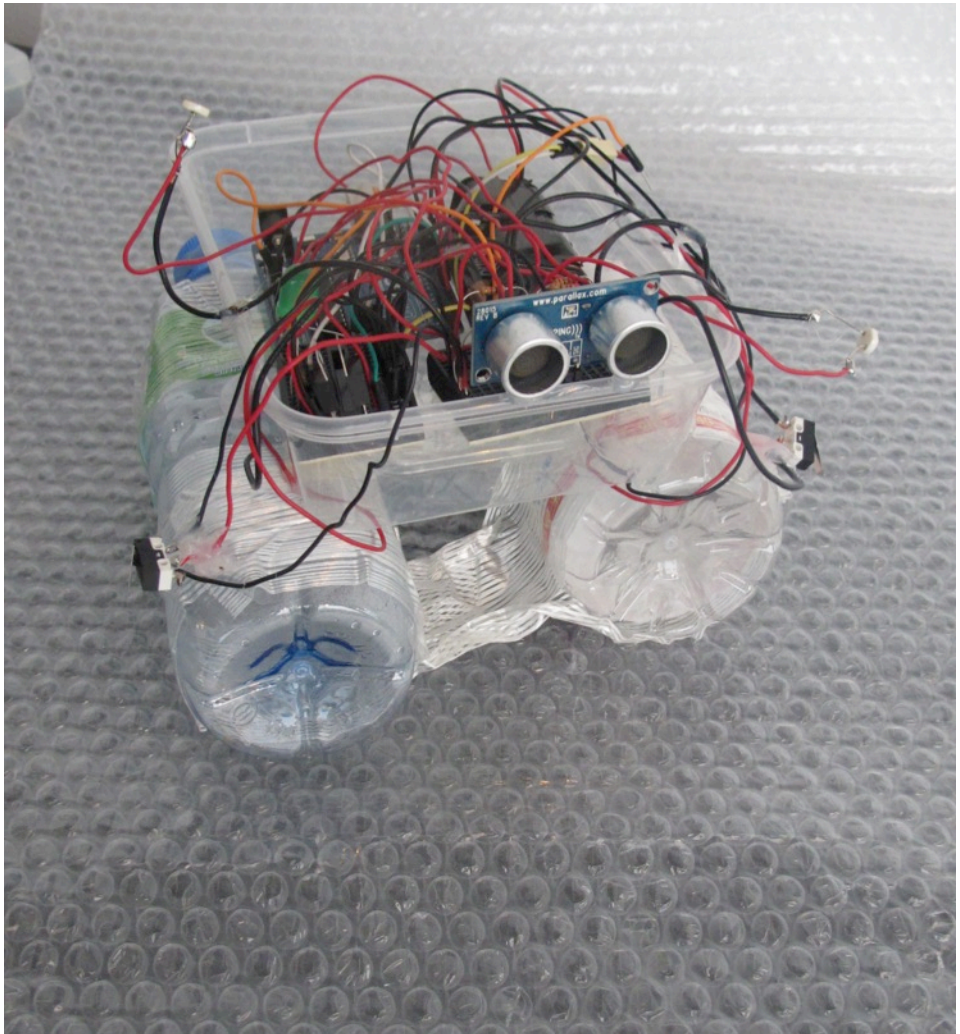
Let’s build a simple, smart, DIY, boat!



workshop:

Gabriella Levine
Science Gallery
Saturday Oct. 22, 2011

Gabriella.levine@
gmail.com

Gabriellalevine.com

What is DIY and open_source hardware?

3) Adding Flotation to the Hull

There were two ways of adding flotation that were explored. First, airbags were placed inside the body and pressurised so that they fit snugly inside each compartment.

Airbags inside hull

However, the airbags were abandoned because it added too much stiffness to the bending, and the seals on the bags were not reliable as they constantly leaked. As an alternative, Styrofoam slices were used to provide flotation. Circular slices were cut for each section and then adjusted to allow space for bolts, connectors, spines etc. inside the hull.

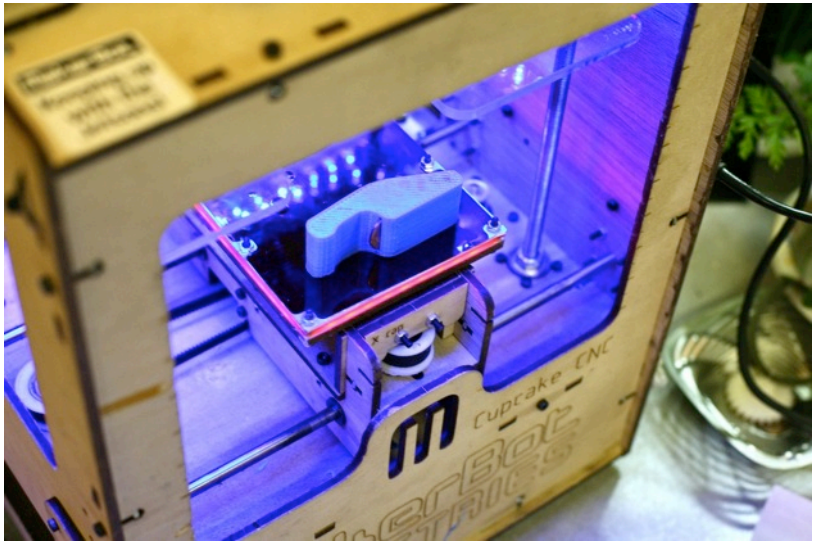
The Styrofoam slices had the advantage that they provided a fixed amount of buoyancy and did not oppose the bending of the hull.

Adding flotation to the hull

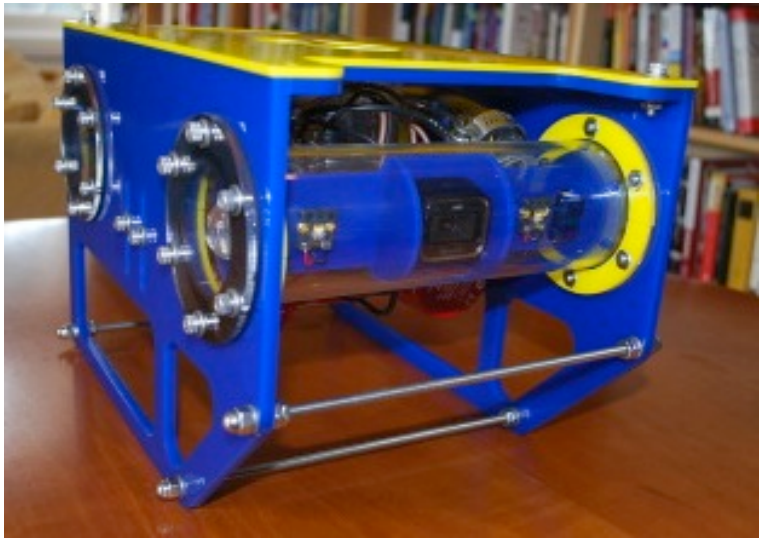
Protei Handbook | v.2011 09 02 | CC BY-SA 3.0 | contact@protei.org | p. 48 / 89

Protei_006 and the Protei handbook

A couple more OSHW projects:

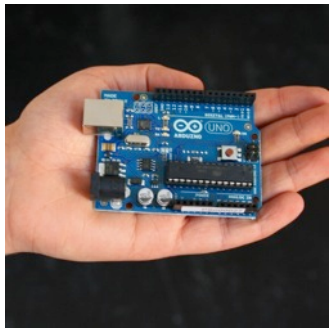


DIY printers (MakerBot, Fab@Home…)



OpenROV.com

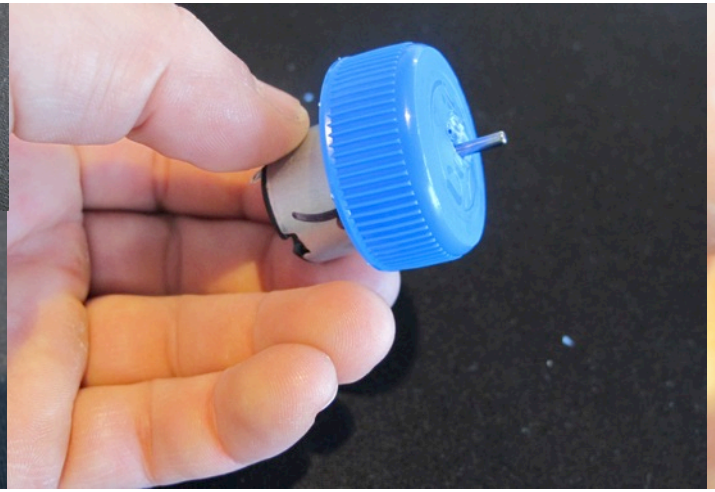
Materials



1. Take off the top of both water bottles

2. Poke a hole in each cap

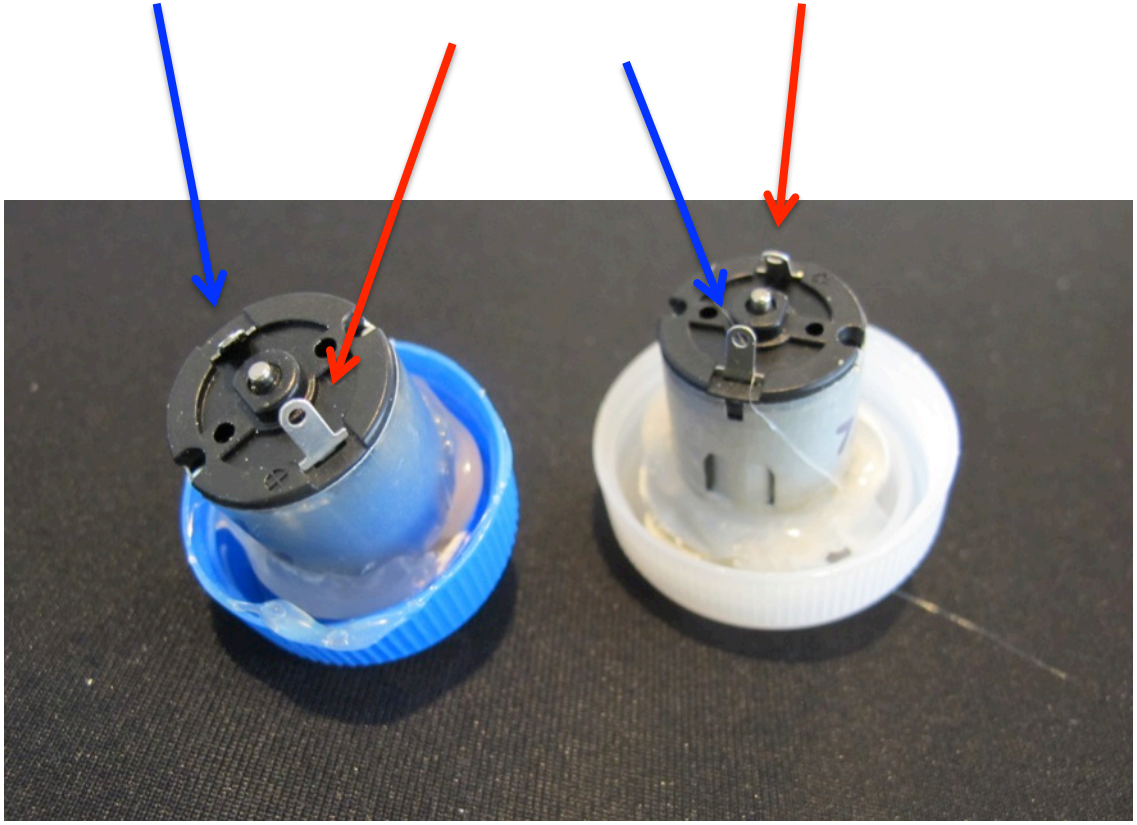
3. Apply hot glue to the inside of thecap, but not on the hole. Slip the motor shaft through the hole. When dry, the shaft should spin freely.



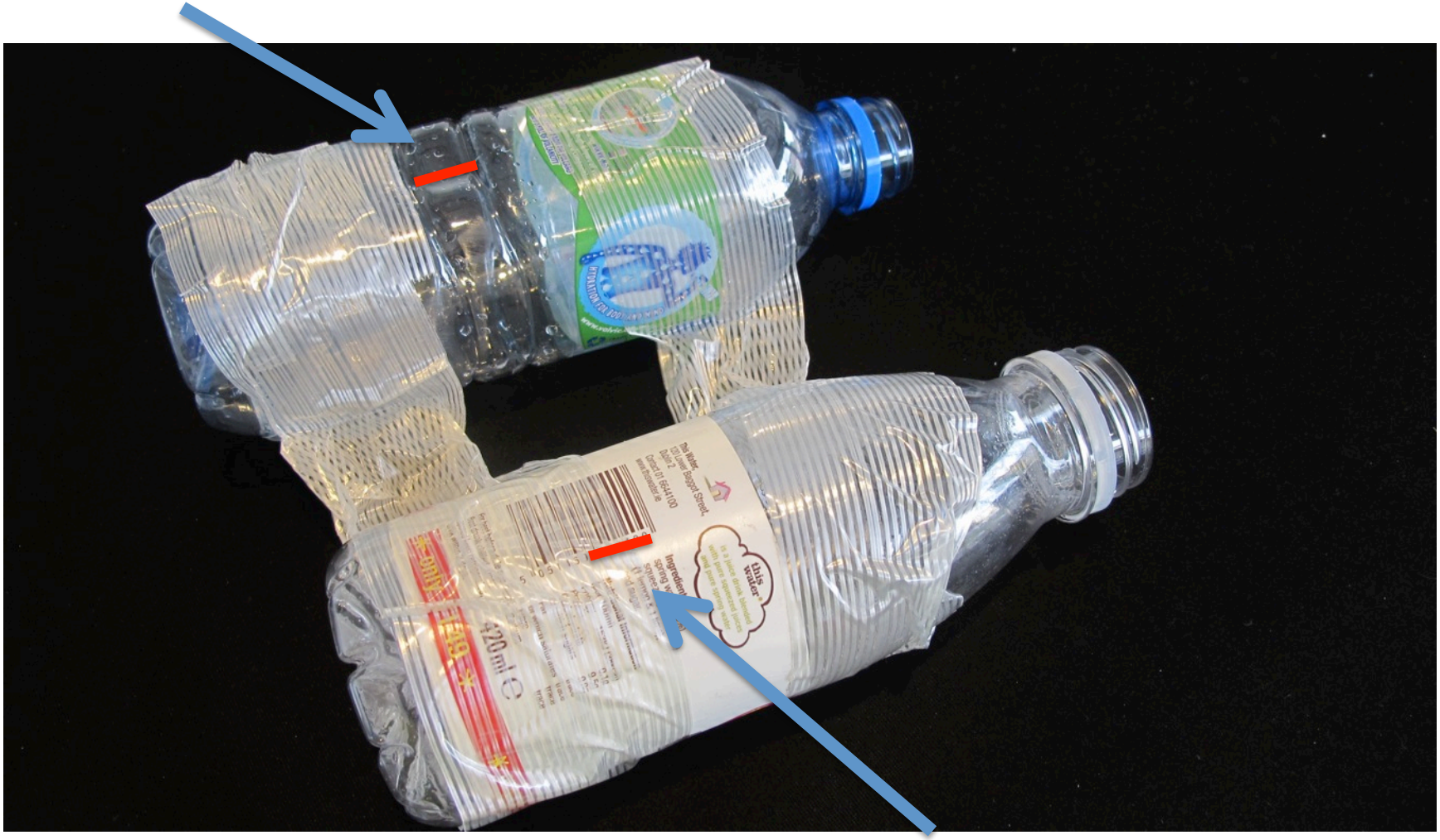
Do this with both bottle caps.

4. Use two or three strips of tape, tape your water bottles together, sort of like a raft.

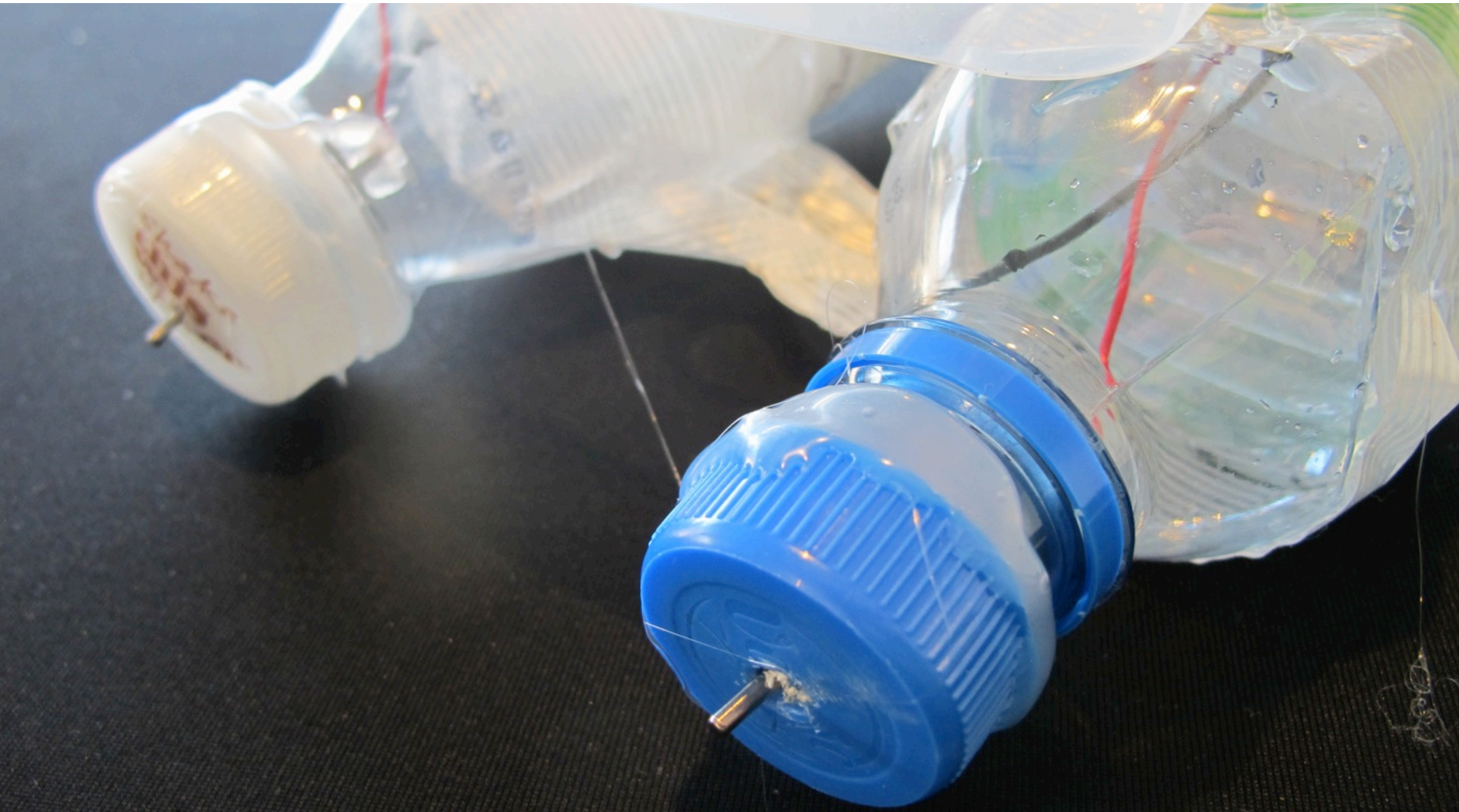
5. Solder on long leads to the motors, now attached to the bottle caps



6. Cut a small slit in the top of each water bottle. This is the hole through which the wires From the motor will poke through.

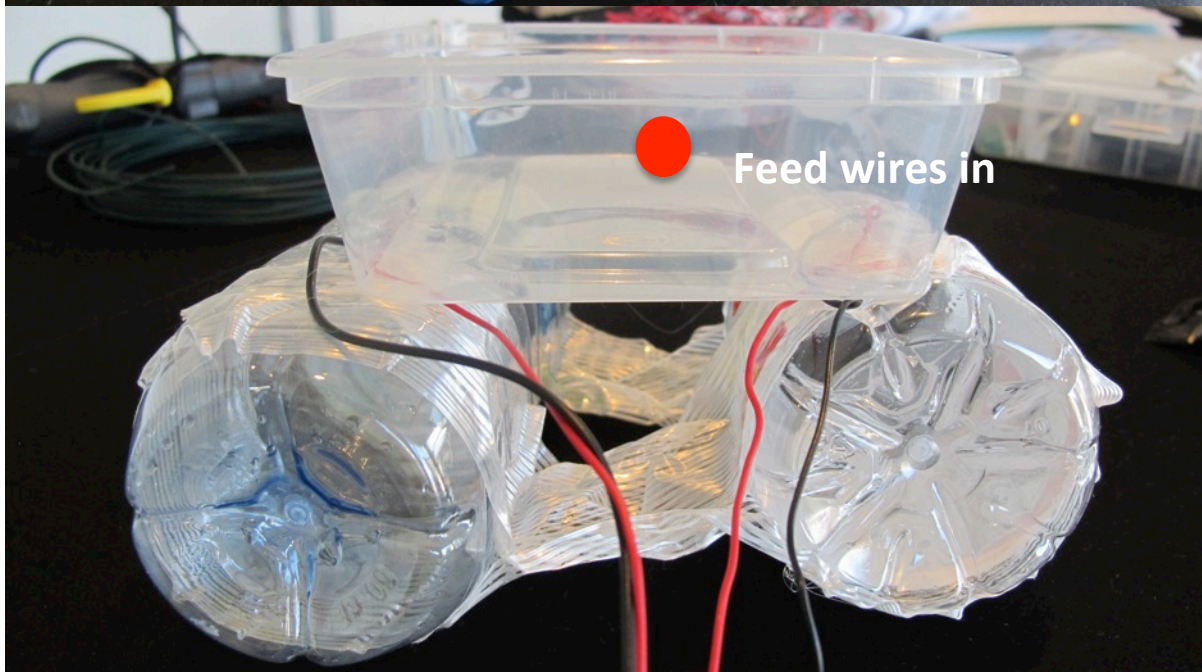


7. Put the cap on the bottle and feed the wire into the bottle opening, then out the Slit you just made. If you have trouble screwing on the cap, use some hot glue to secure It.



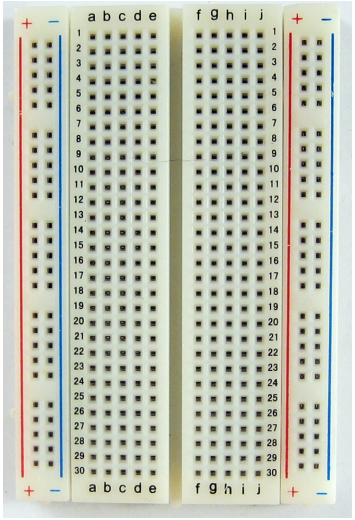
8. Glue a plastic box to the top of your two bottles. You can Bring the wires from the Motors around the back, Or poke a small hole in the Side of the box to feed them Into.

Now, put a bit of hot glue on the Holes you made in the bottles To make sure the bottles are Watertight.



9. Build the circuit - breadboard basics

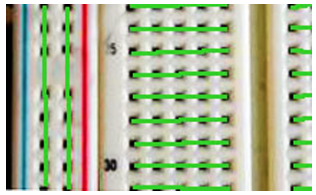
THE SOLDERLESS BREADBOARD



The breadboard is basically a chunk of plastic with a bunch of holes in it. But there is something special going on:

There is electrical conductivity. Basically this means that even though you can't see it, if you poked inside, there are metal strips that connect the ROWS and the COLUMNS together. LIKE THIS:

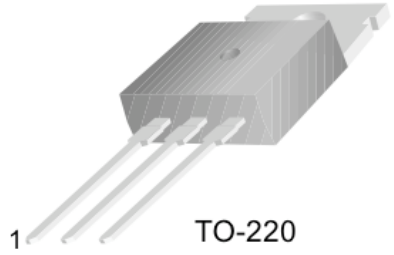
here's a CLOSE UP



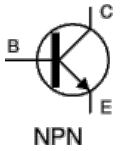
columns

rows

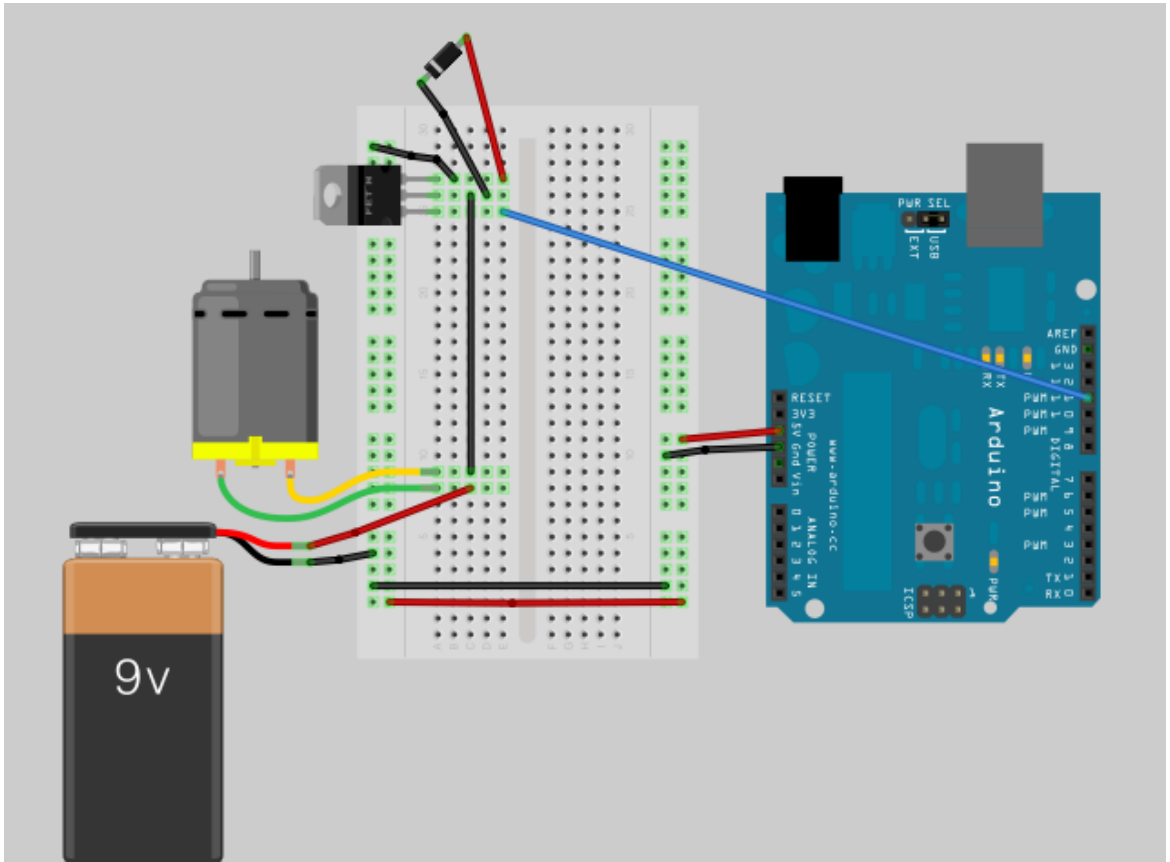
9. Build The Circuit.



1.Base 2.Collector 3.Emitter

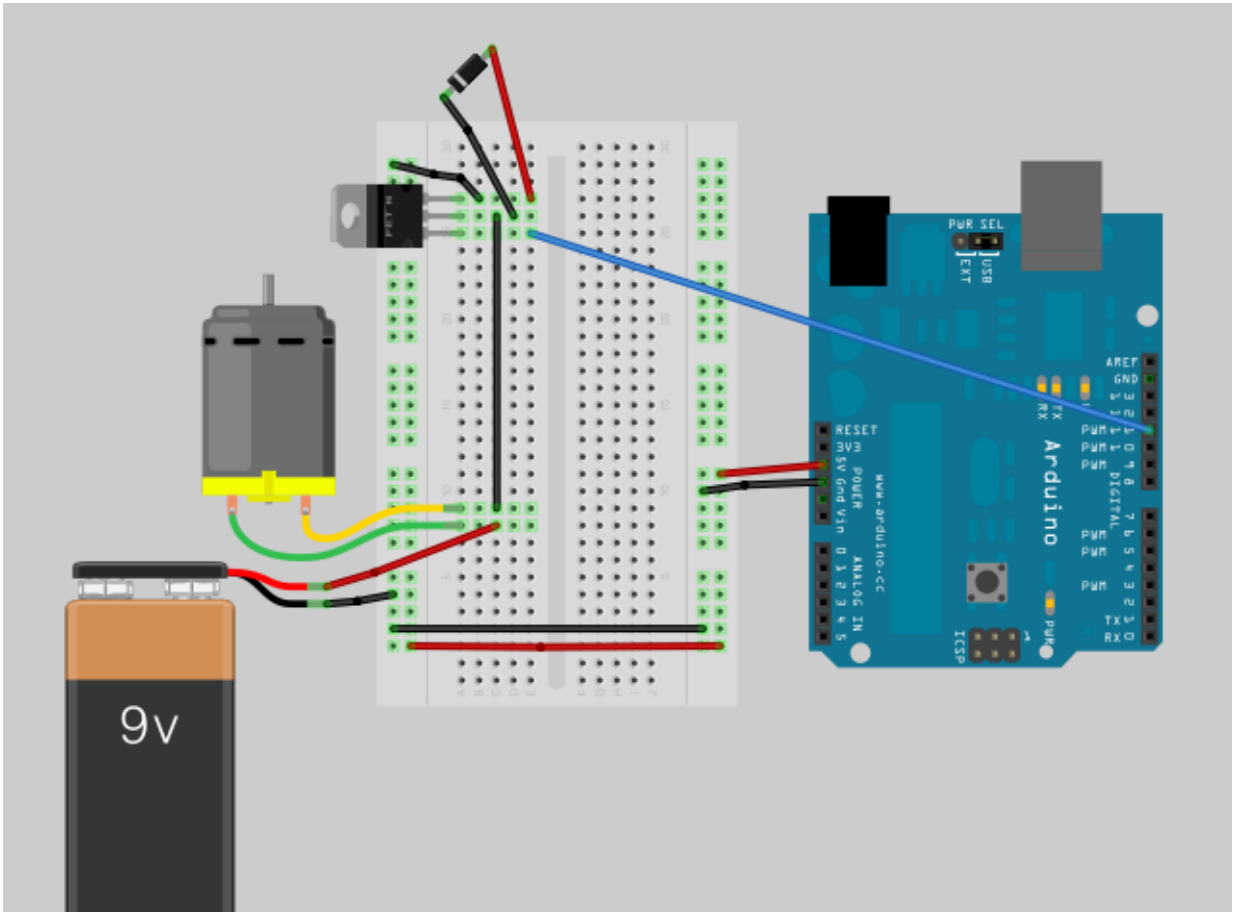


This circuit uses a transistor (an electronic switch) to power a high current load (because Arduino does not output enough amperage to turn the motors.



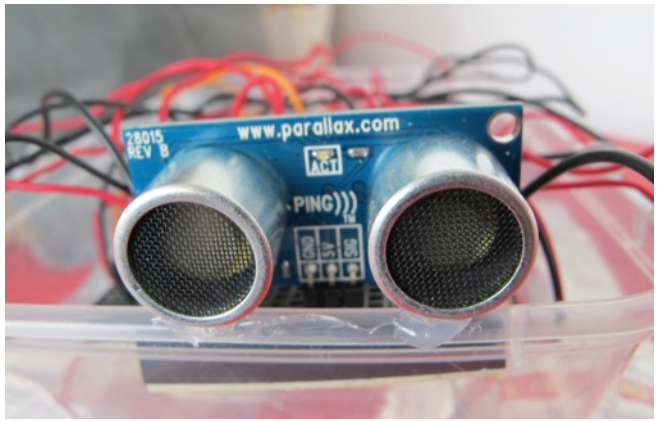
10. Build the same circuit for the second motor, on the breadboard

Note: You do not need to use a second battery.

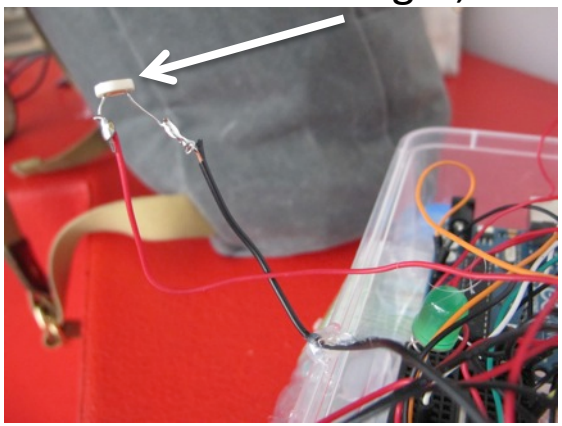


11. Add some sensors (get creative)

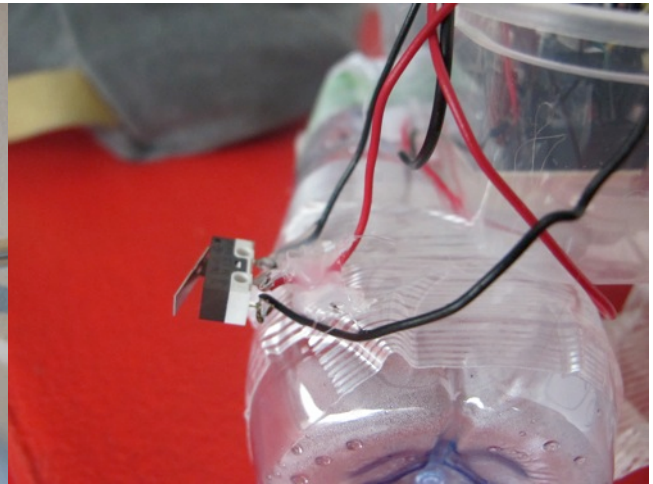
Ping Ultrasonic Rangefinder by Parallax
Works nicely



Photocells, can act like antennas, if you want a boat that steers towards light, for example



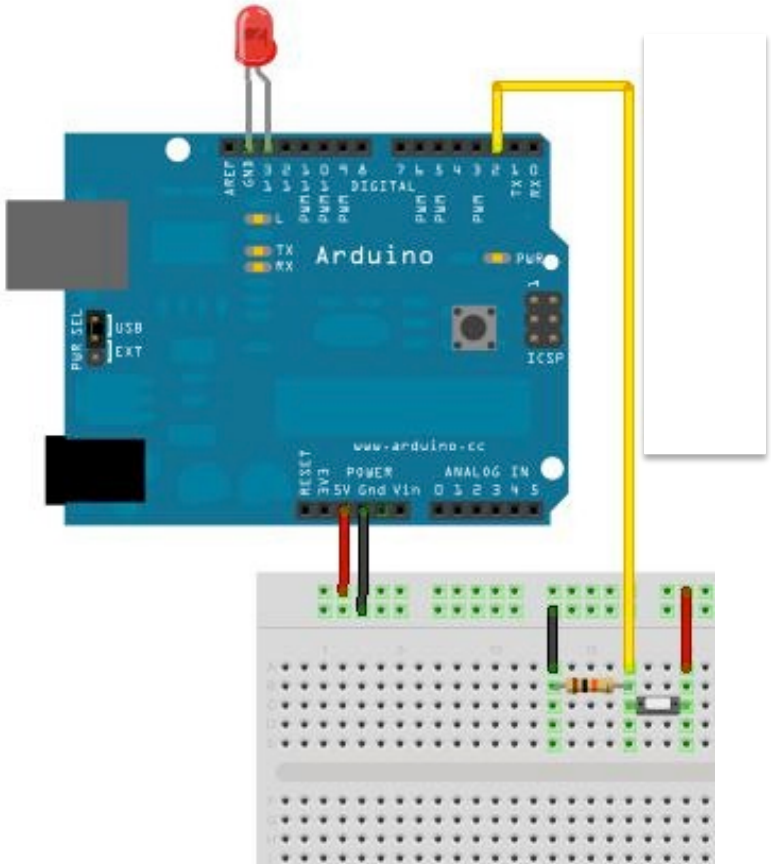
Infrared proximity sensor:
Detects short range obstacle



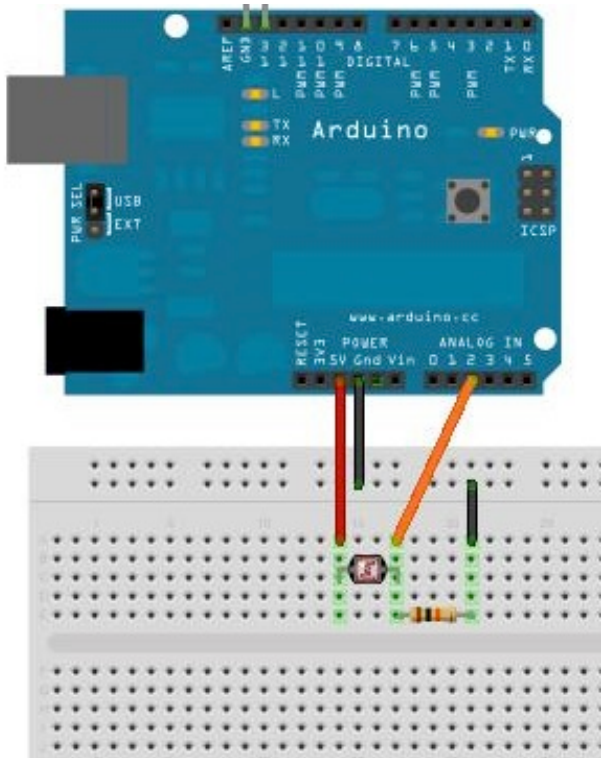
I'm a fan of two simple Switches, mounted on the Sides of the boat, acting as obstacle detectors

circuits for various sensors:

A simple button with a 1K resistor
(sample code: http://www.arduino.cc/en/Tutorial/button)

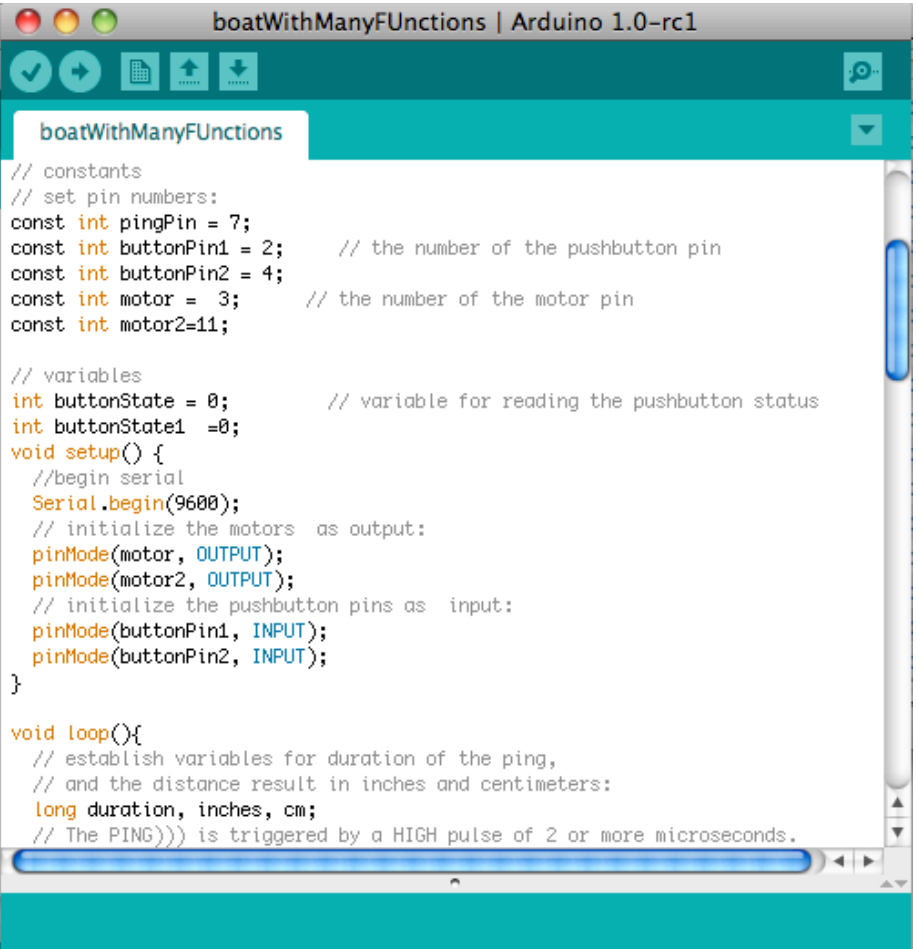


A photocell with a 1K resistor
(analog input example:
http://www.arduino.cc/en/Tutorial/AnalogInput)



12. Let's write some code

https://github.com/gabriella/boat-

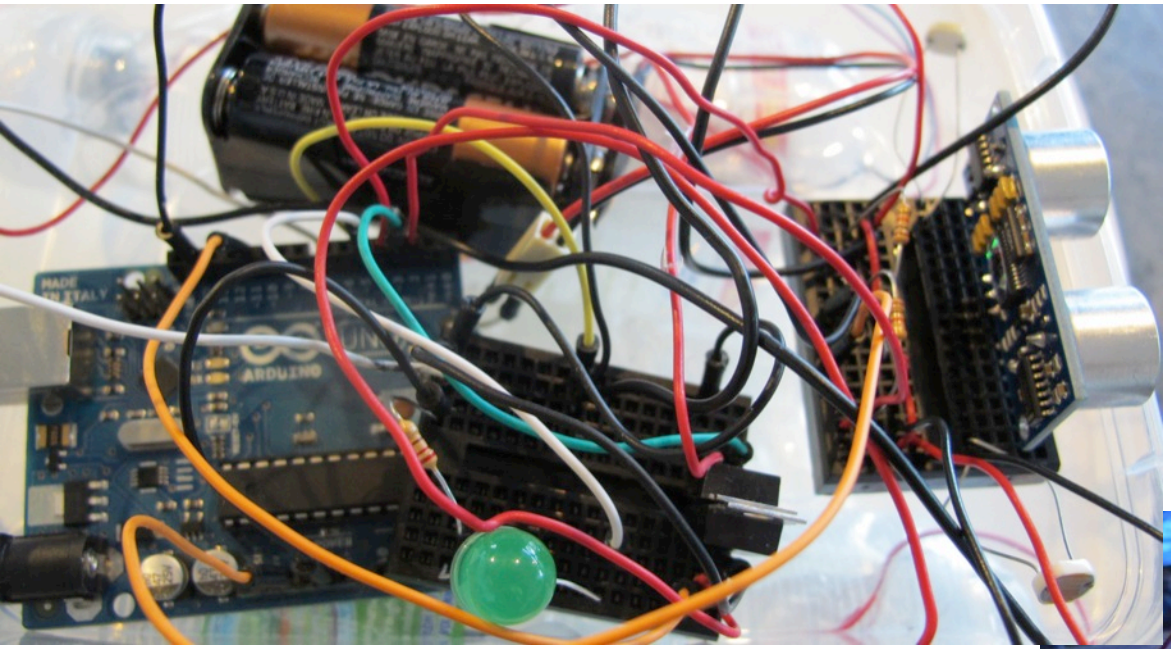


At the above github site, you can download some super simple premade code I wrote to Give the boat basic functions. There is code For a light following boat, and a boat with An ultrasonic range finder, with two buttons As edge sensors.

The way I have it operating is if the boat Approaches an obstacle ahead, it turns to Avoid it. If the boat hits something from the Side, it turns away from the barrier.

Now, let's modify that code! OR
Let's write our own!

13. Put your circuit and Arduino in the box

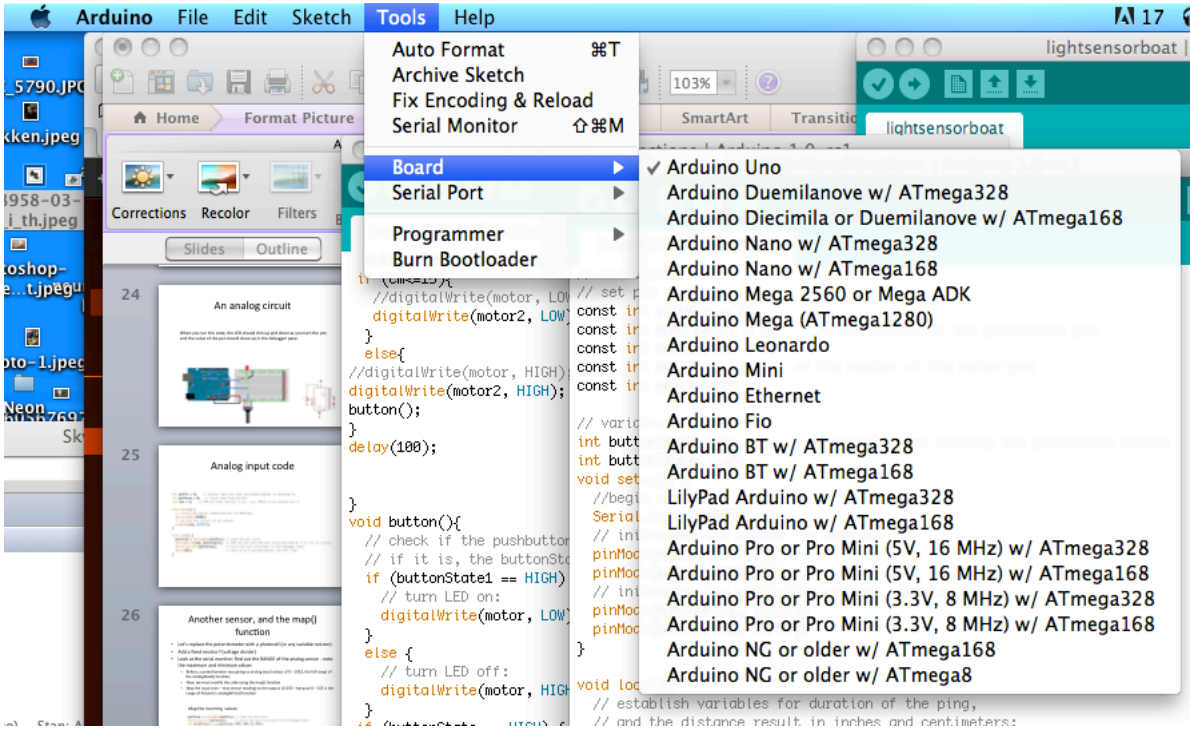


(my circuit)

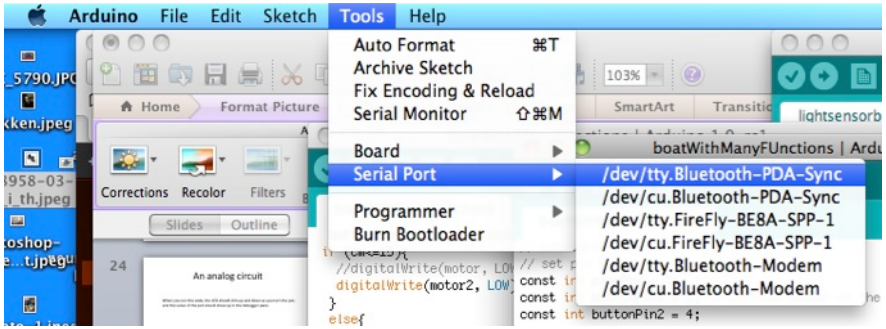
(my spaghetti monster)

14. Compiling and uploading the sketch

Select the correct board

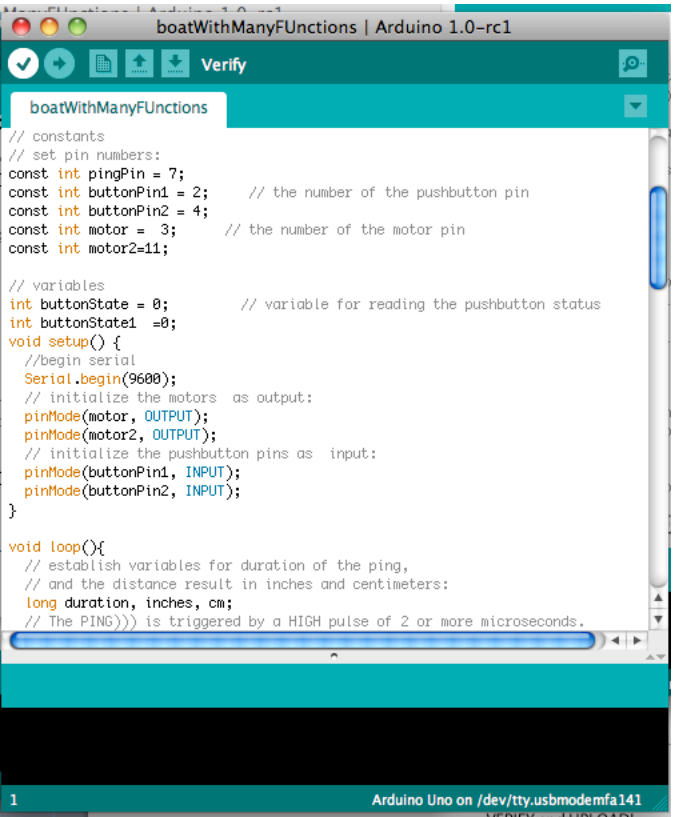


Select the correct serial port

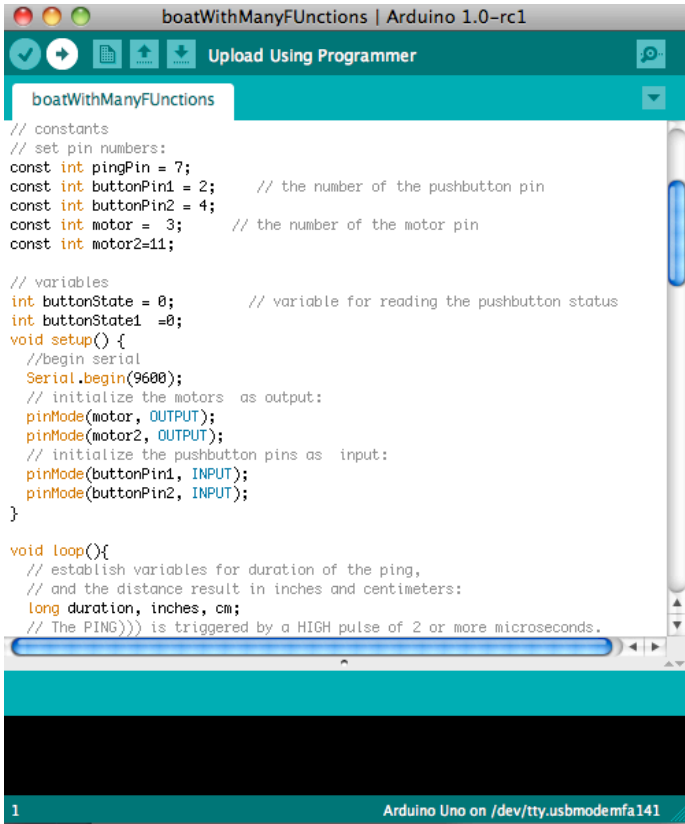


14. Compiling and uploading the sketch

Click Verify…



Click Upload…



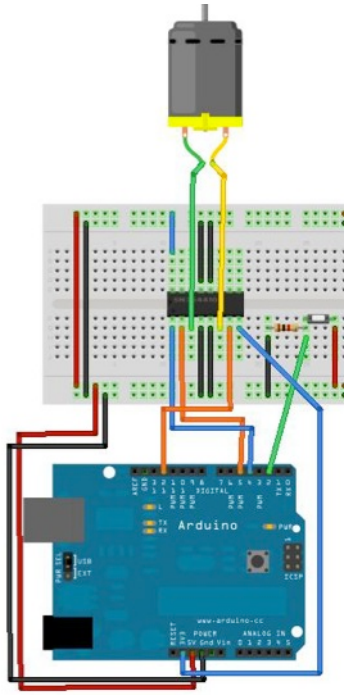
15. Seal up the holes, glue on the propellers, and let's test out the boat

Next Steps

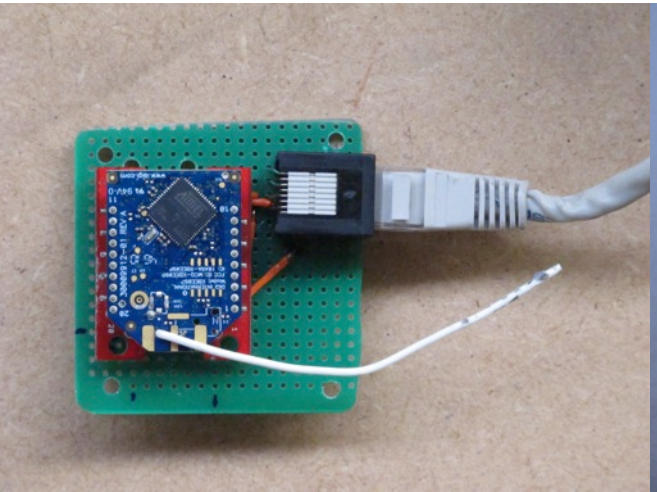
- Use an h-bridge (motor driver) so the motors can spin in both directions

(see circuit left and example code: http://itp.nyu.edu/physcomp/Labs/DCMotorControl)

- Go wireless! And make your boat R/C
- More waterproof!



(Xbee module for wireless Tx/Rx)



(below: motor driver)