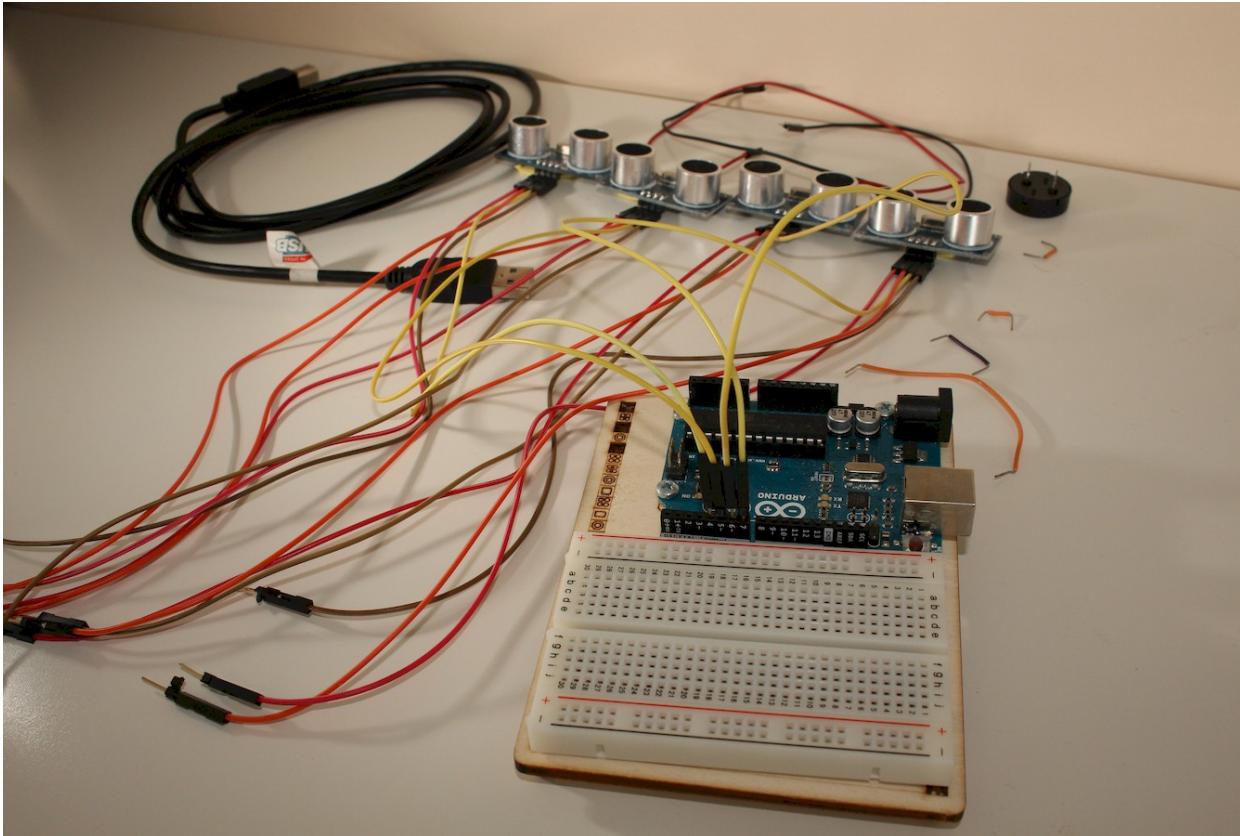
Socket n°5

3rd sensor, 3rd wire



Socket n°6

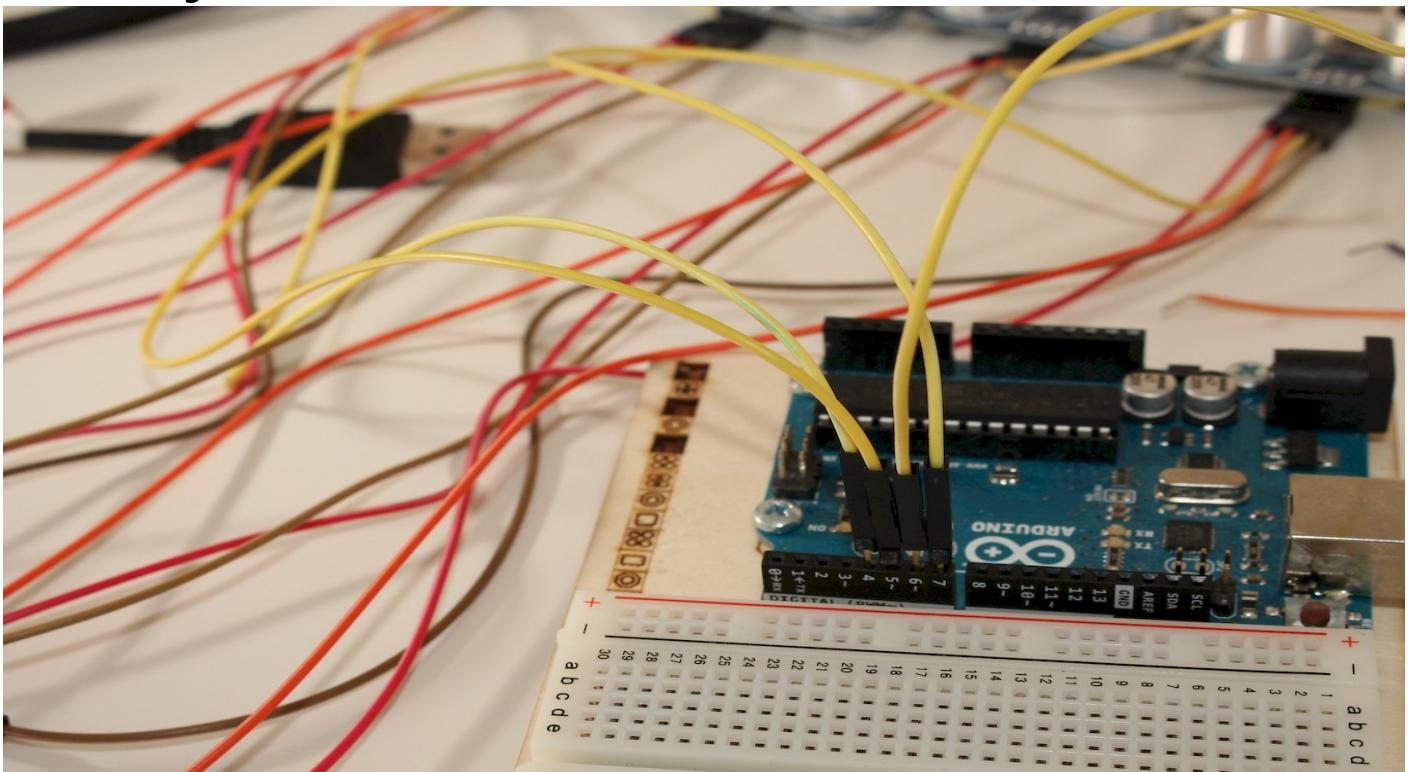
4th sensor, 4th wire



Socket n°7

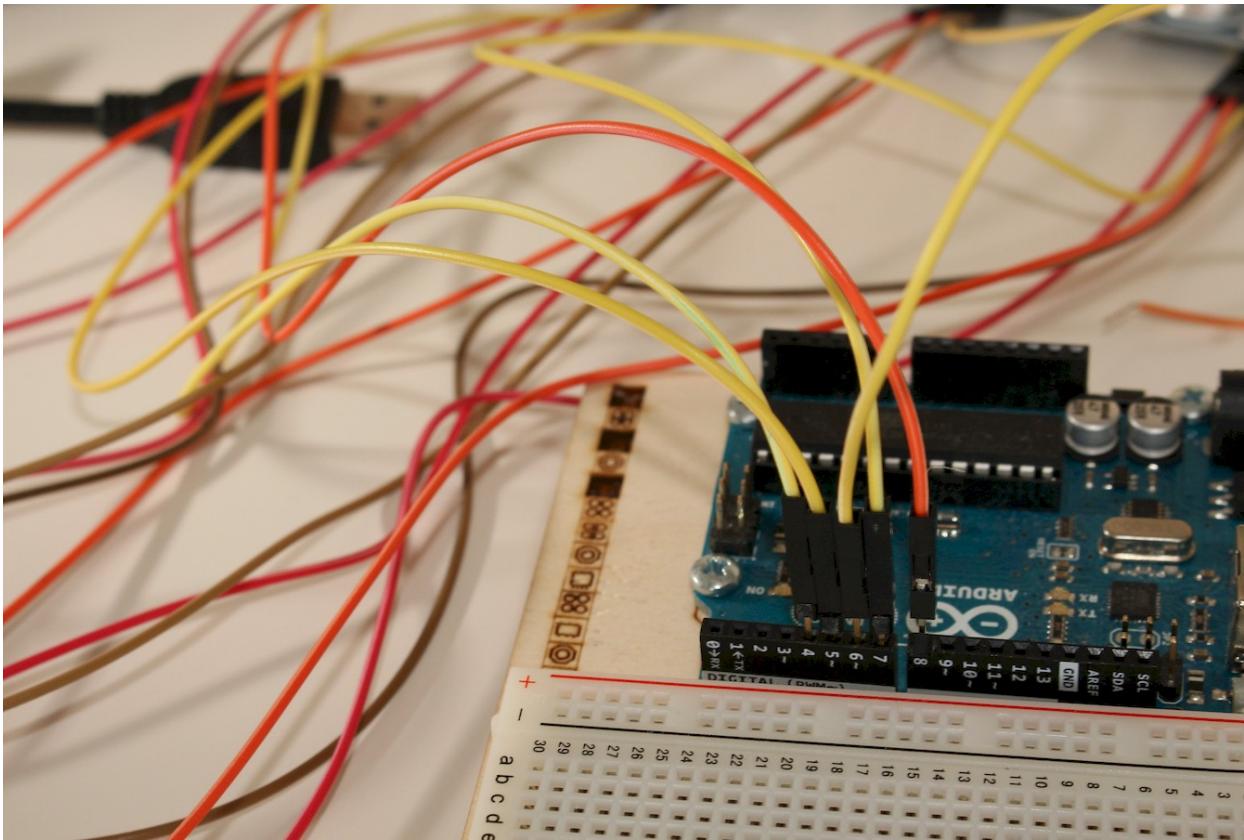
Good job !

- Over for the yellow wires!

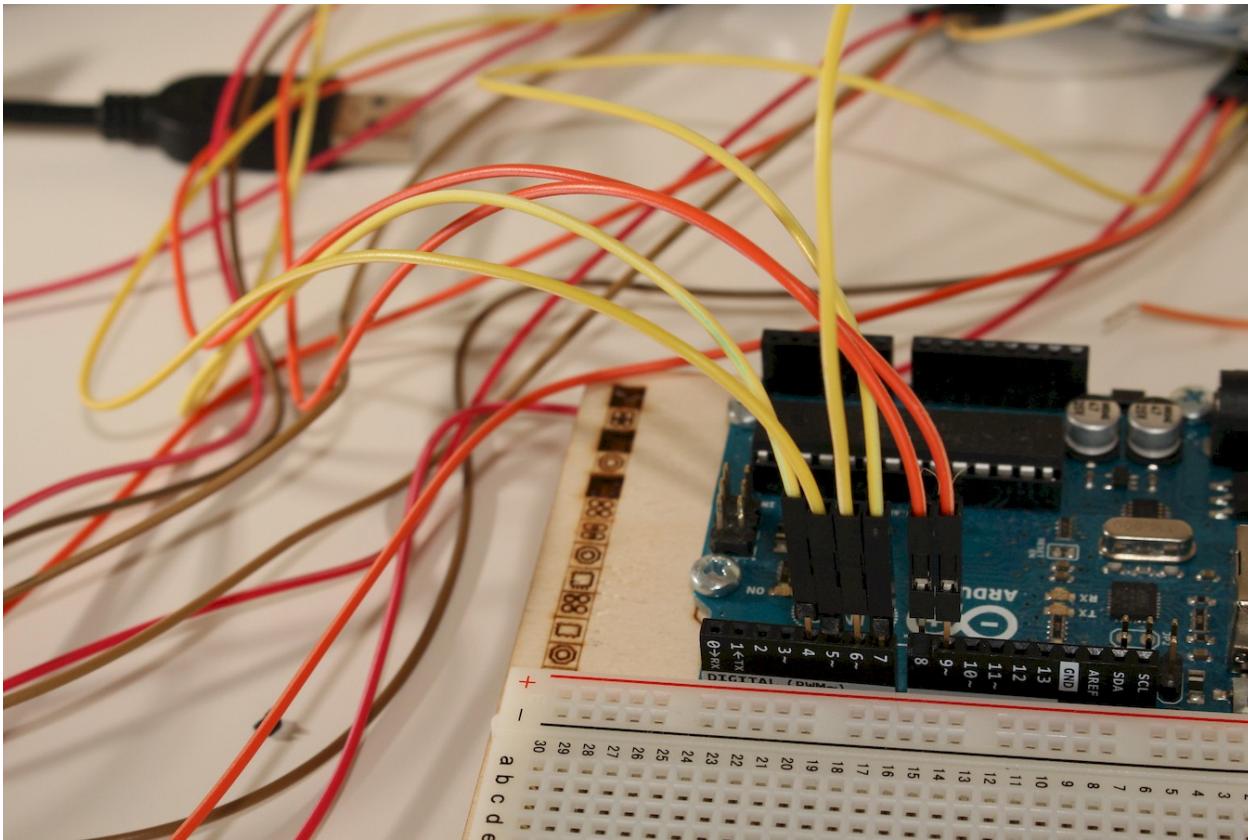


Now, the oranges !

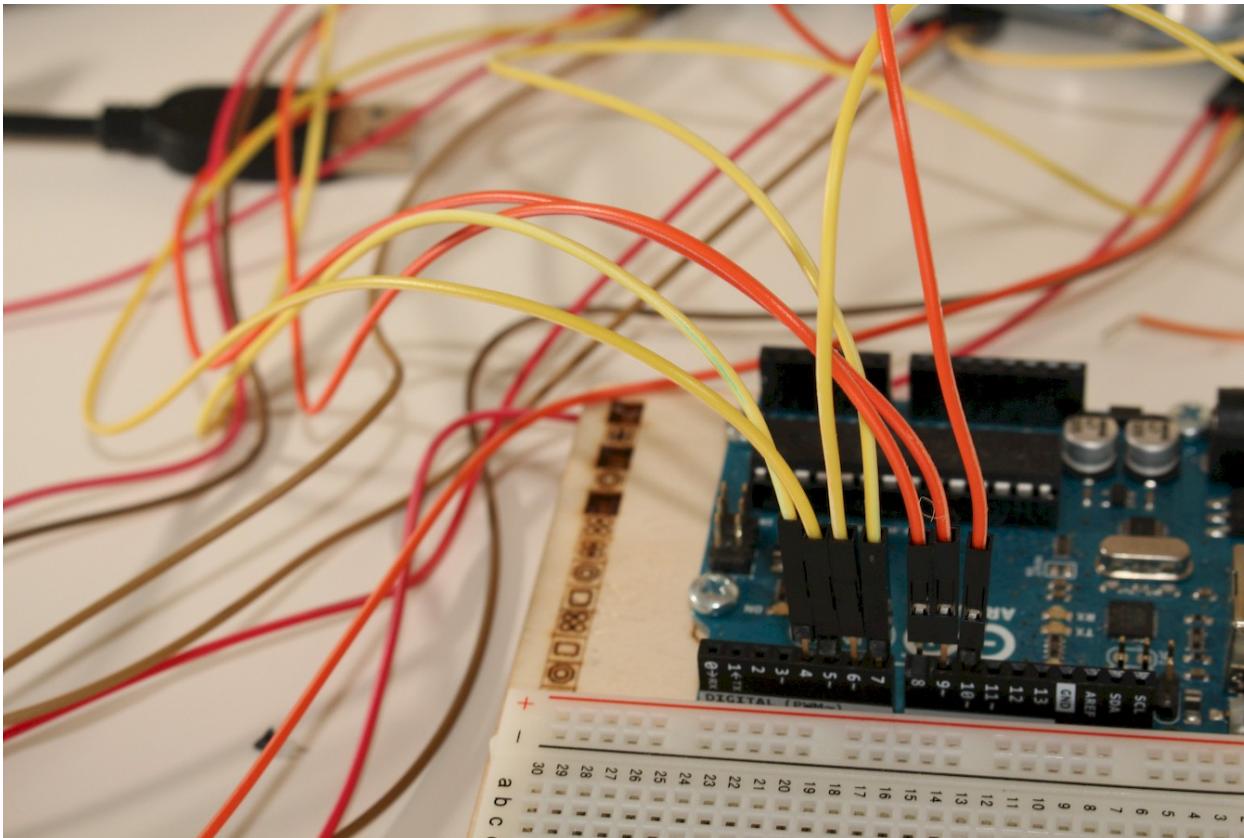
Orange 1 in 8



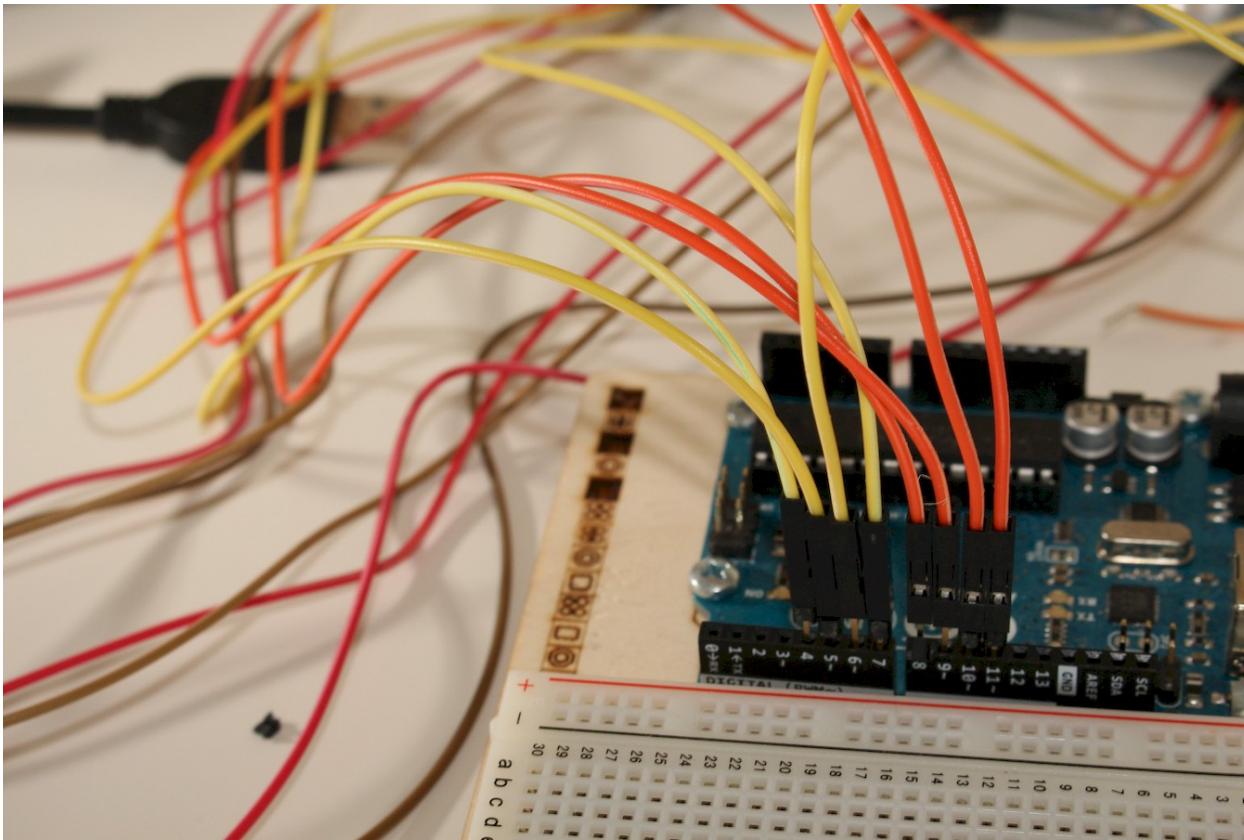
Orange 2 in 9



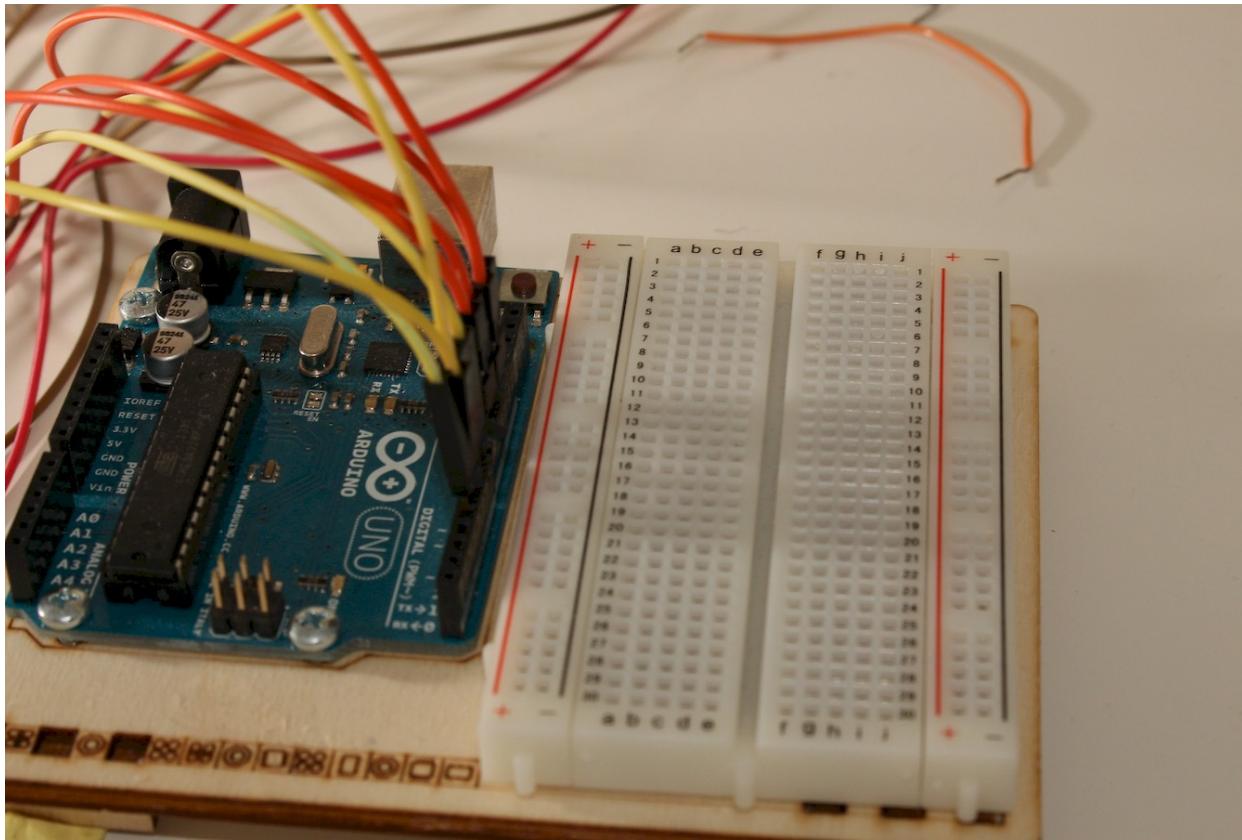
Orange 3 in 10



Orange 4 in 11

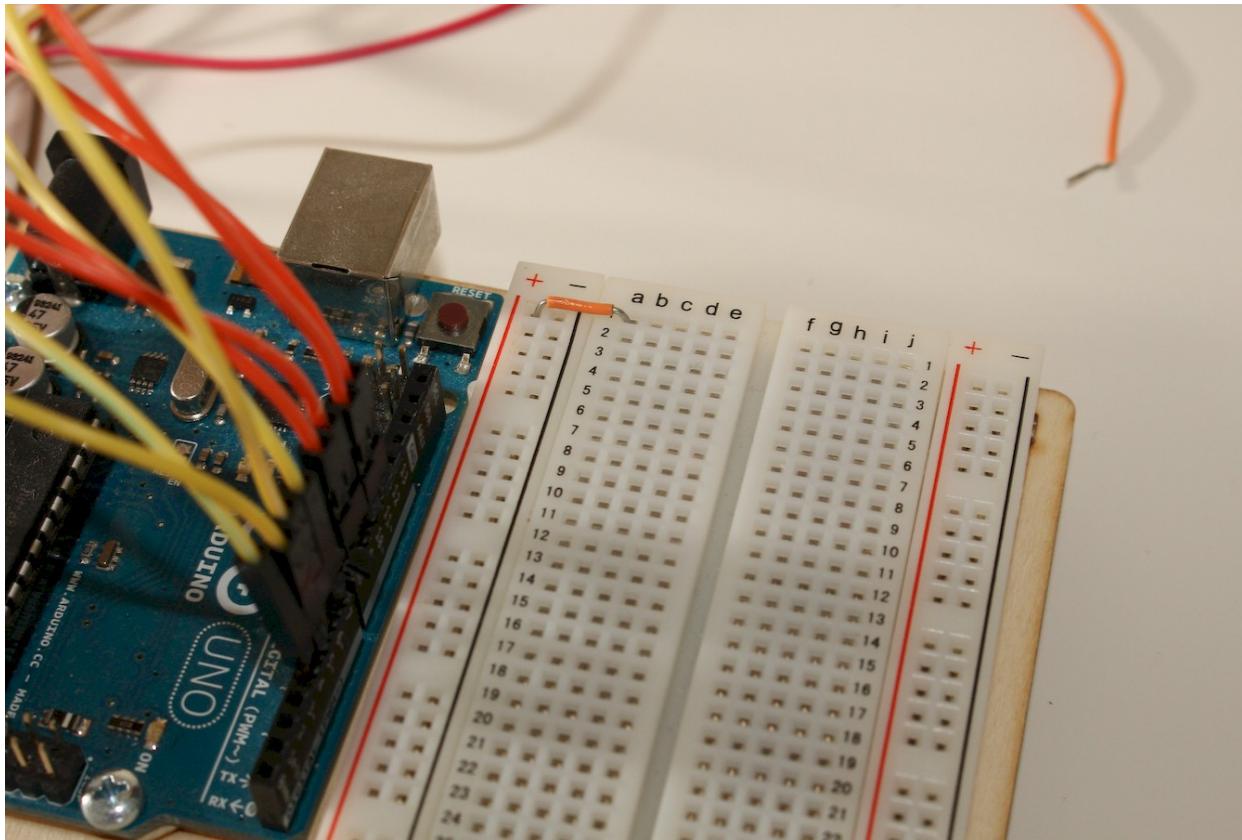


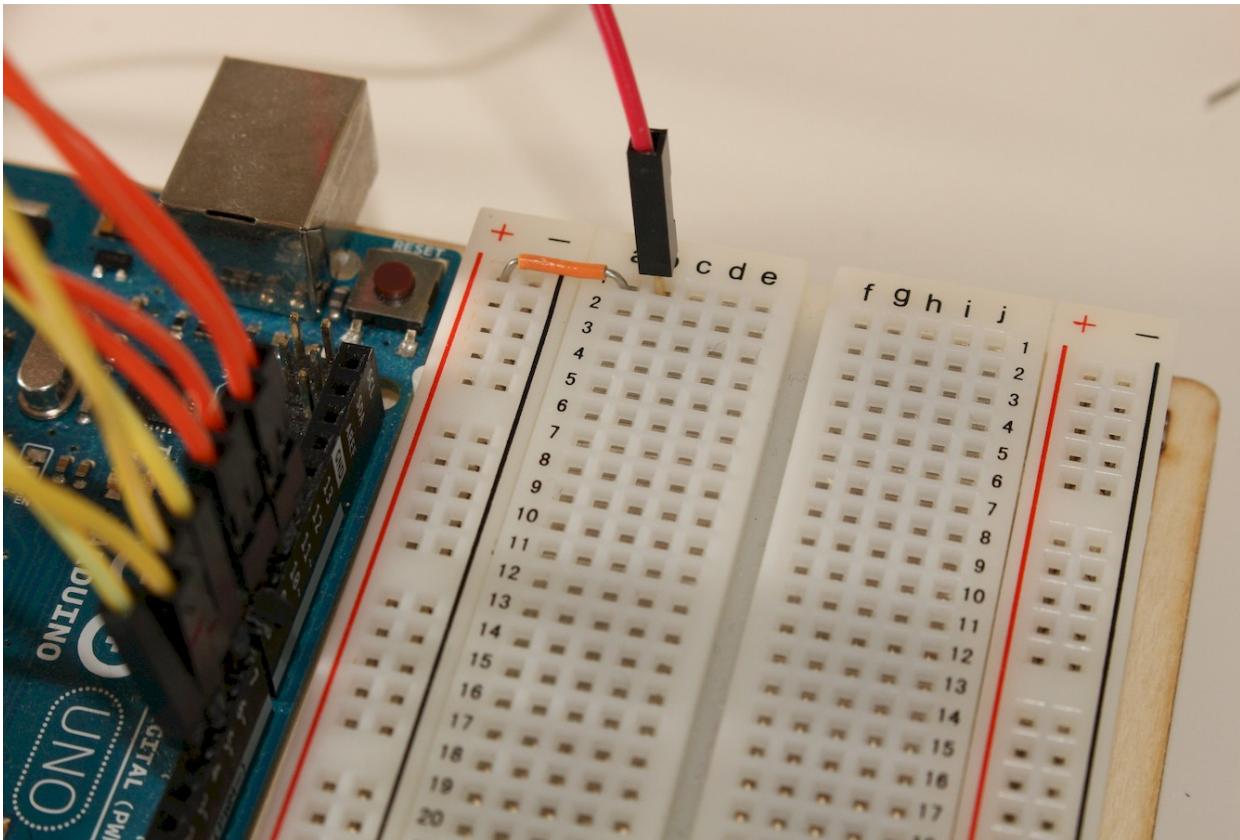
Let's continue

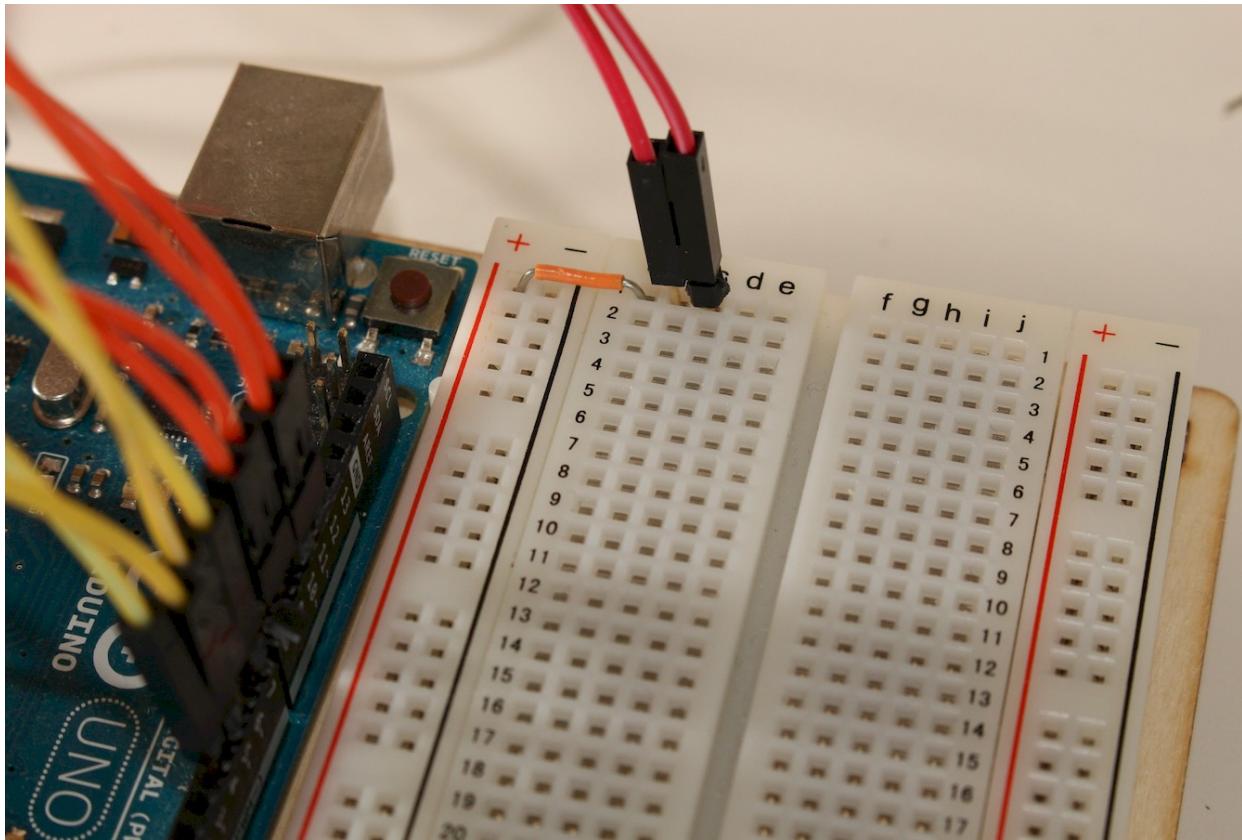


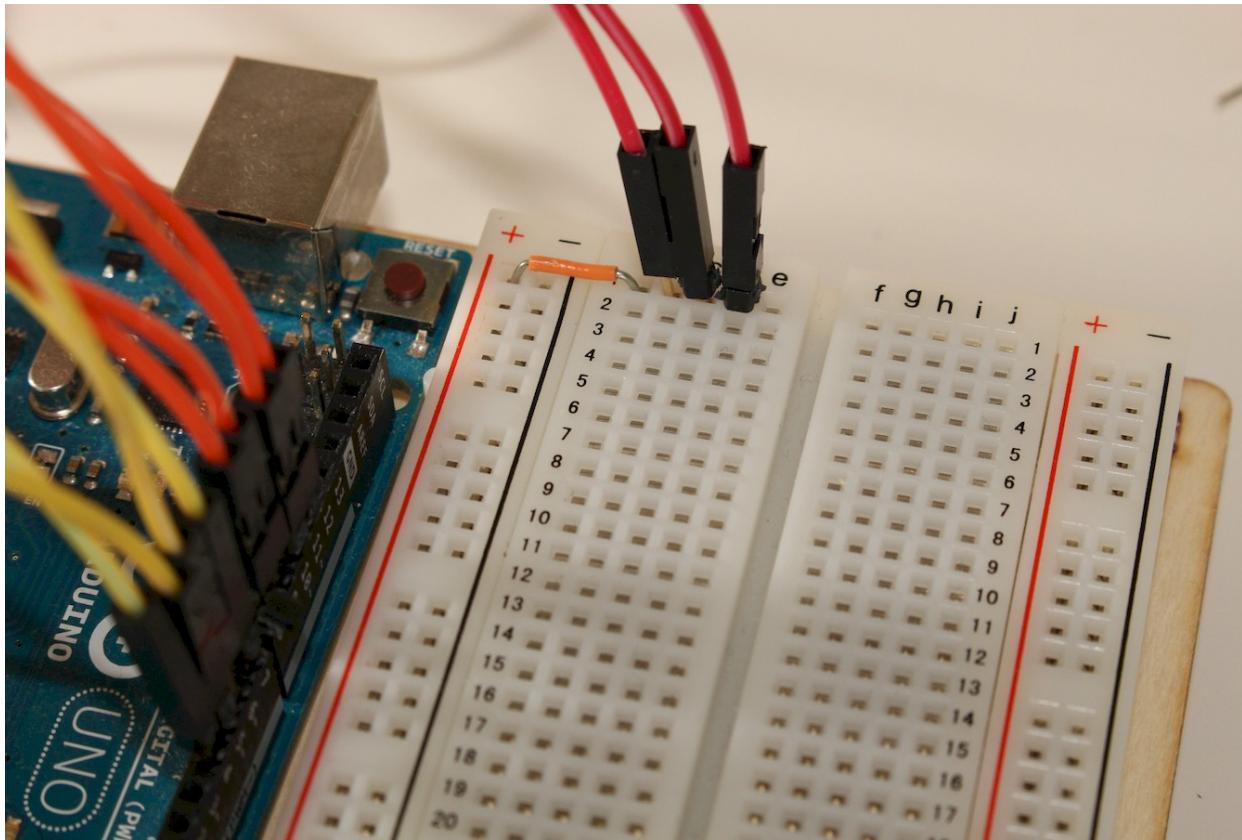


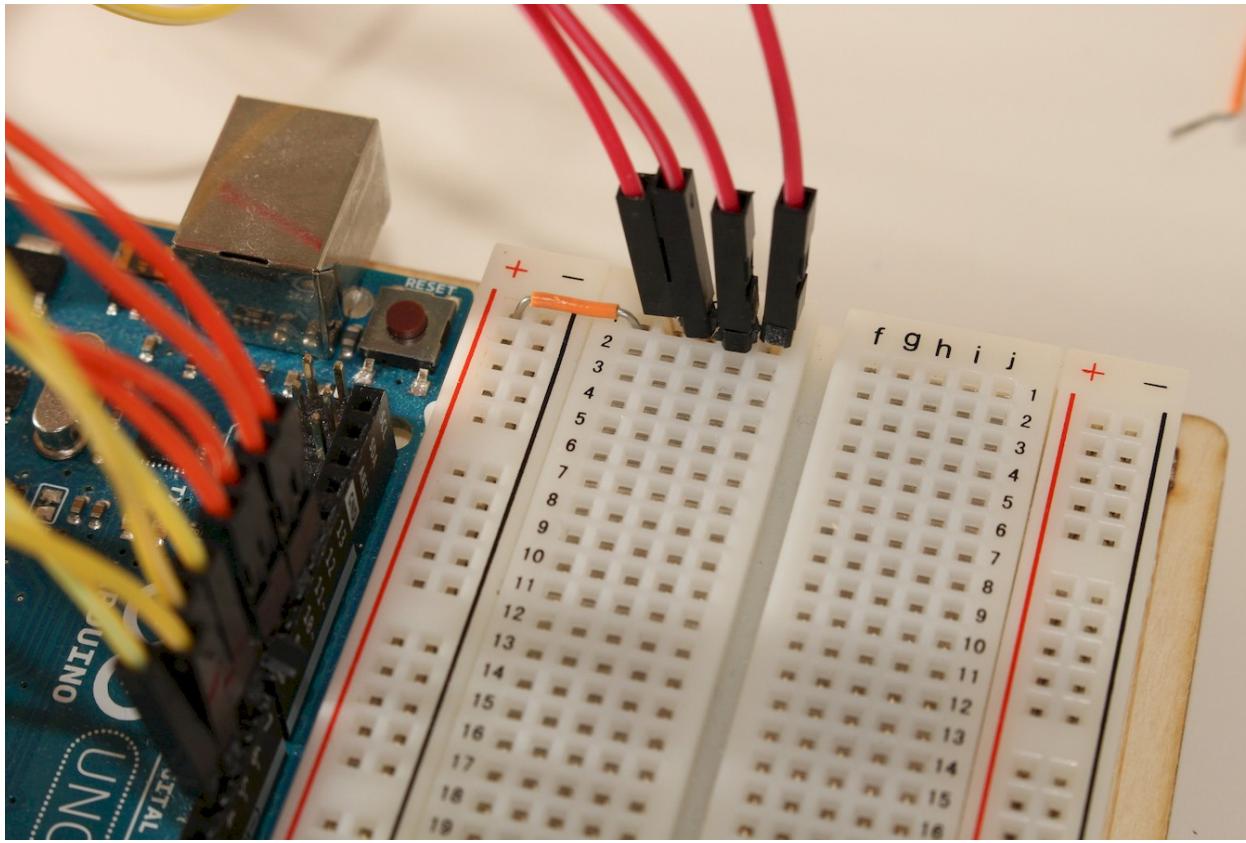
Jumper 1



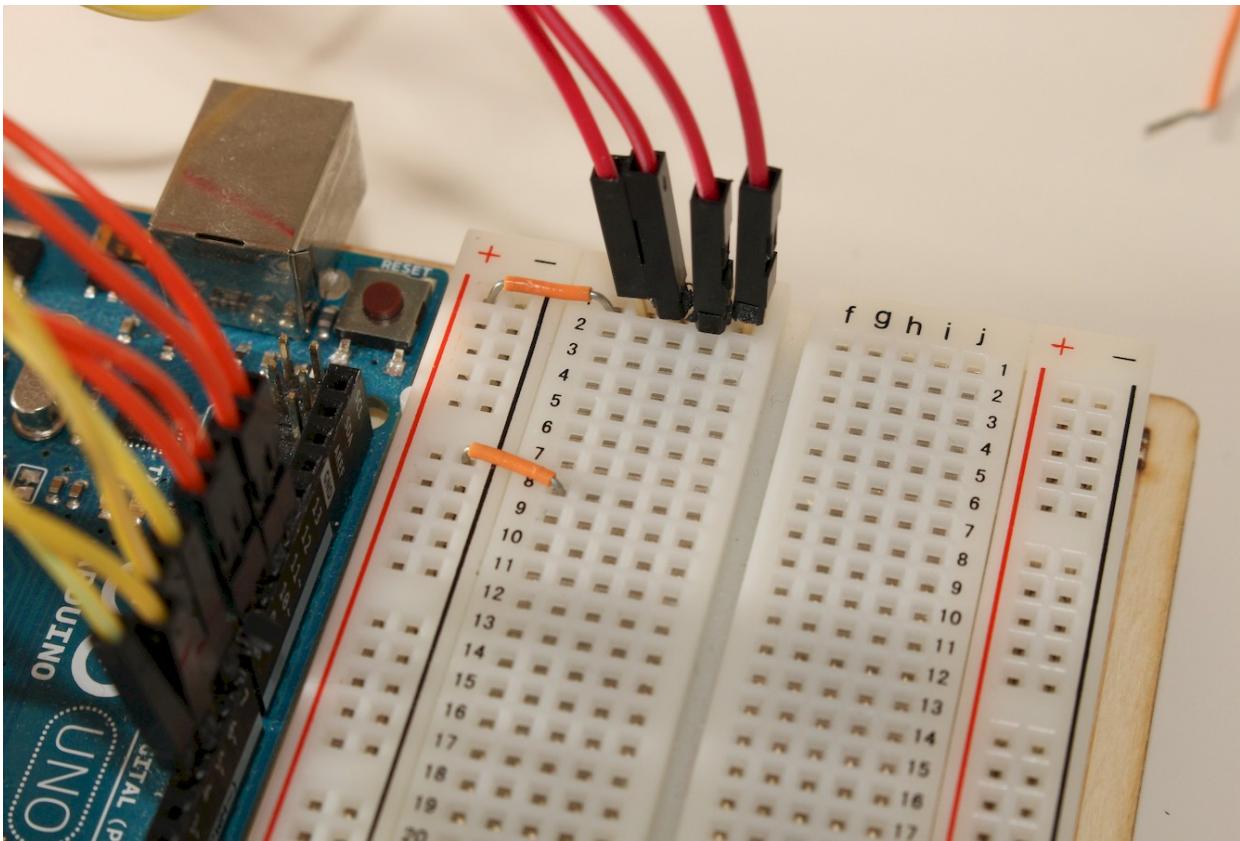




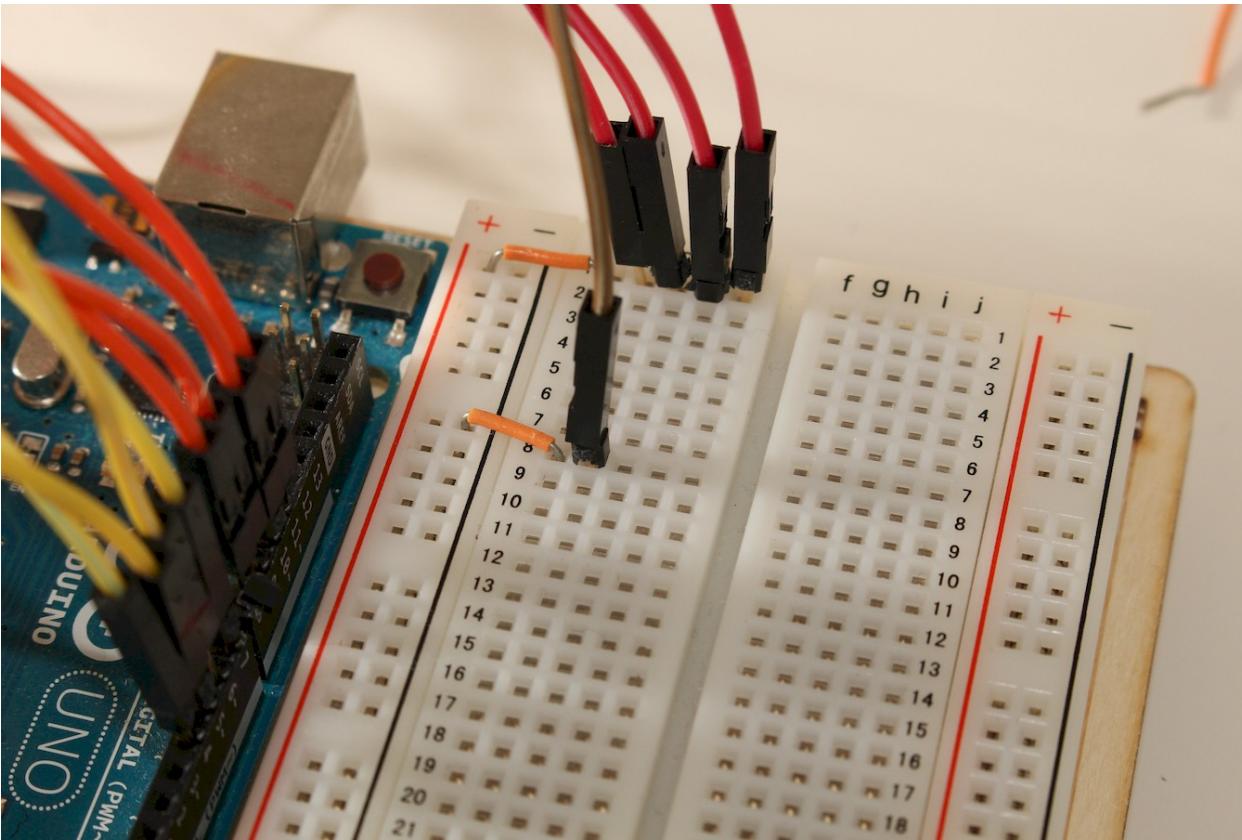




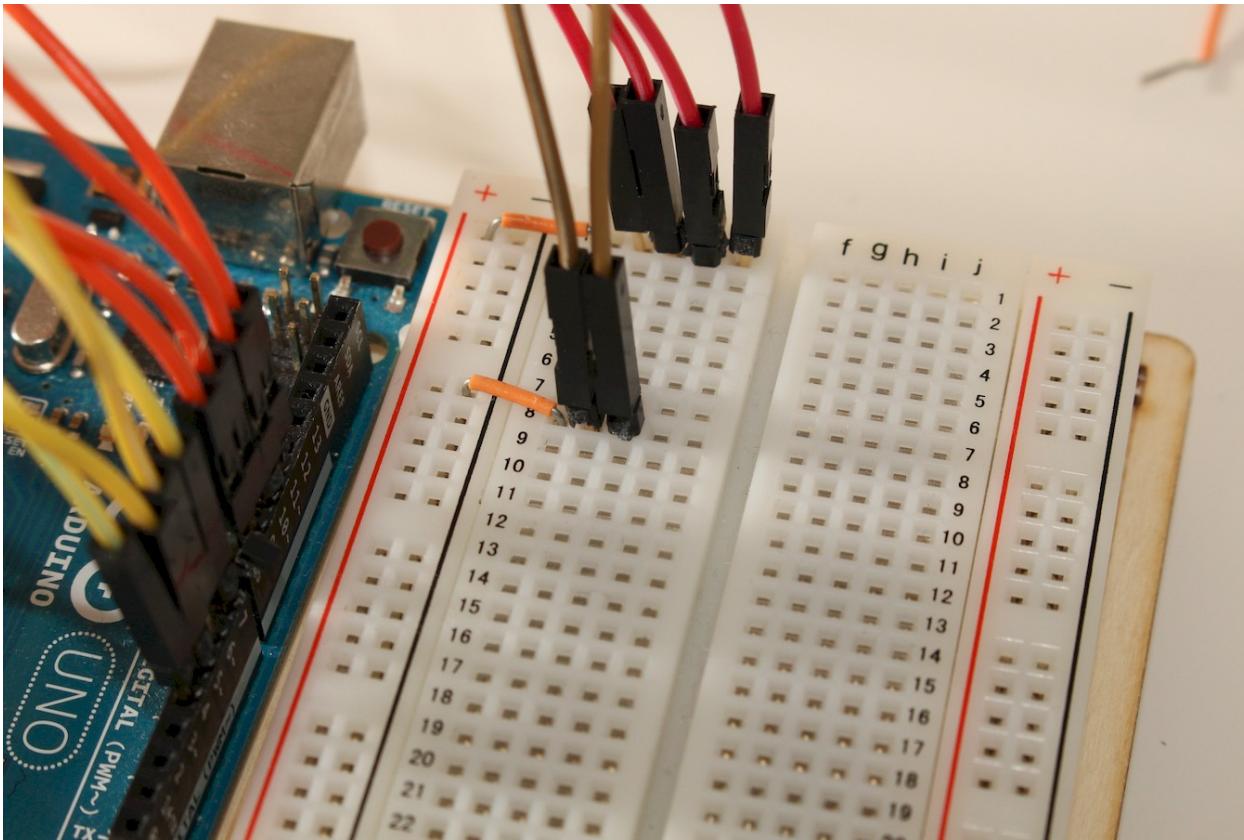
Jumper 2

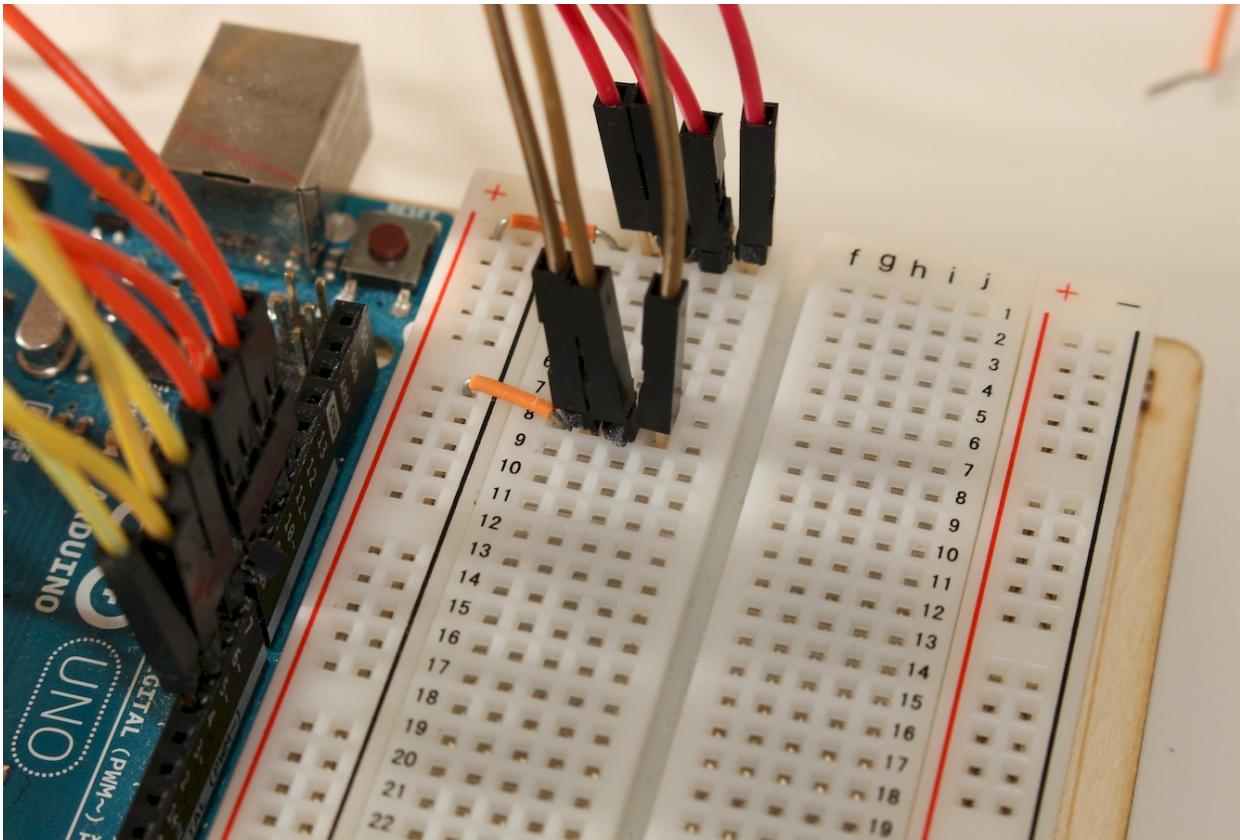


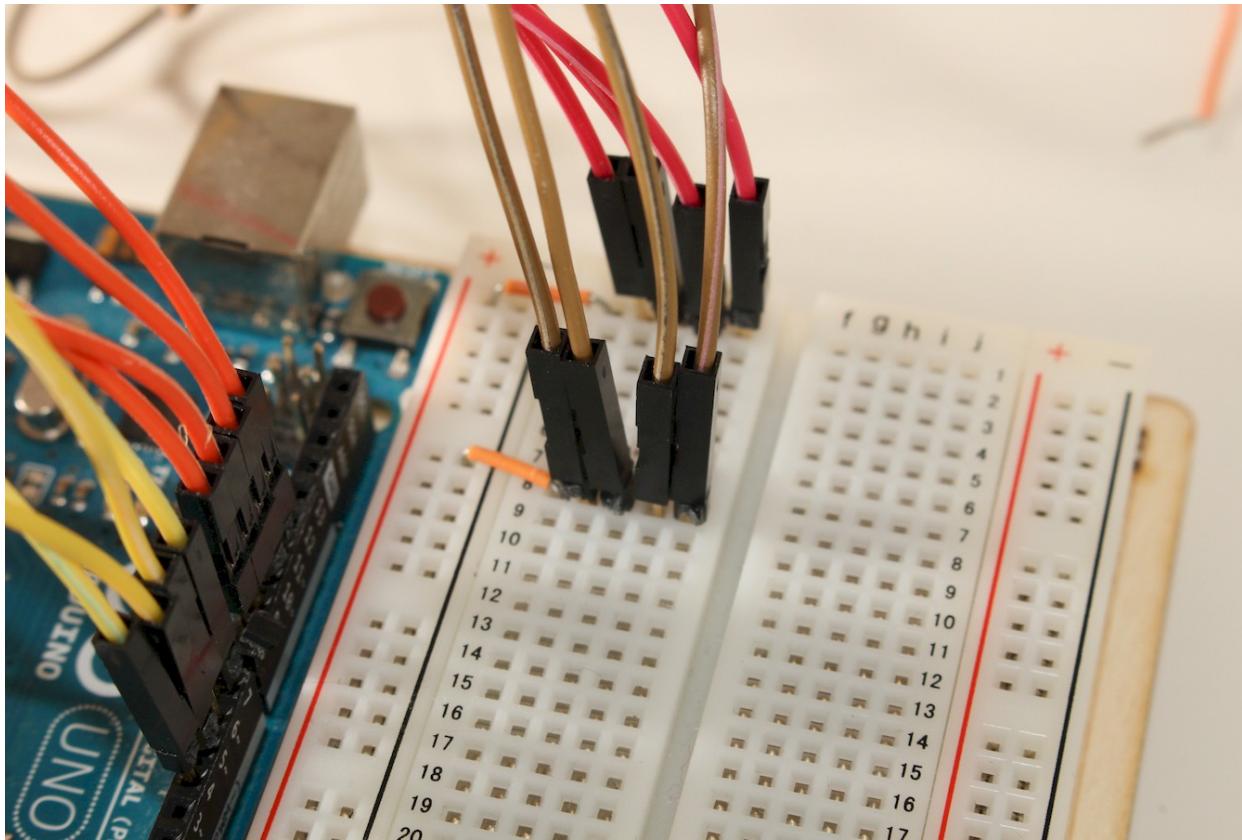
Maroon 1



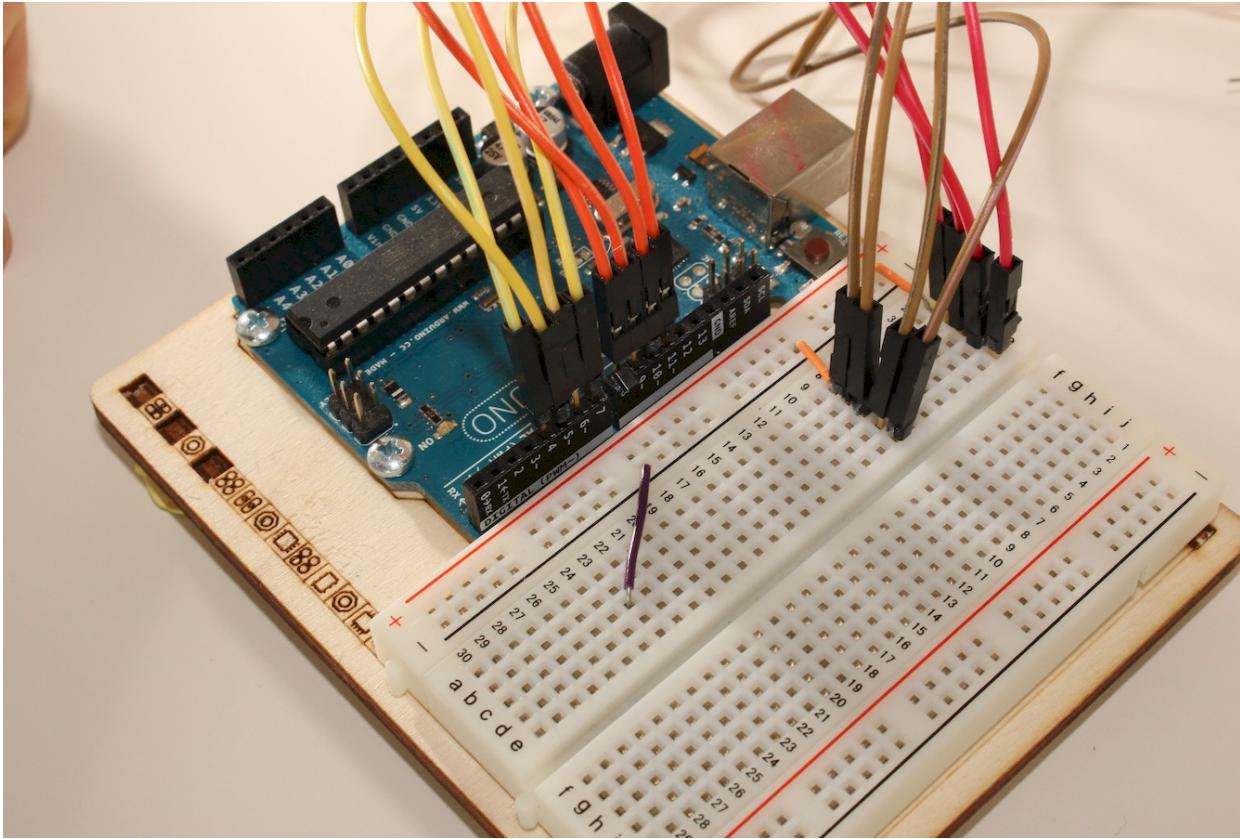
Maroon 2



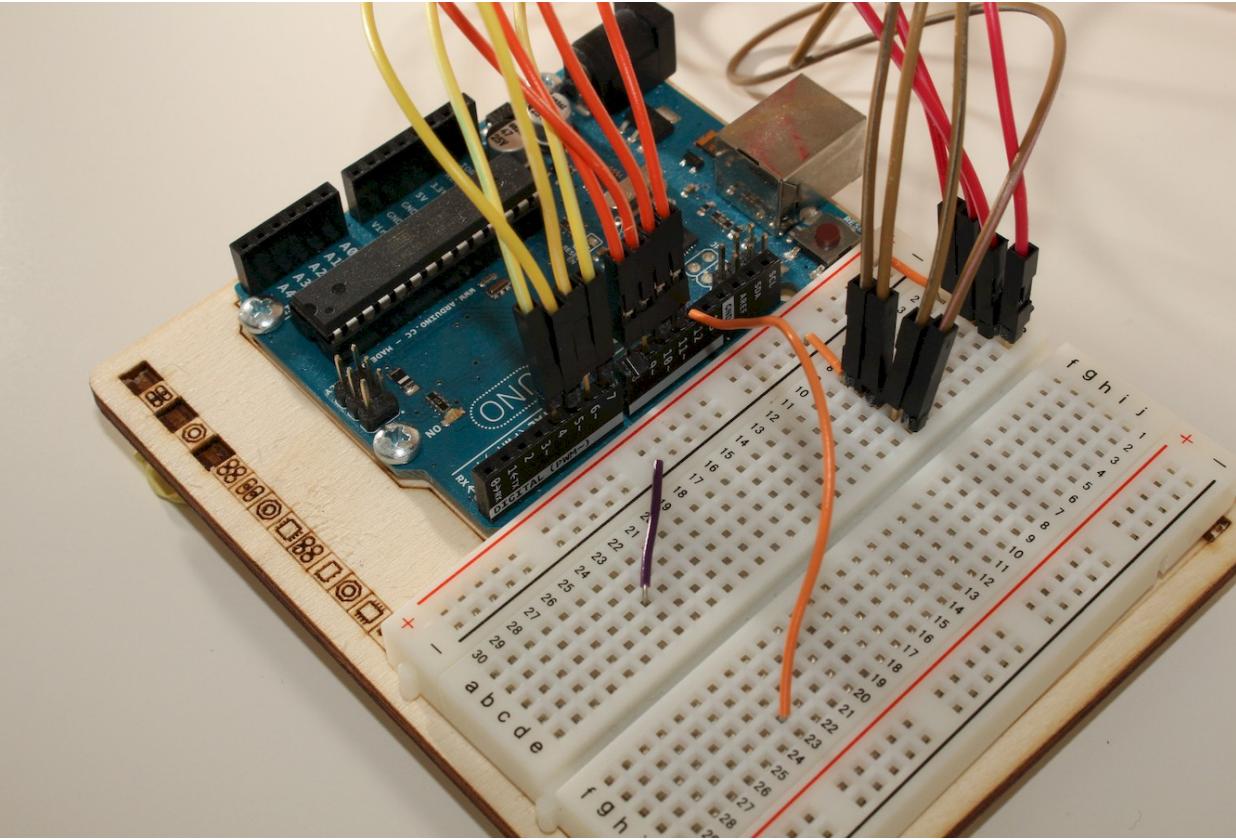


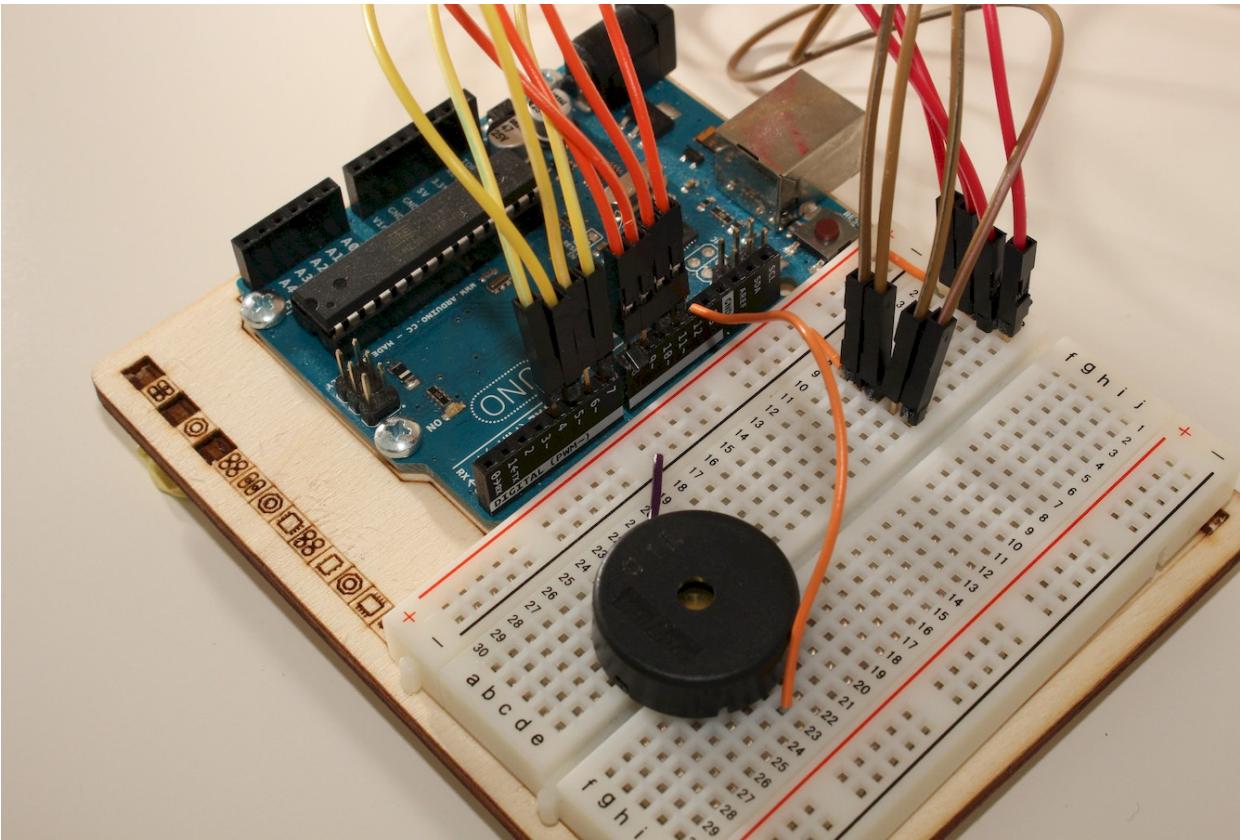


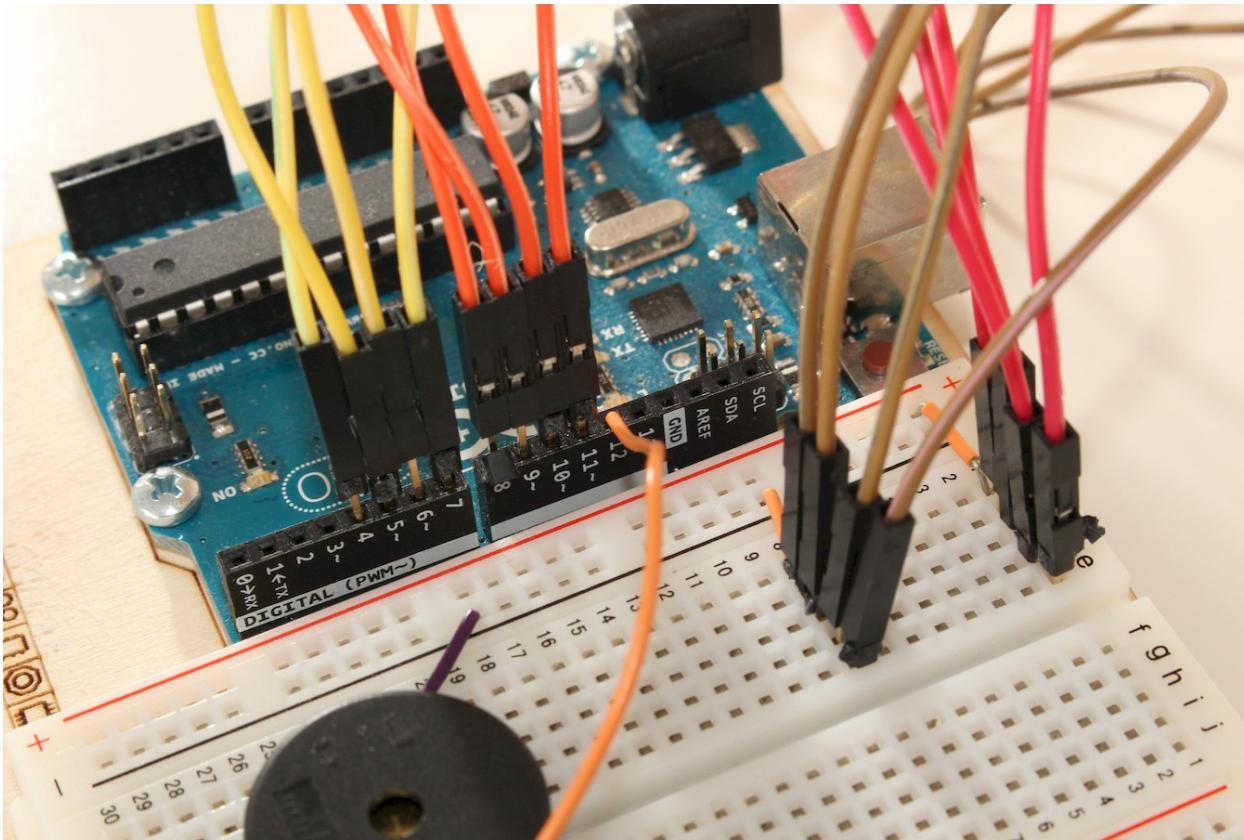
Jumper 3

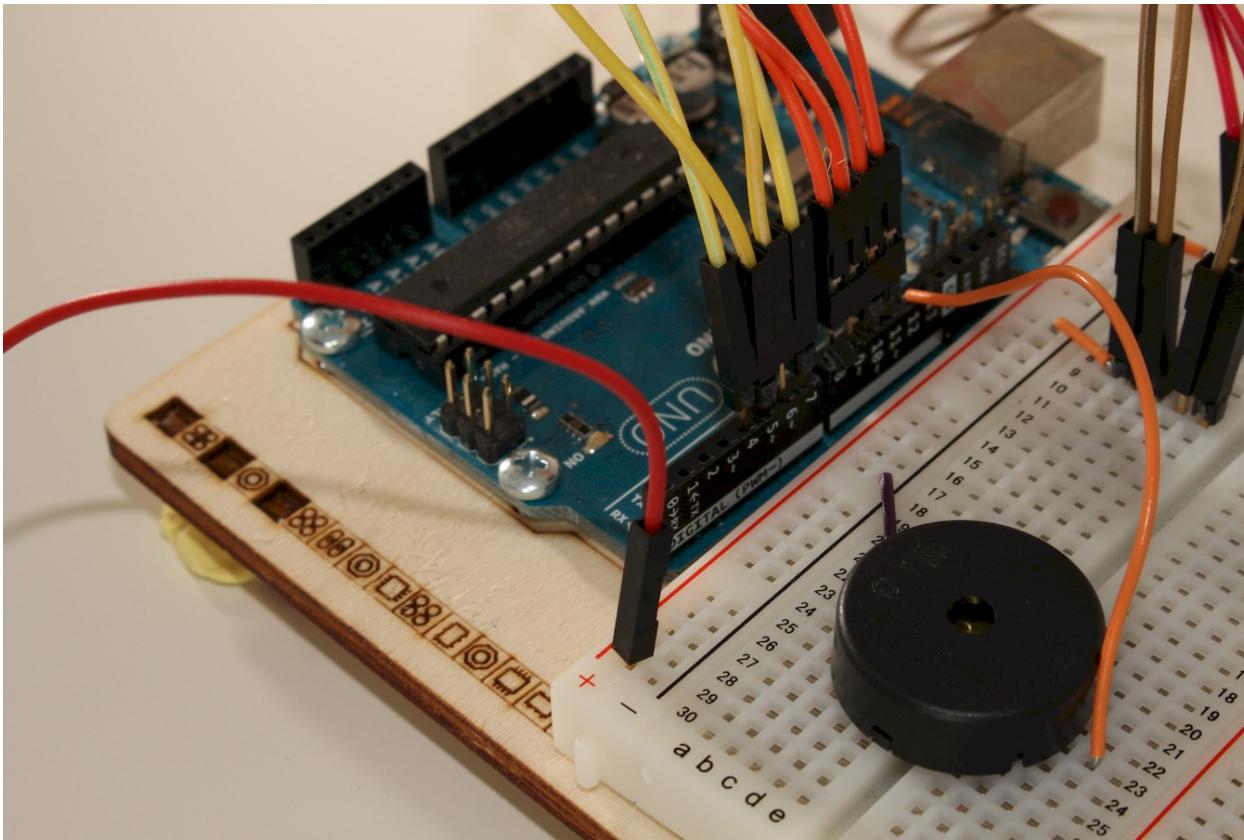


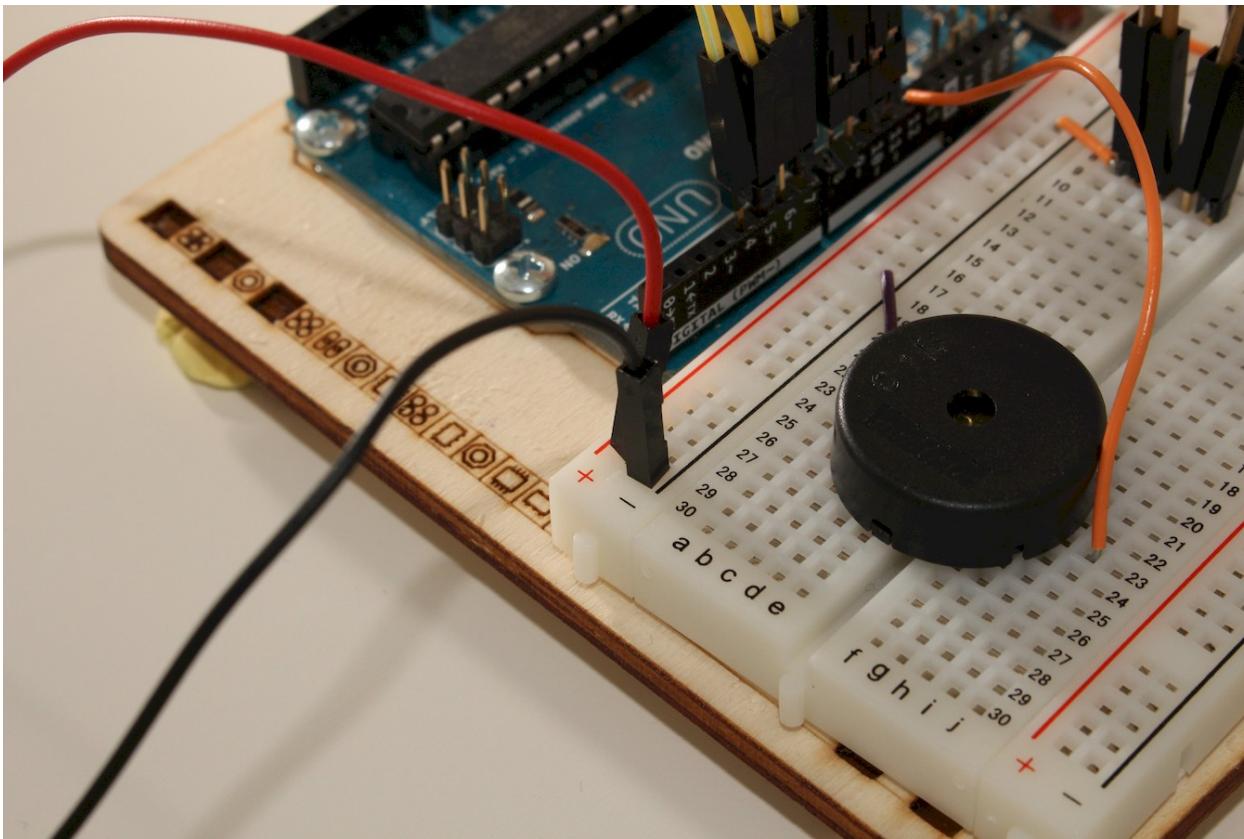
Jumper 4

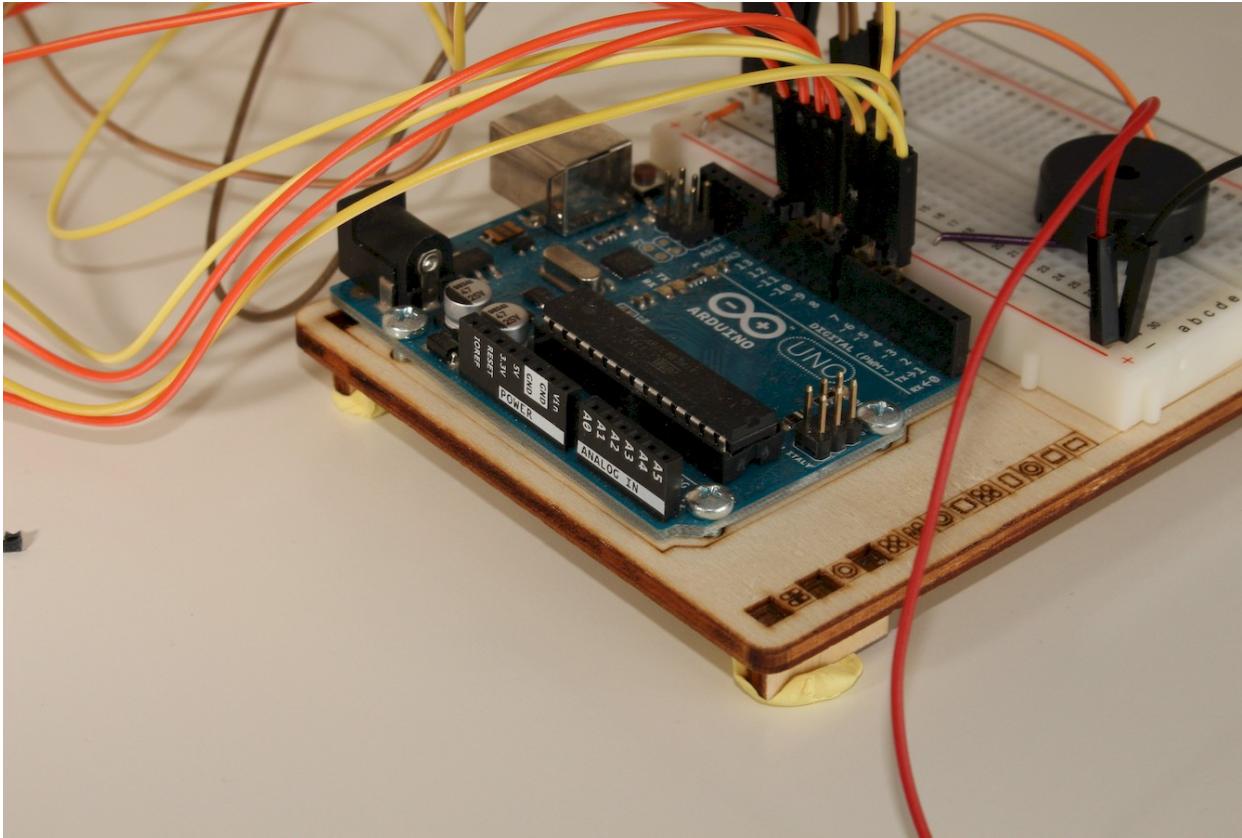




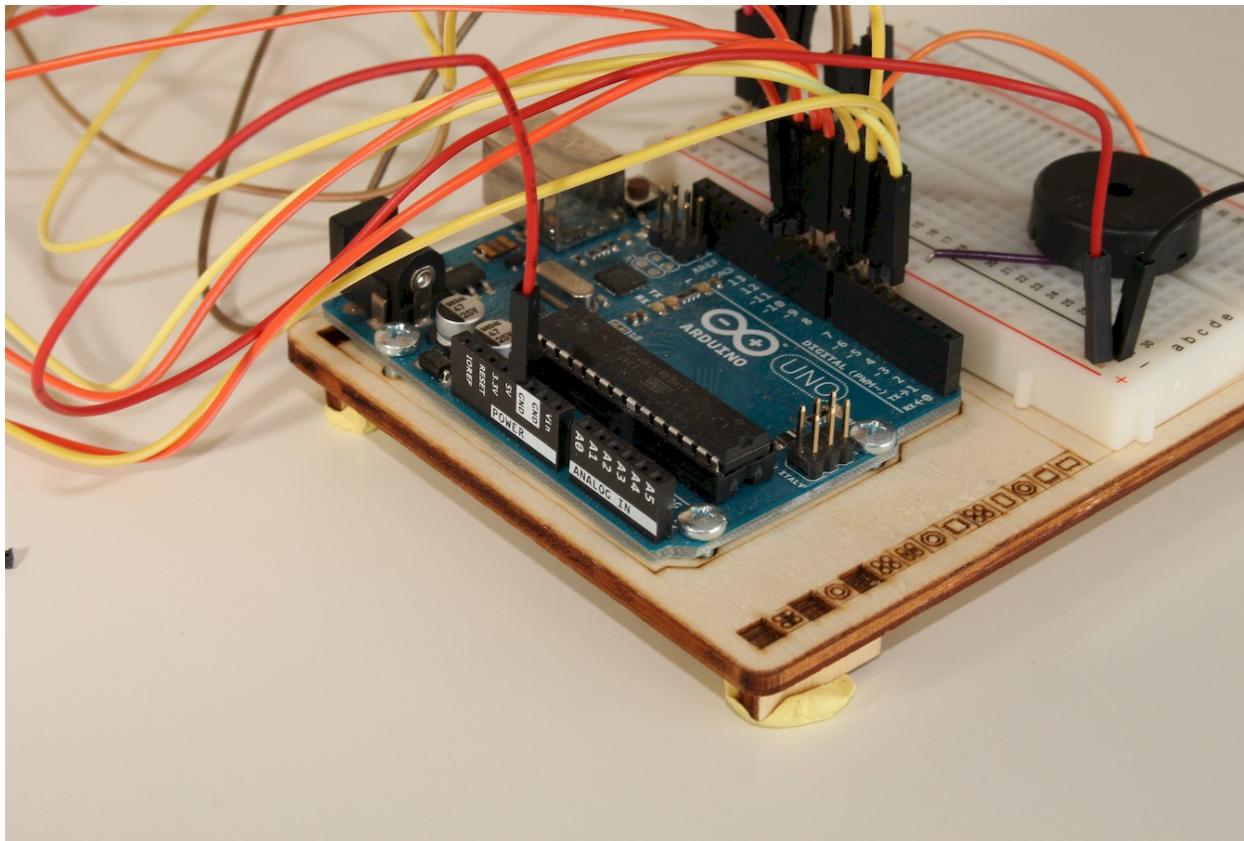


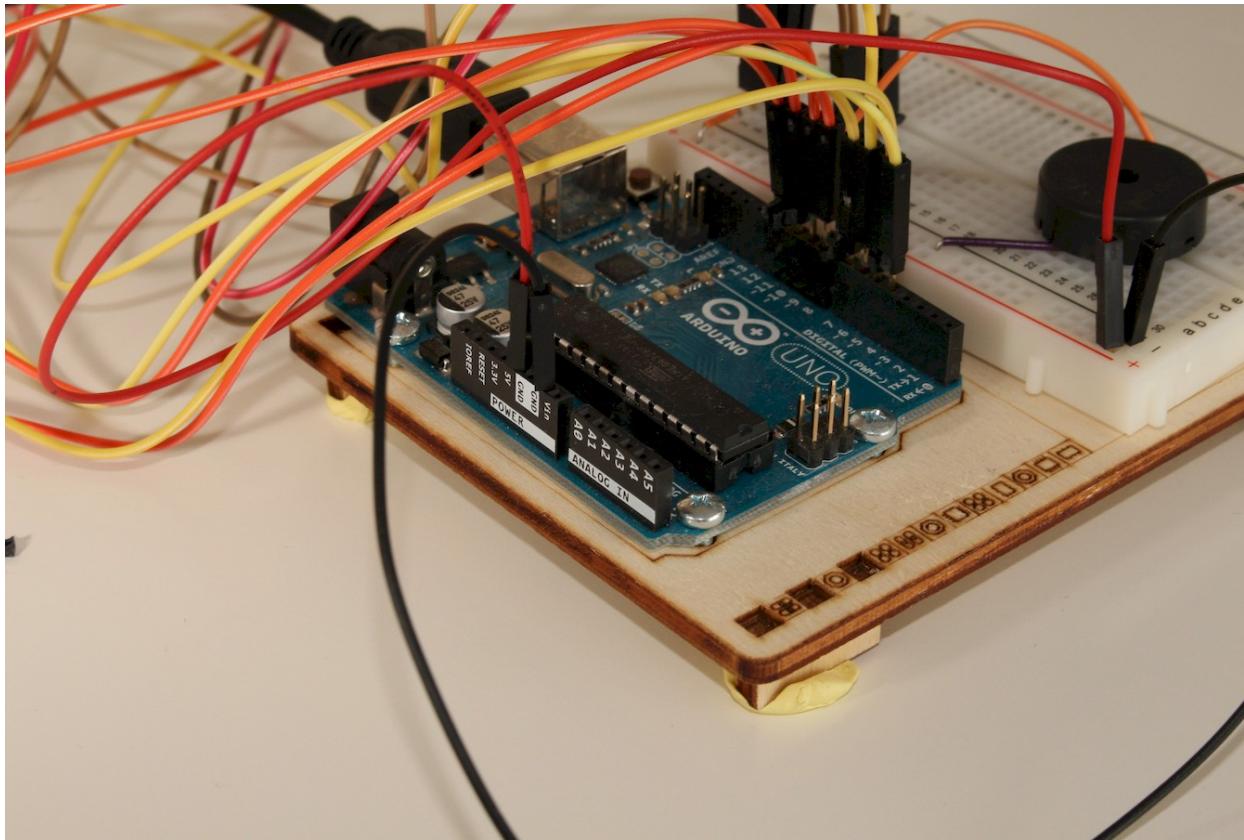


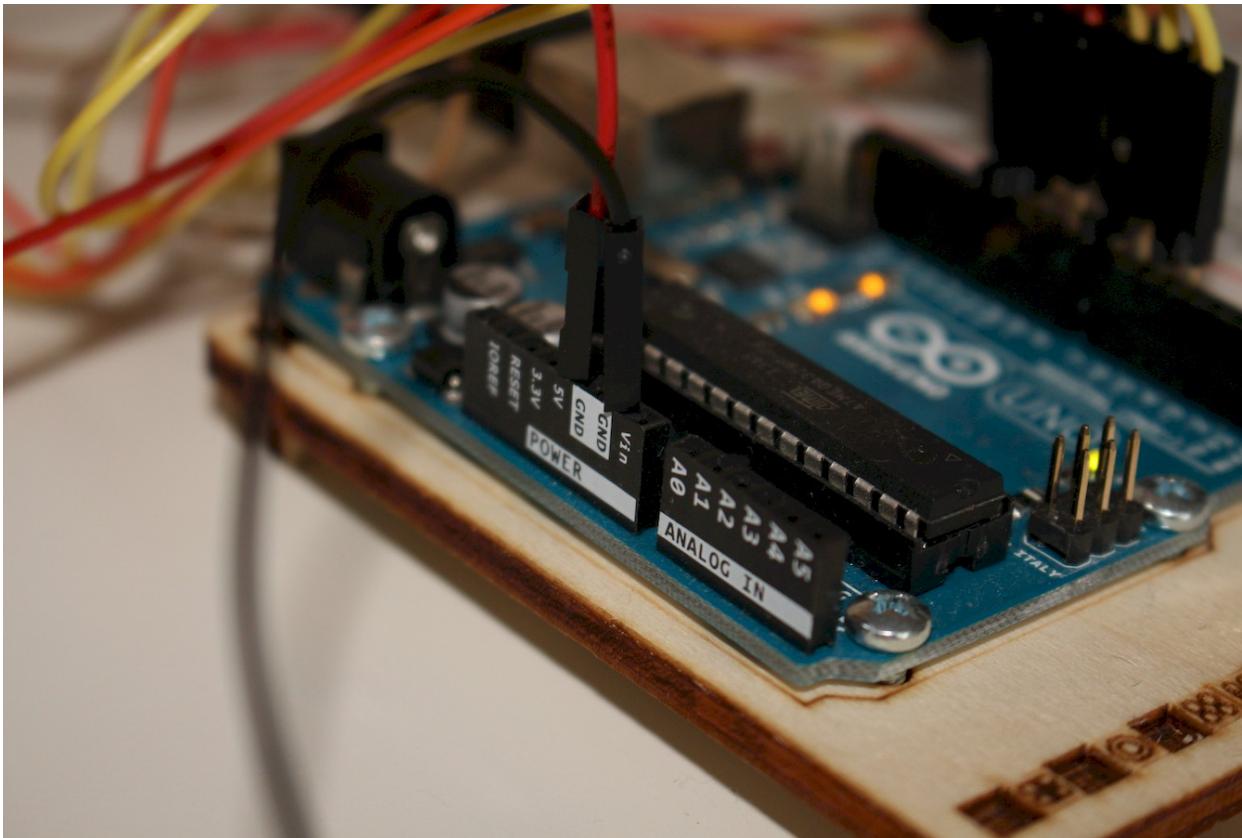




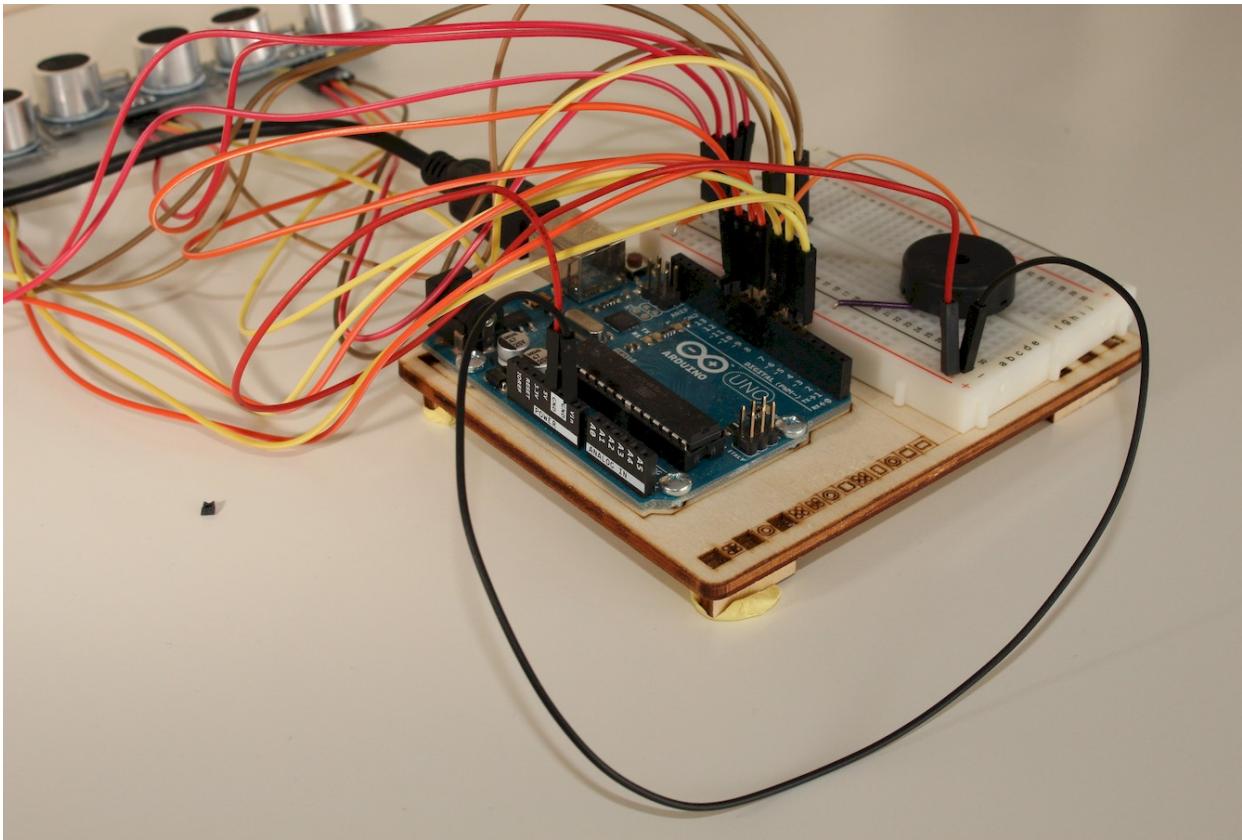
As we are dealing with the power wires, it means we are close to the end of the setup

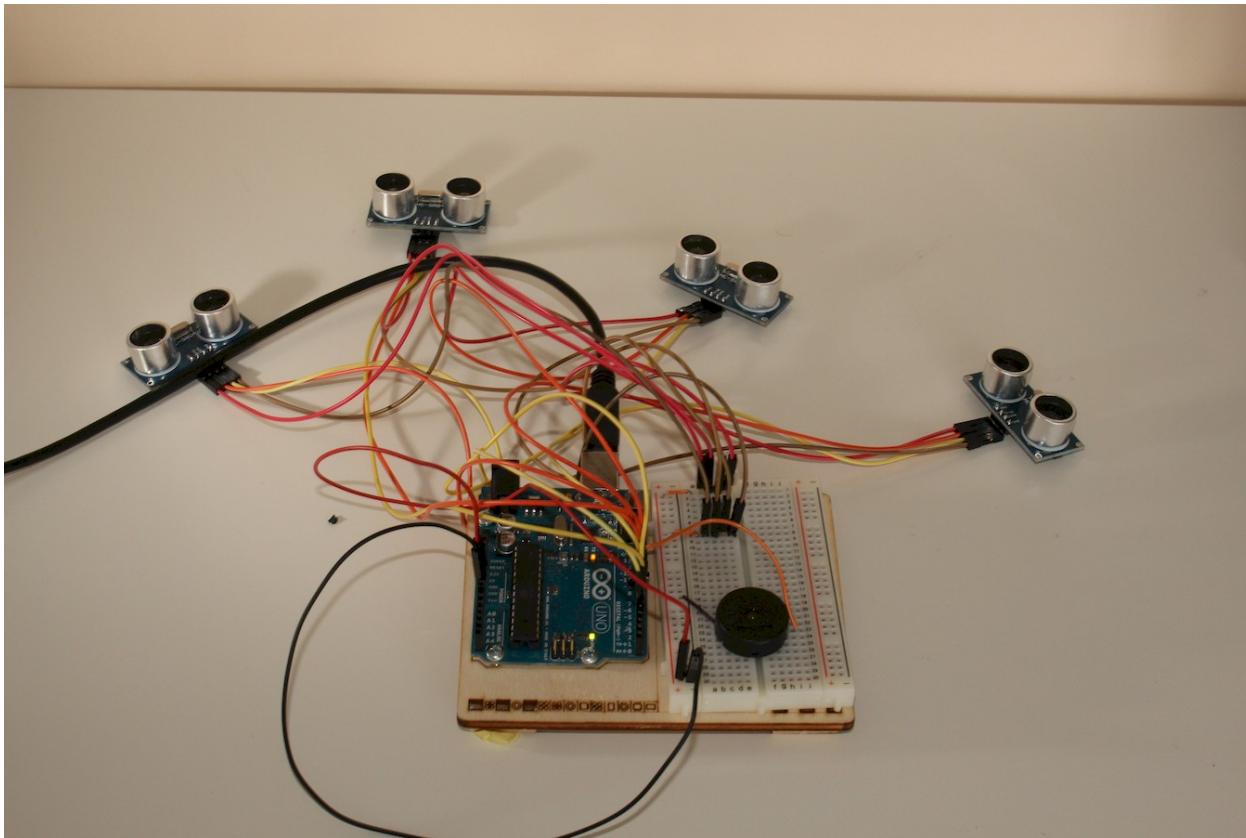






Red wire goes into a 5V socket,
Black wire goes into a GND socket
www.devoxx4kids.o





- Before to connect your setup to the computer, check it.
- (by browsing the slides again)



Is everything OK ?

- Well done !
- Good job !
- Next steps need to use a computer !



On the computer

- Launch Arduino IDE
- Open the project « sketch »
- Upload it to the Arduino board

- If you don't already know how to do, ask the event-leaders around you for help



Wow, what now ?

- Have fun playing some music !
- Tweak the program
- Which song do you know ?

- Else let the internet help you



Tones without playing ?

- If you experience musical note without playing that means that your sensor are too close from one another. Put space between them.

WE WANT MORE !

- I am sure you have a lot of ideas to modify the project and make it do even more stuff.
- C'mon, lets do a little BRAINSTORMING all together to share our ideas (max 10 minutes).
- I put some ideas in the next slide.
- Will we have the same ideas ?

Ideas

- More notes per sensor
- Physical clues to indicates the ranges
- More sensors
- Add buttons to modify the length of the notes
- Buttons to change the sound (like buzzer on/off)
- Add lasers, LCD screen
- Make the computer play the notes



More ideas

- Use another library to read the sensors
- Allow to record a serie of notes to make it replayed over and over.



Have fun !



Photo credits

□ Jérôme Baton, 2015, www.wadael.org