

Dan's Robot #14 shall
be known as

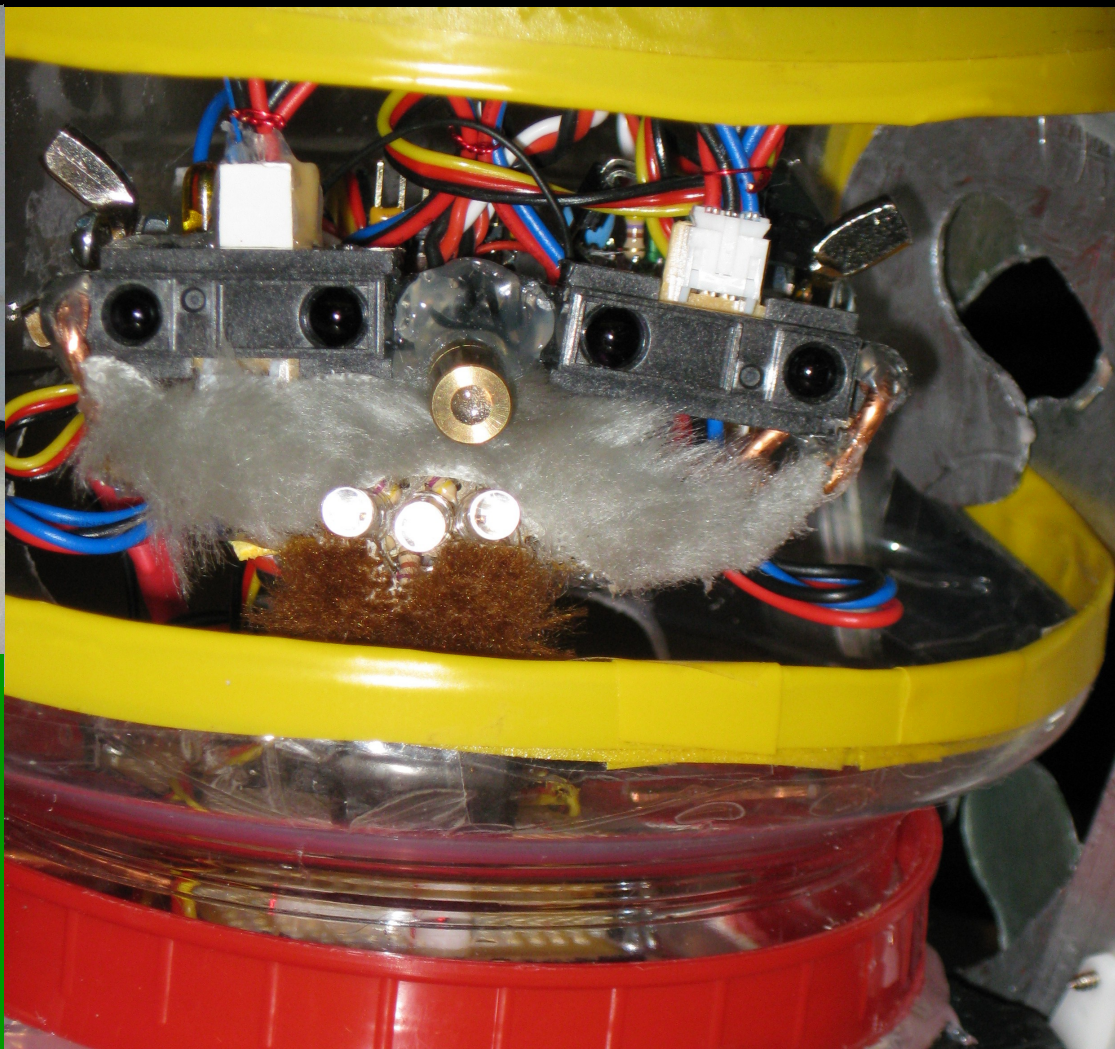
Jartron



Featuring

- Four legs!
- curly toes!
- six CDs!
- kindly face!
- LASER nose!
- multi-chromatic mouth!
- stereoscopic ranging vision!
- bias for action!
- protective head-gear!

Jartron the robot seeks distant places, but will take momentary interest in very close things. He is known to spontaneously perform LASER light shows and draw on the wall.



a product of

Imprecision Engineering: the impractical art of making things up as you go in imitation of actual craftsmanship; measuring only when necessary and then only in relative units of the object being measured; measuring the king's clothes in lengths of his arm.

TOOLS

USED:

- . soldering iron
- . wire cutters
- . Dremmel tool
- . hot glue gun
- . drill
- . Wits
- . Sweat
- . Tears
- . Fingers
- . Elbow
- . Amigdala
- . screwdriver
- . file
- . bolt cutters
- . pencil, pen
- . paper
- . iphone

PARTS: PUT IN:

- 6-CDs
- 1-Arduweenie
- 1-PC Board-RadioShack Cat#: 276-150
- 27 pin headers (3x 5 servos, 3x2 three wire connectors)
- 1-28 pin IC socket
- 2-servo connector wires, 3 wire double female
- 5 standard servos
- 2 infrared rangefinders
- 1 laser pointer
- 1 PNP transistor
- 11 150 ohm resistors
- 1 270 ohm resistor
- 3 tricolor LEDs (RGB) common cathode
- 1 LED any color
- 1 plastic jar-the kind that once held 5 lb of liquid barley malt for making beer, or a 100 CD container
- 1 one inch by 2 feet (or more) strip of aluminum
- double sided foam tape
- 2 three AAA battery holders
- 6 AAA batteries
- 1 on off switch
- 3 5v Voltage Regulators
- 4 1 uf capacitors
- silver paint
- nuts and bolts

Part 1:

The Mouth, Eyes, Nose, Mouth :

The head electronics were assembled on a piece of perf board. Doing this again I would use another Radio Shack small circuit board for the convenience of the solder pads and they are just the right size.

Each LED got a 150 ohm resistor between it and the arduino

Two of the 3 pin headers are used to make connections for the 4 leg servo signals wires and the power supply v and ground.

The Arduino pins are connected like this:

<u>Pin</u>	<u>Prog</u>	<u>Item</u>
2.	Digital 0	Right Green LED
3.	Digital 1	Middle Green LED
4.	Digital 2	Neck Servo
5.	Digital 3	Right Red LED
6.	Digital 4	LASER
11.	Digital 5	Left Red LED
12.	Digital 6	Middle Red LED
13.	Digital 7	Open for expansion
14.	Digital 8	Green Signal LED
=====		
15.	Digital 9	Left Blue LED
16.	Digital 10	Right Blue LED
17.	Digital 11	Middle Blue LED
18.	Digital 12	Left Green LED
19.	Digital 13	the built in LED
23.	Digital 14	Left Rear Leg
24.	Digital 15	Right Front Leg
25.	Digital 16	Right Rear Leg
26.	Digital 17	Left Front Leg
27.	Analog 4	Left Eye
28.	Analog 5	Right Eye

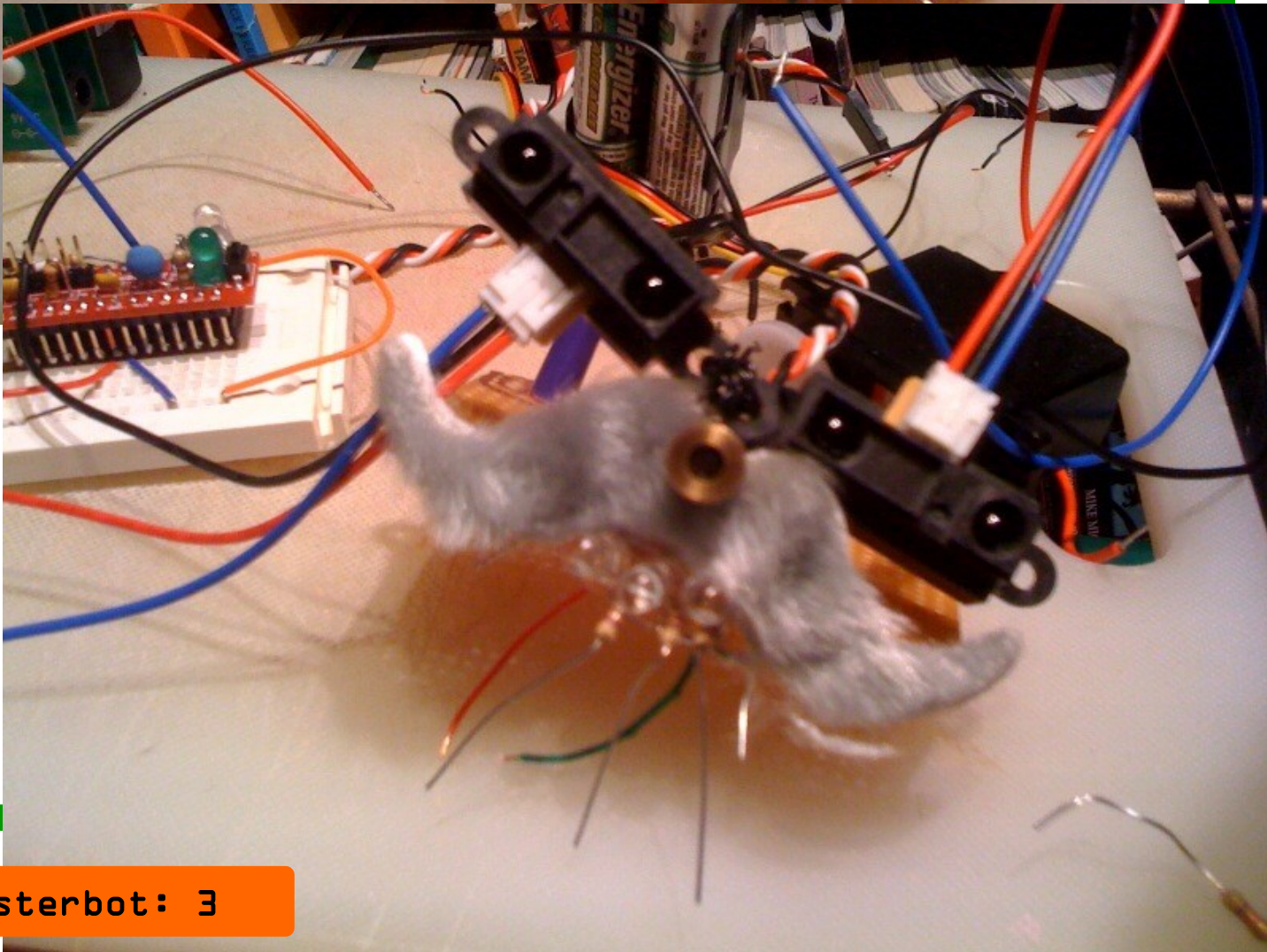
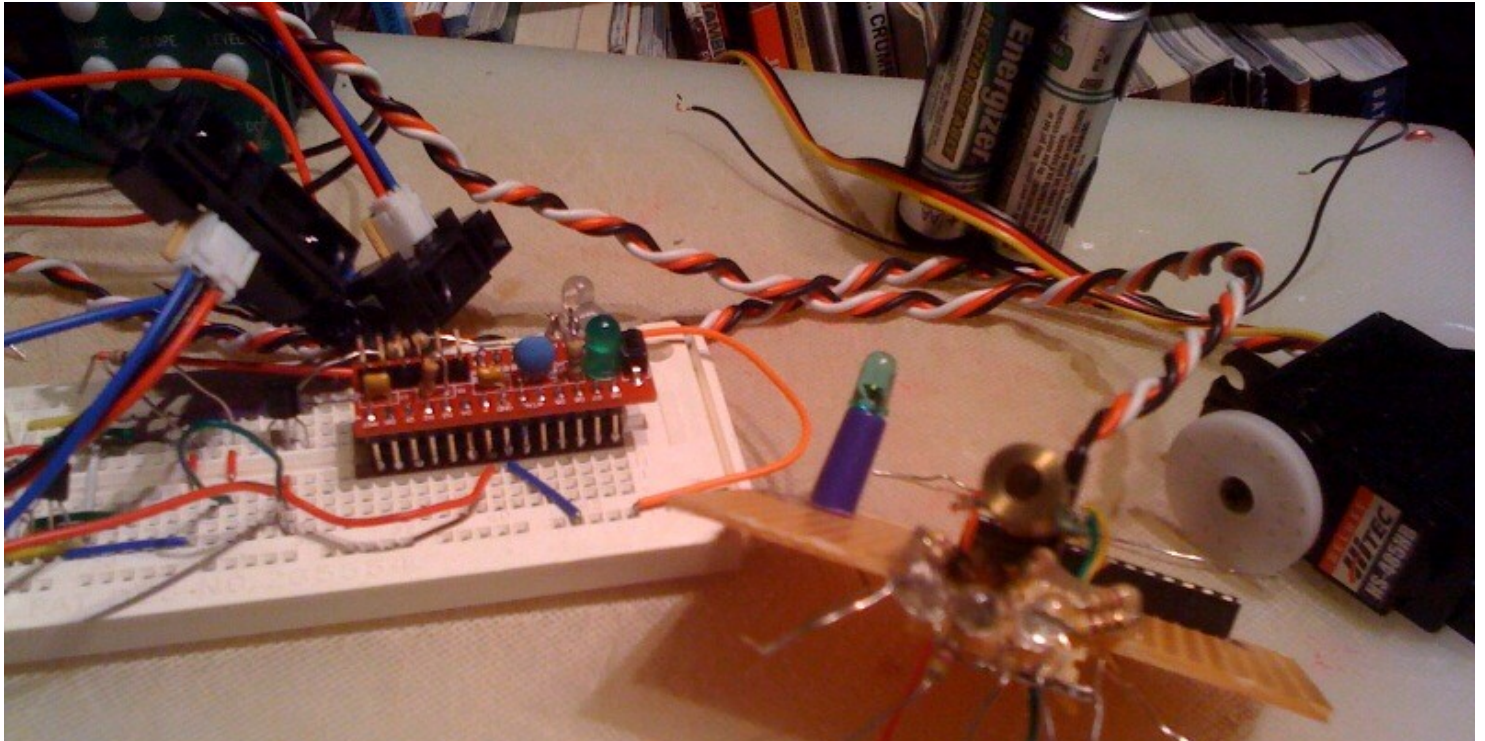
Step 1:

Soldered each part to each Arduweenie pin on the 28 pin socket as listed here.

The 5v Regulators are where ears would go.

Wingnuts go on the regulators as heat sinks and because and because wingnuts are like robot beauty marks. One regulator is to power just the neck servo, the other is to power the Arduweenie and the sensors.

notice the plastic stand for the green LED—this puts it at a relative height and position to match the green LED on the Arduweenie. These two are meant to mirror each other alternately blinking out the metabolic rhythm.

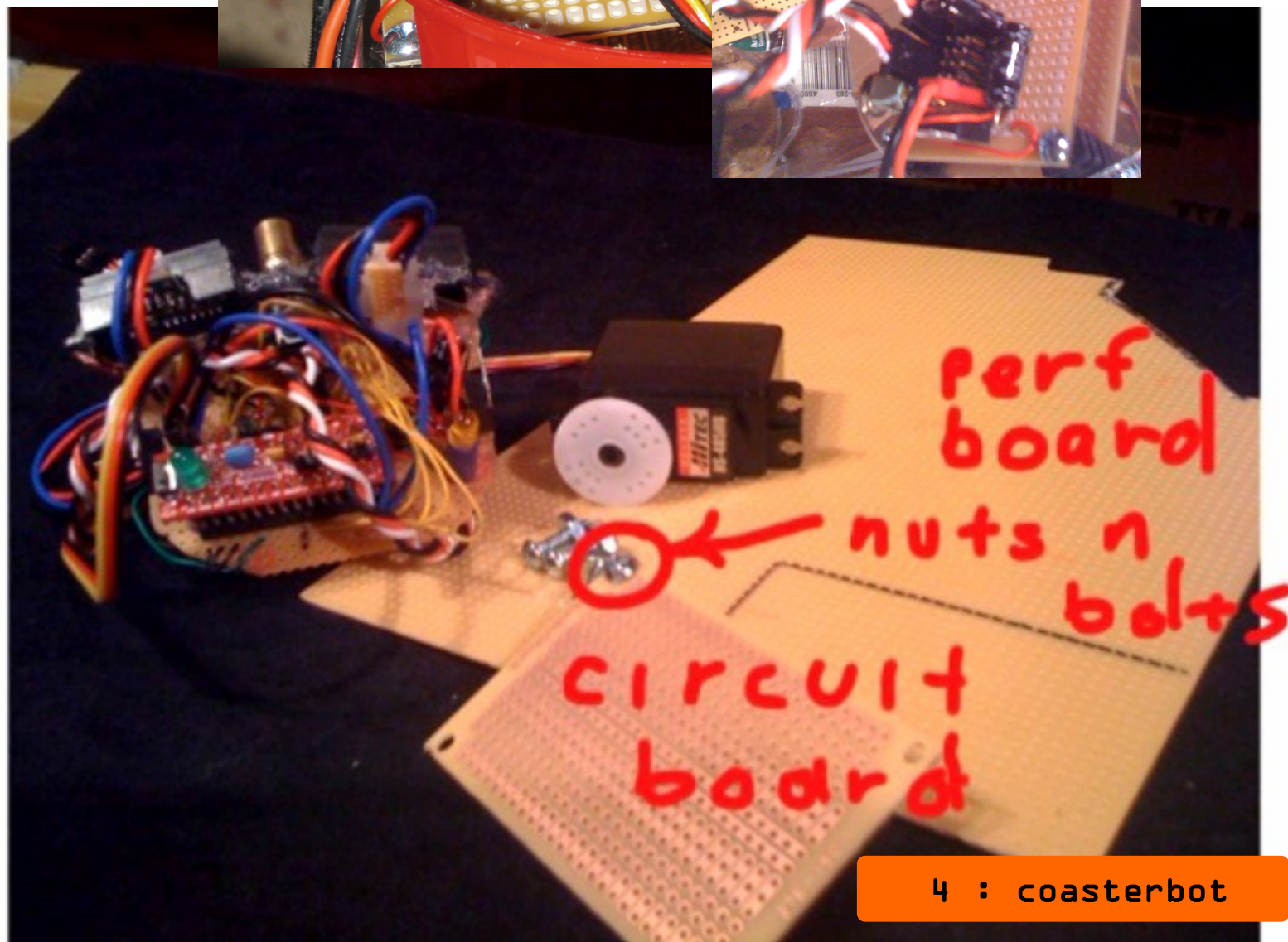
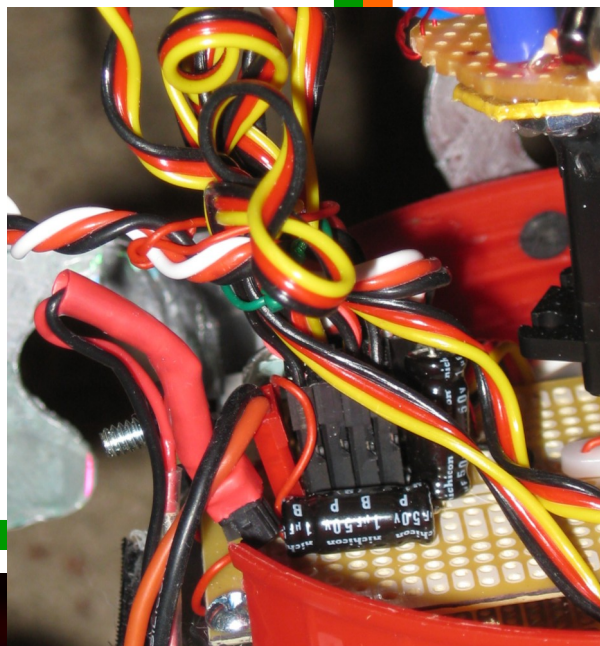


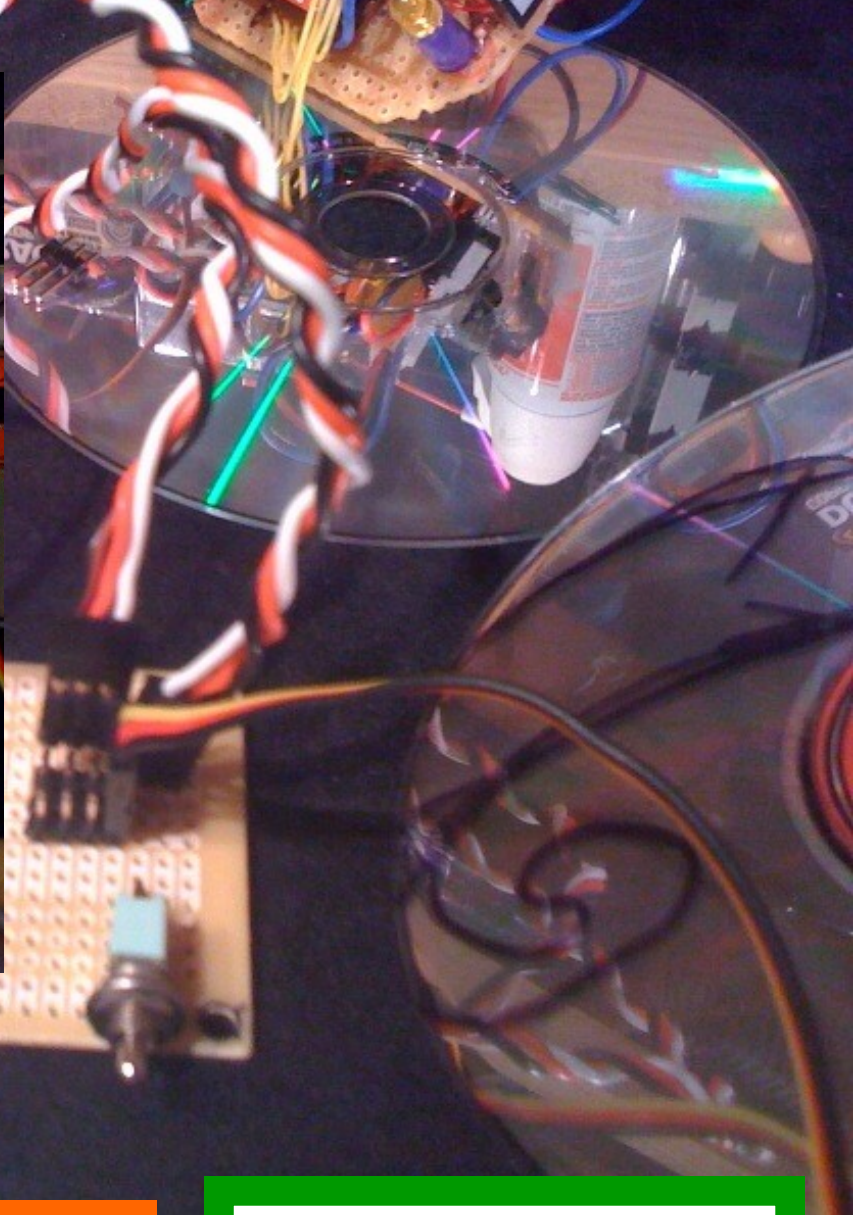
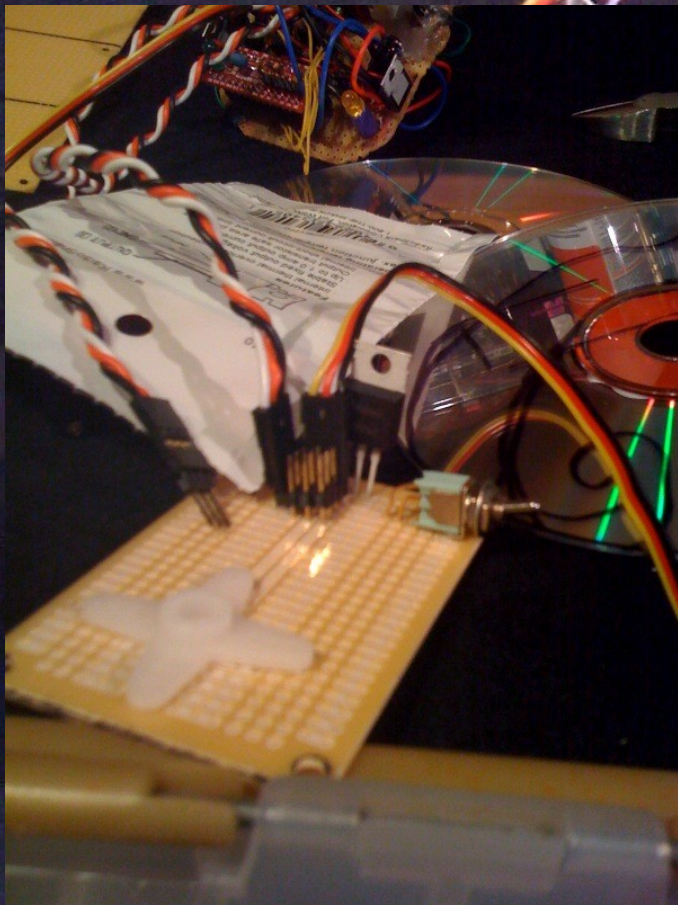
Part 2

The Servo Connectors

On the head circuit board, one 3 pin header carries 3 of the leg signals. the other 3 pin connector carries the fourth pin, ground and voltage.

On the circuit board for the legs, the 3rd voltage regulator is added for the 4 leg servos. Found a side mounting on/off switch, connected it between the power supply and the input to the regulator. Added a 1 μ f capacitor between ground and the regular input and another 1 μ f capacitor between ground and the output to smooth the power supply for the arduino.





The laser is triggered via the transistor. The transistor base has a resistor in series connecting it to the arduino pin. The resistor limits the voltage and current. There is another resistor limiting the 5v arduino supply power to the 3v max that is ok for the laser power supply. The anode and cathode of the transistor are connected in parallel with the terminals of a push button switch that's on the laser.

Part 3

Neck and Leg Servos

used foam tape to connect the four leg servos to the body CD. Reinforced with hot glue.

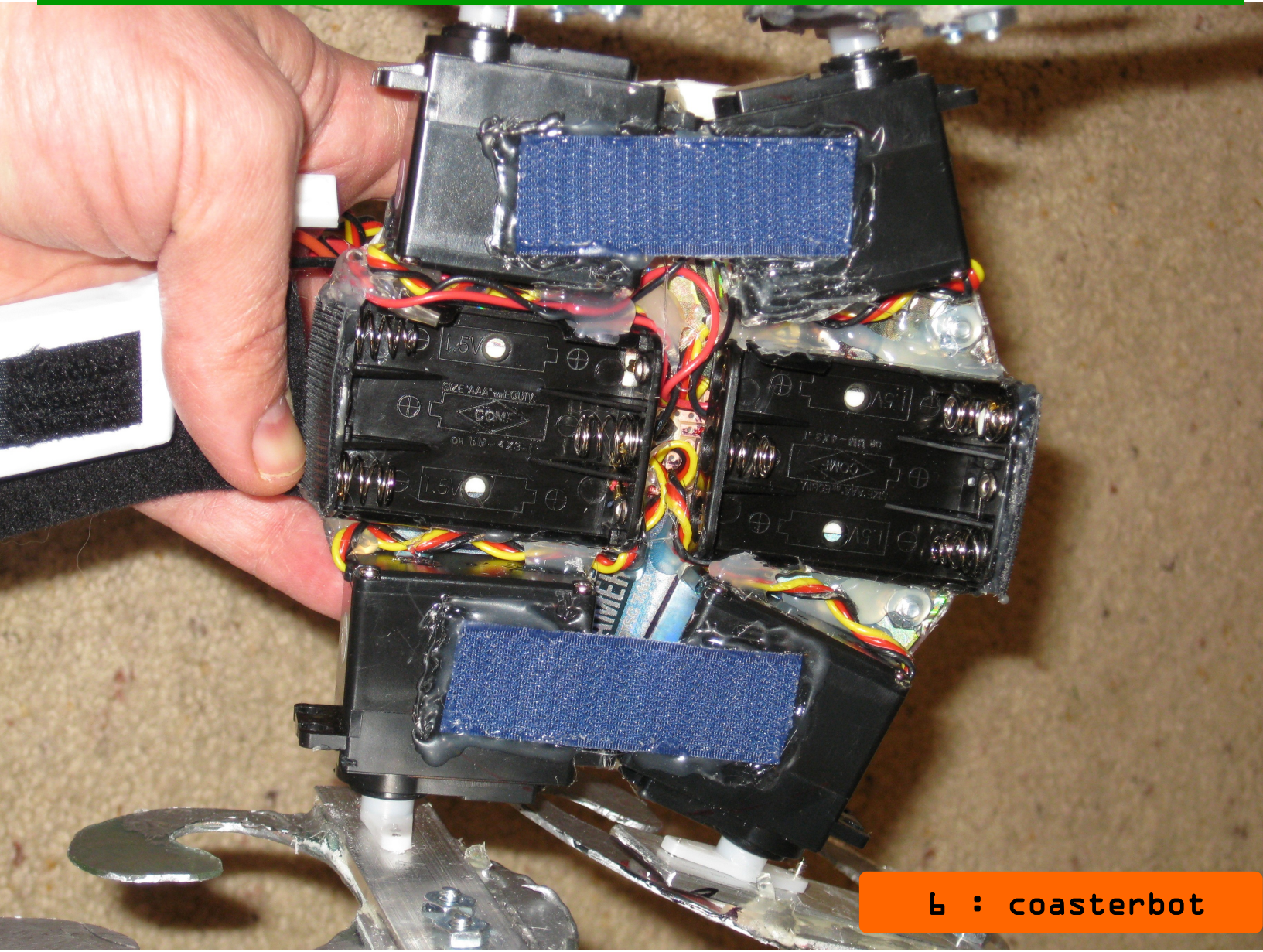
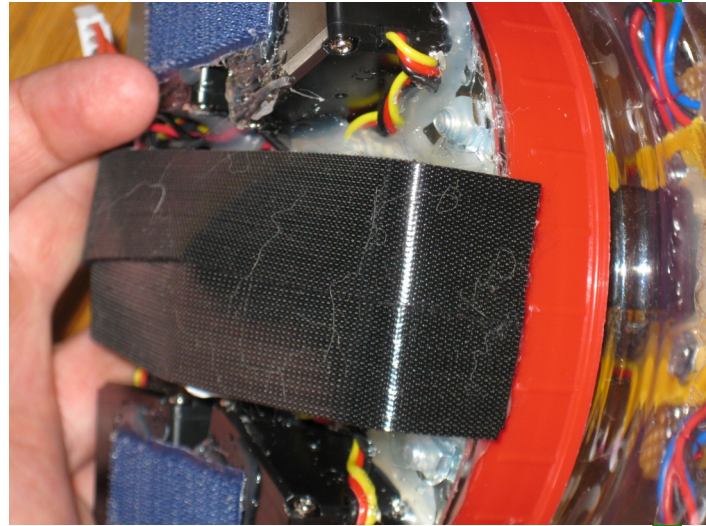
Glued the neck servo to the base circuit board with a servo horn, then threaded fine wire to lash it down.

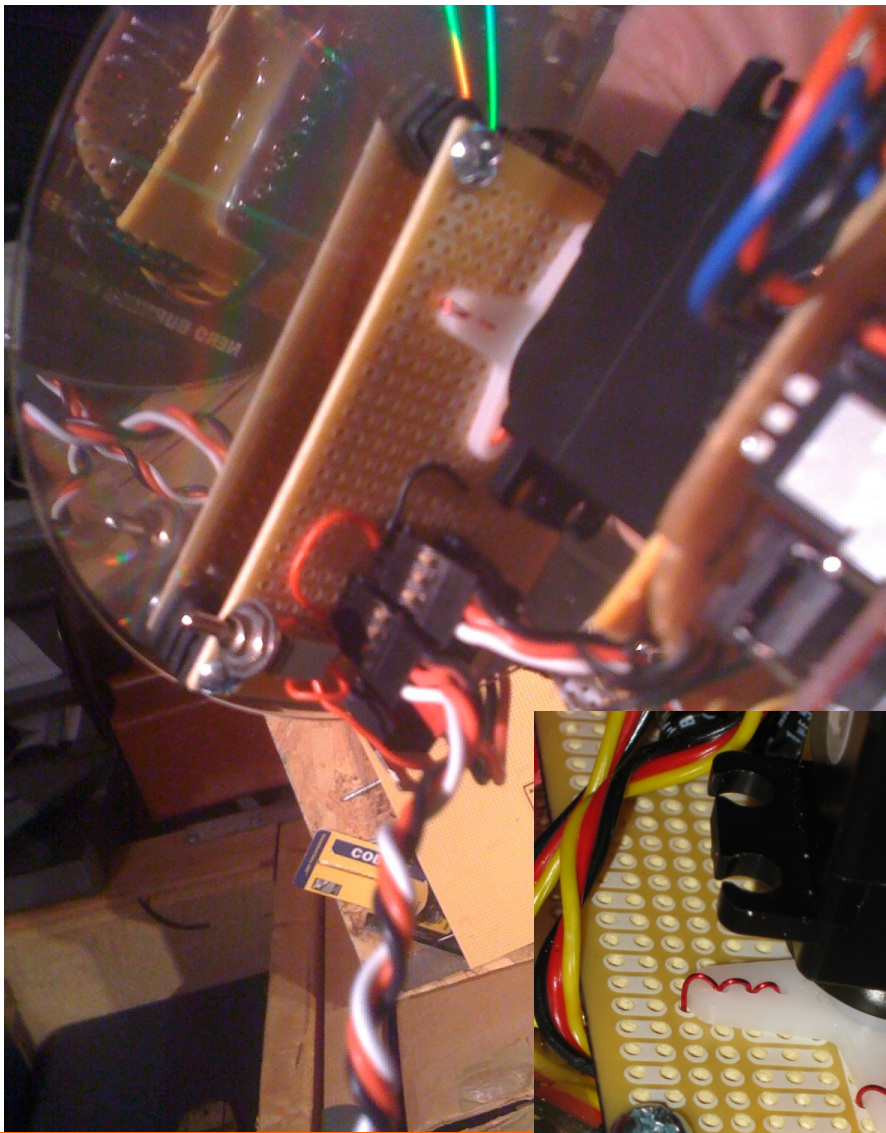
The Underside

The four leg servos and the two 3xAAA batter packs were foam taped and positioned on the body CD, then glued into place. The wires from the 4 servos and from the two battery packs are run up through the hole in the CD.

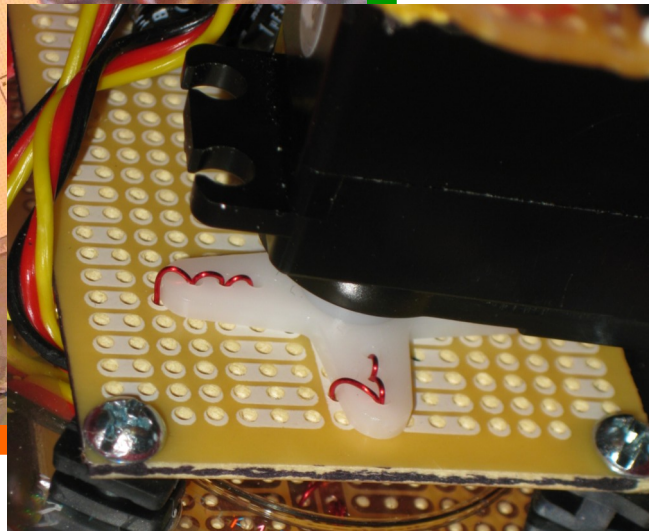
The back legs are positioned to aim directly forward to backward. The front legs are positioned at a slight outward angle.

Velcro strips were glued on across the front to back servos pairs to add tension (the CD flexes a little) and to allow an undercarriage CD to be stuck on as a battery cover. Velcro was also glued to the ends of the battery packs so that Velcro strips could be run across the bottom.





The base circuit board is attached to the base CD with four nuts and bolts. Holes are drilled in the CD and servo spacers are used to space the circuit board a little off of the CD. Besides leaving room for the solder and pins on the bottom of the circuit board, it allows room for the Servo and battery wires to header pin hub at the back where everything connects to the base circuit board.



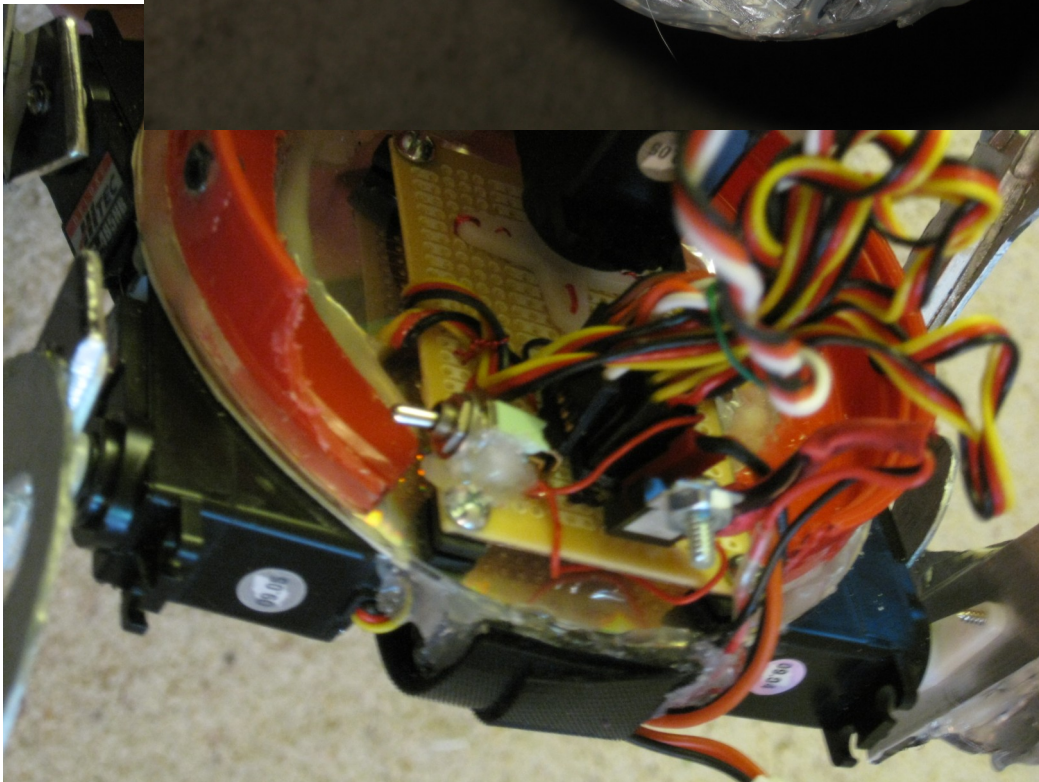
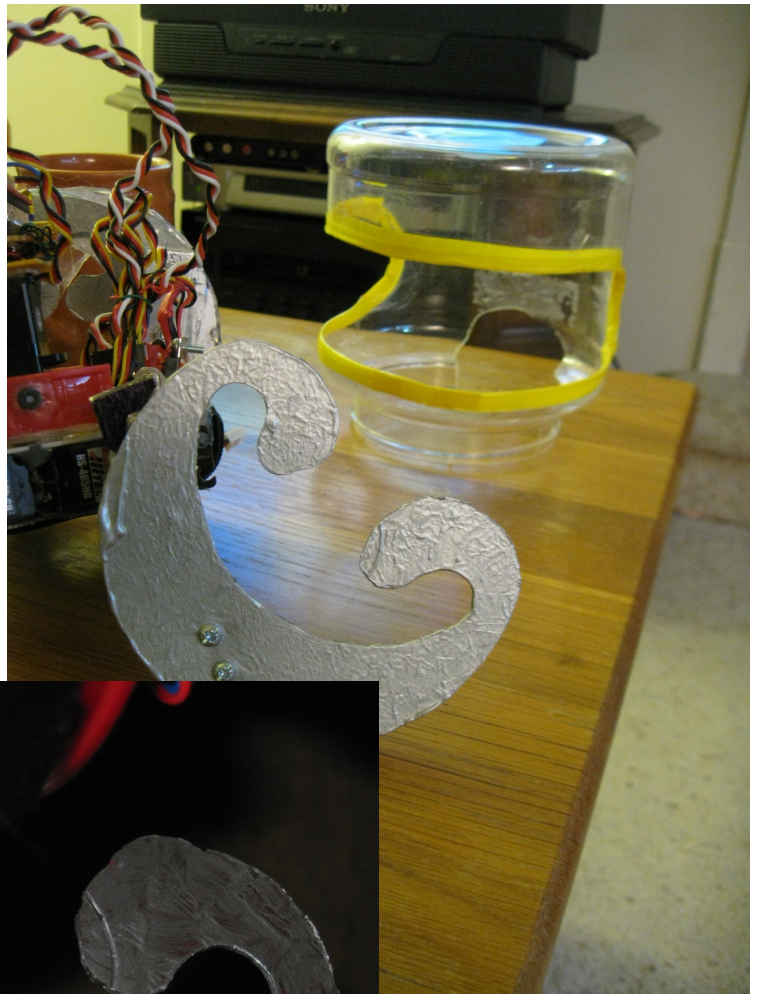
Four lengths of aluminum strip were cut with bolt cutters, and drilled for servo horn screws to attach them.

On the circuit board for the legs, the 3rd voltage regulator is added for the 4 leg servos. Add the on/off switch, connecting it between the power supply and the input to the regulator.



The CD legs

Two more holes were drilled into the aluminum strips for bolting on CDs. Foam tape was used to place the CD on the aluminum in the optimal position. Then I drilled holes and bolted them together and added some hot glue to keep the bolts from slipping and to remove the play introduced by the foam tape.

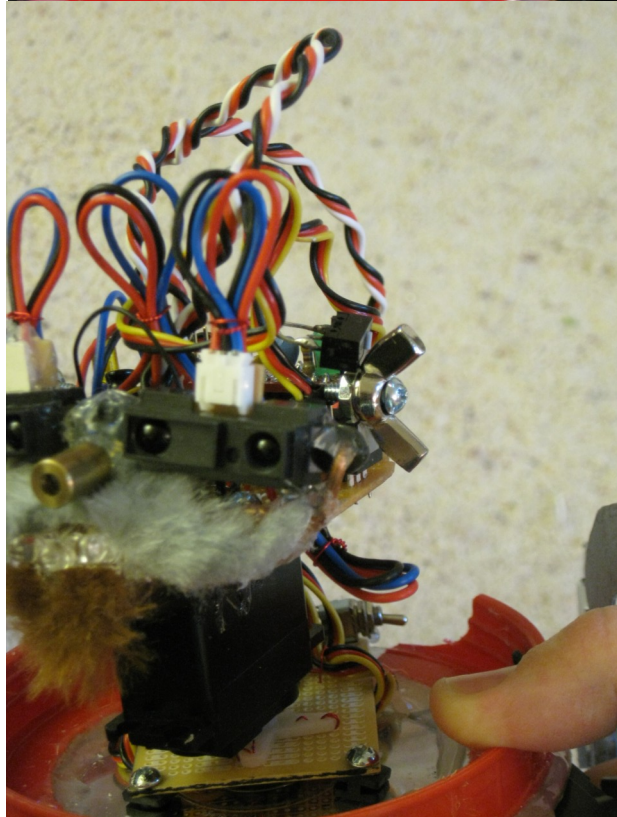
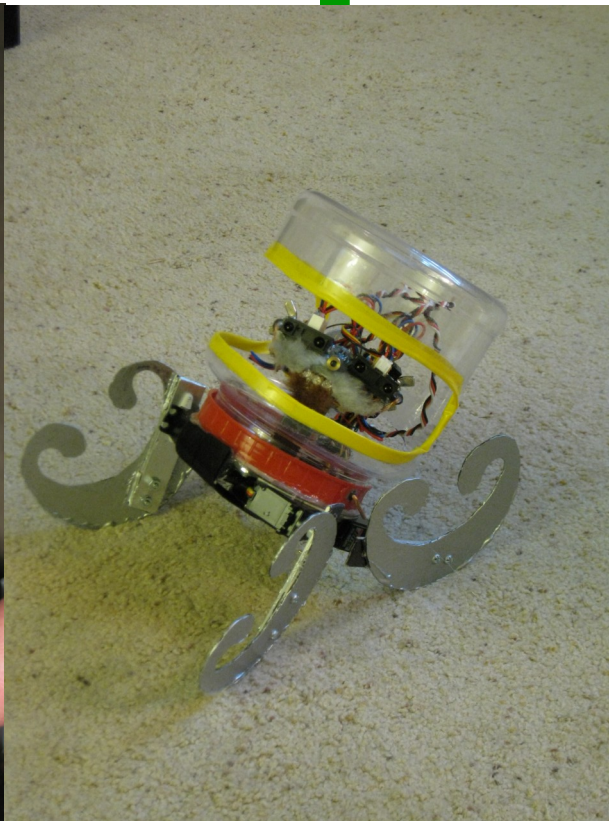
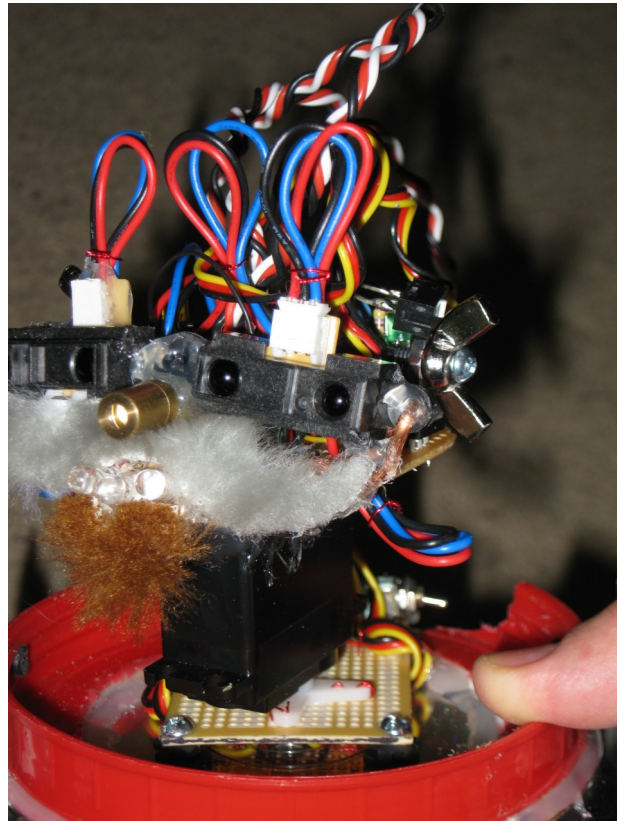


Put it all together

The red jar lid was cut out, bolted and glued to the body base (D).

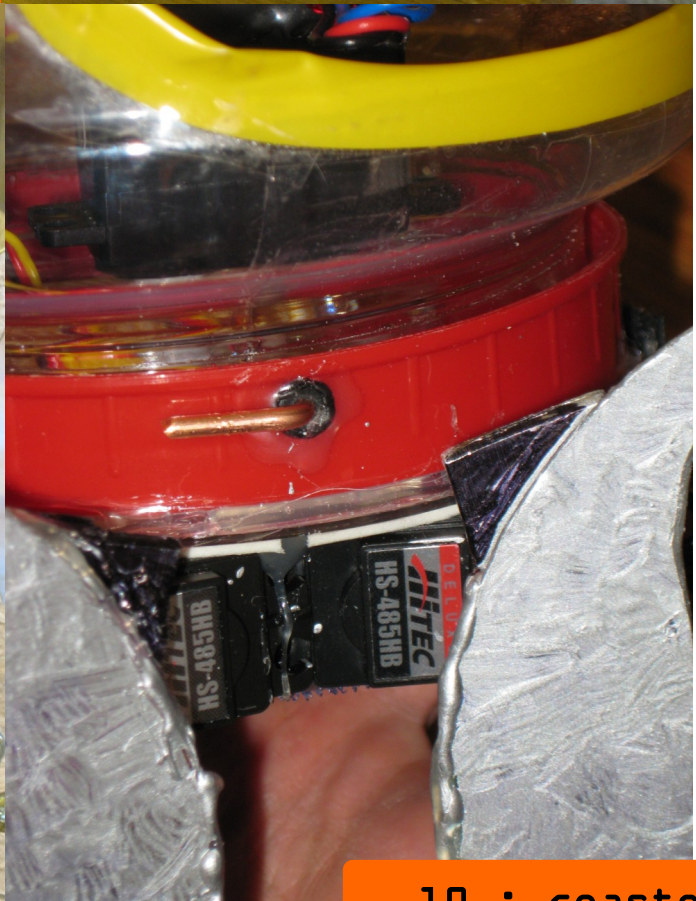
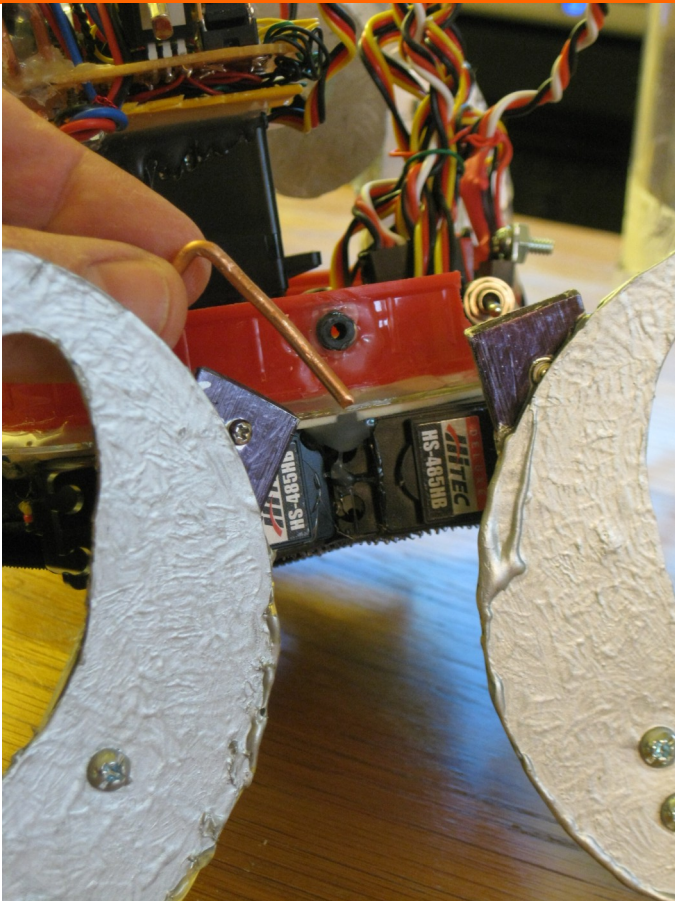
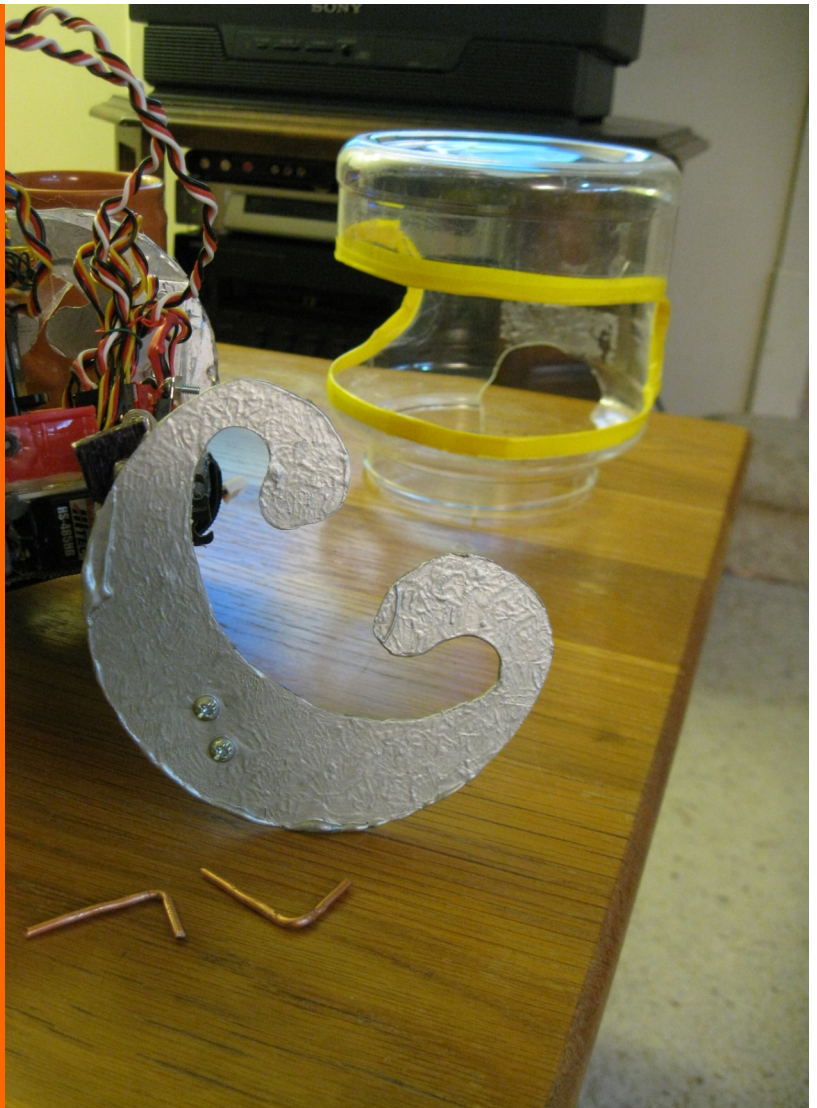
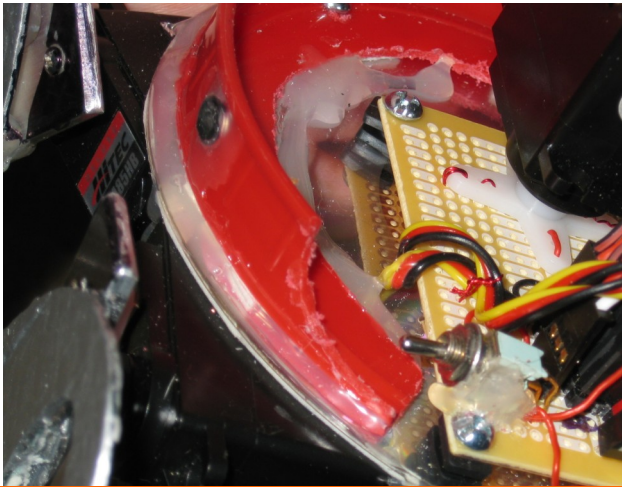
The CDs were cut with a Dremmel cutter, then smoothed with a grinder and painted. The shape was sketched a time or two, then hand drawn with a sharpie and somewhat ad lib cutting. The first CD was used as a template for the other 3. CDs are better than DVDs. Those dual layers tend to split and break. Painted with silver hobby paint. Some hot glue along the edges gives the front

feet a bit more traction.



the headgear

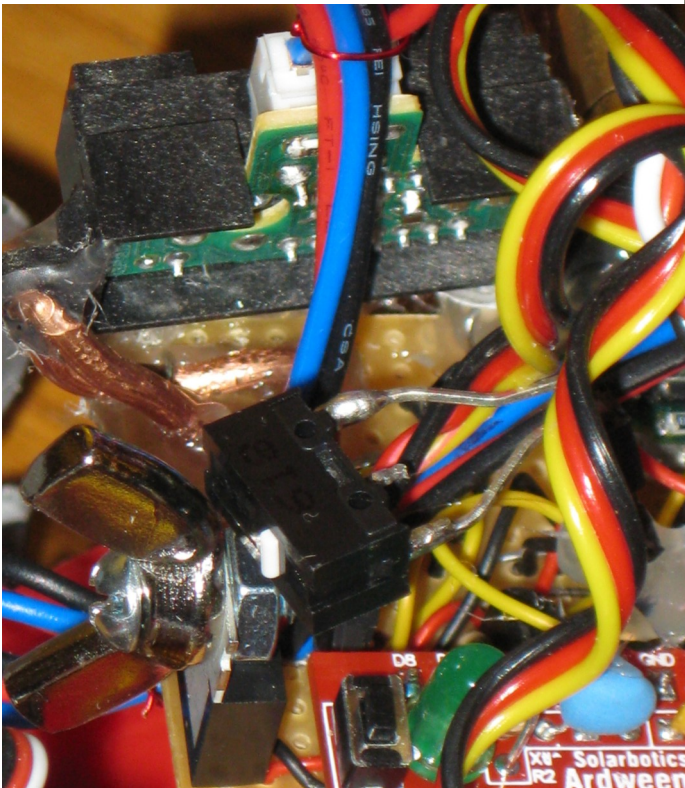
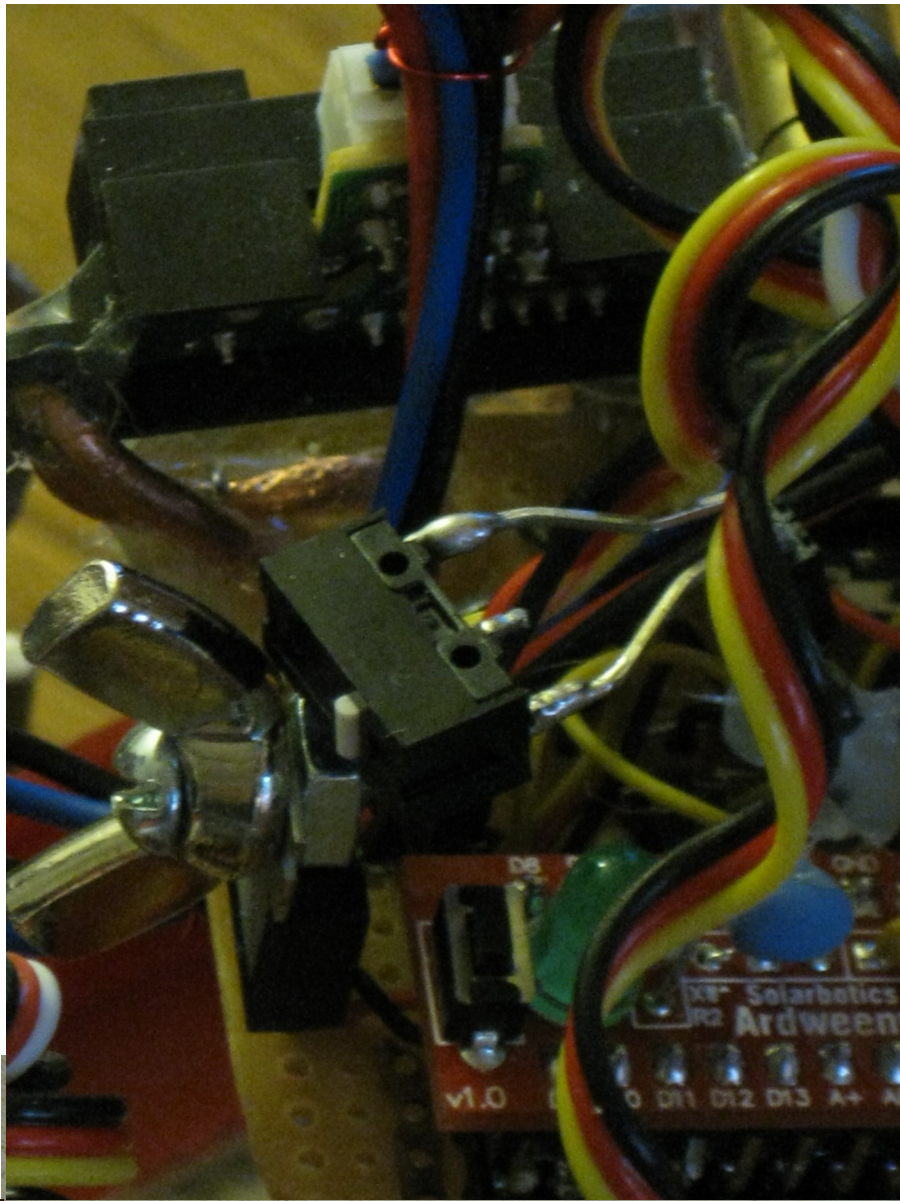
comes off for access to the circuit, another sensor could be added. While removable, the headgear is also strong enough to use for picking it up and to protect it from a fall off a tabletop. 12 gauge wires were stripped and bent to act as pins. Rubber servo grommets hold the pins.



programming

I had constant trouble programming the arduweenie until I added a switch which disconnects the ground and effectively removes the arduino from the circuit.

Wingnut ears on voltage regulator heat sinks are like robotic beauty marks.

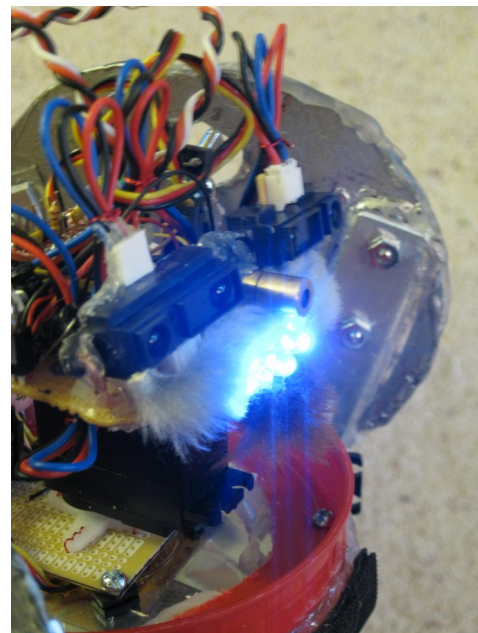
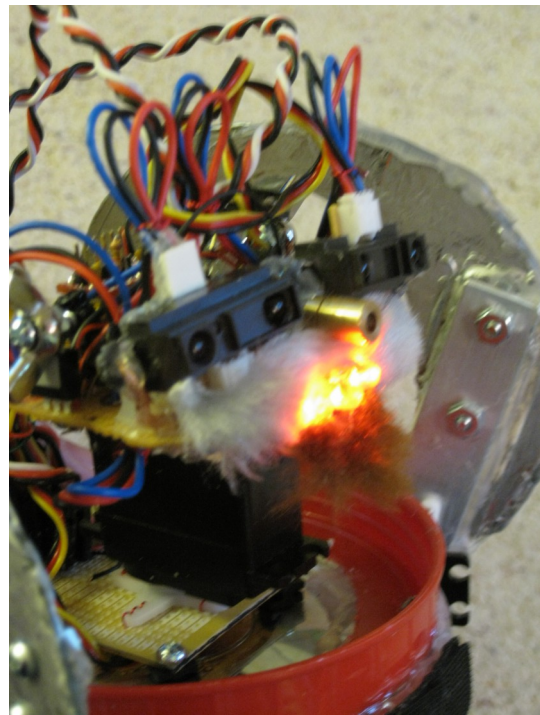


Part the last

I spent too long with programming errors and about 10 to 1 failures to program the firmware until I added the programming jumper switch.

As is always a good practice, I first developed simple test routines for each part, LEDs, servos, sensors.

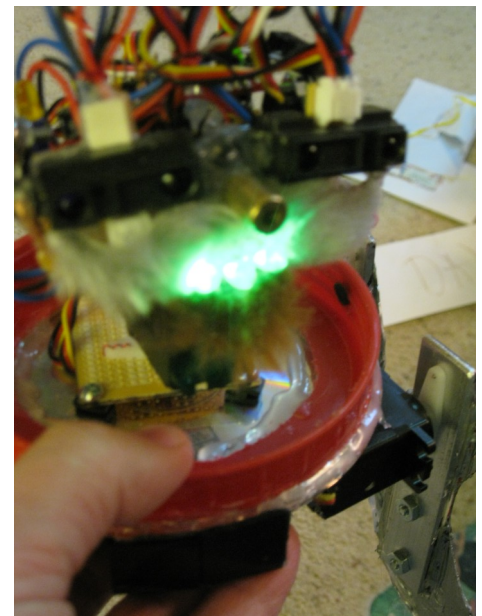
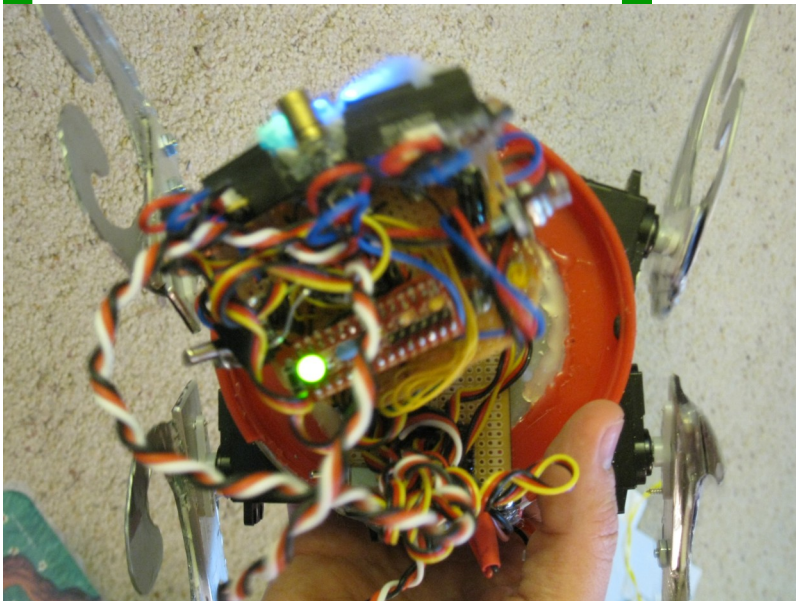
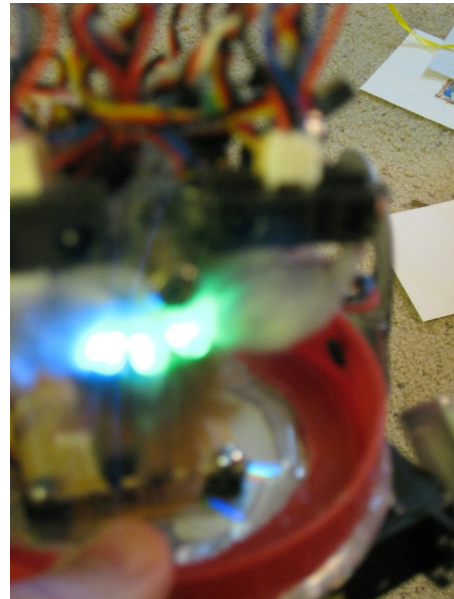
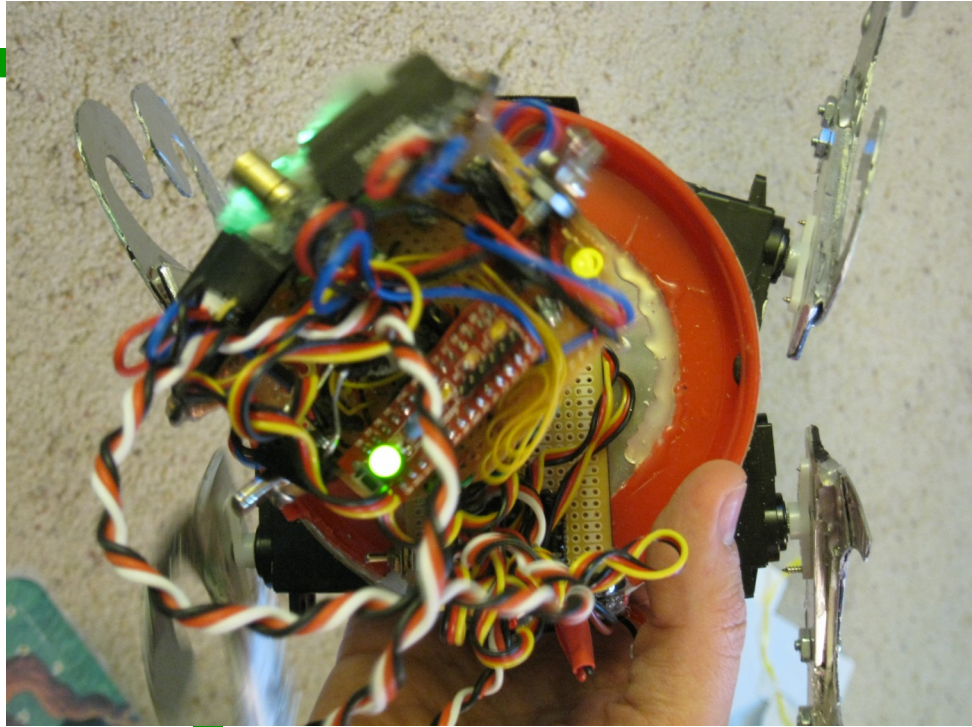
To have everything running concurrently, I relegated all timing functions to being in countdowns inside of loops which update every cycle.



Part infinite:

programming four legs to walk, coordinated but alternating, synchronized but individually sequenced is hard to do.

They have to move at the same time but in different directions with different initiatives. A propeller microcontroller is probably a better choice than an arduino.



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2 for 1

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**Scheming
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