Making a Robot Room Guard shrimp

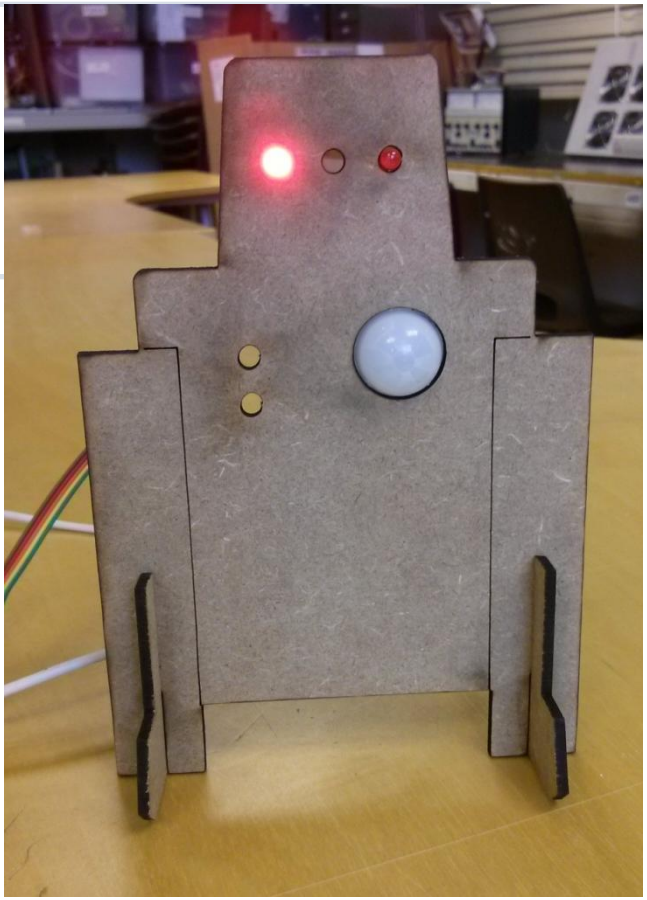
Is your brother or sister always sneaking into your room when you're not there? Wish you could have someone to keep an eye on things and warn you when they do?

That sounds like a job for:

Guard-a-tron 3000.

Build your own robot to stand guard over your room and sound the alarm if anyone tries to sneak in.

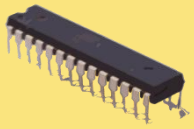
A shrimp is a small computer made by you from individual components. It can do all sort of things, similar to a Rasberry Pi or Arduino only more cheaply.

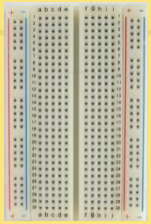


Step 1 – What you'll need to start your Robot Guard

These are the basic building blocks for our Robot kit to make our mini computer. We'll tell you about each of these in turn in the next pages.

The Shrimp





The Breadboard

This is a simple way of connecting wires without needing to solder. It has metal grippers inside which join the holes along each row. To use it simply slide in your wires straight and firmly. Each hole has a grid reference: letters along the top, numbers along the side, and we'll be using these to help you place components correctly.

A resistor

A capacitor

A quartz crystal

2 LEDs

A connector

A PIR sensor

PIR sensor
A passive infrared sensor measures infrared light radiating from objects in its field of view.

A piezo buzzer

Lots of wires

Top tip: Wire colours don't really matter, but are just to make life easier for you as you follow the instructions!

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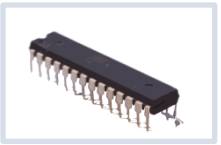
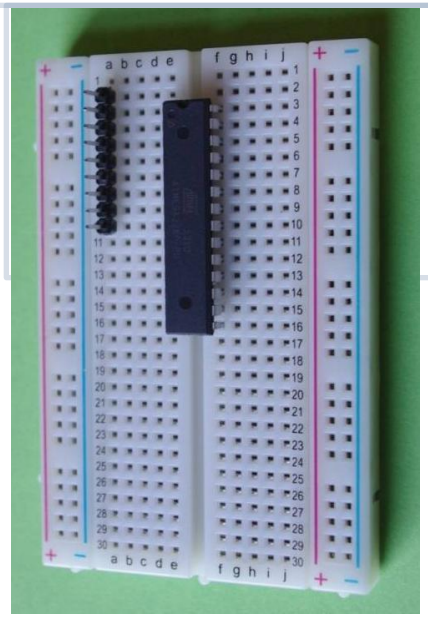
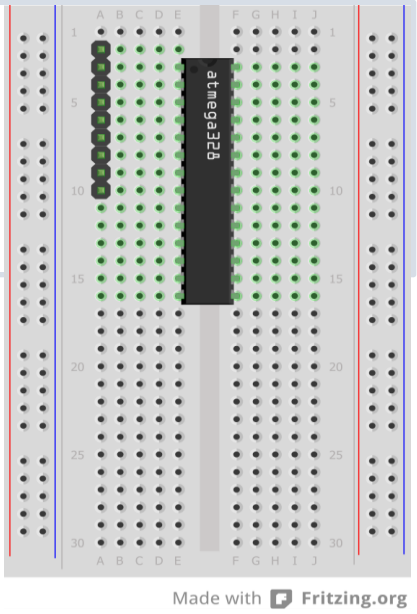
Step 2 – The Chip and connector

The chip is the brains of the computer, the same as in any computer.







1. Insert the chip into the board. Once you get the pins in the holes, place a finger on each end and firmly press it down till it sits touching the bread board.
2. Insert the connector into the board. You'll also need a firm push with this one.

The connector is a simple way of attaching the wires which will let us program our computer.

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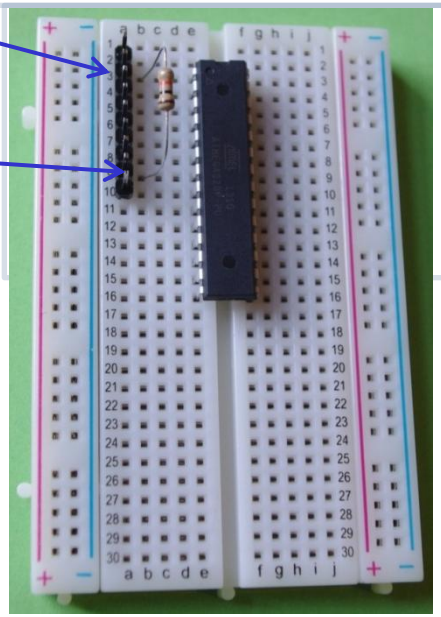
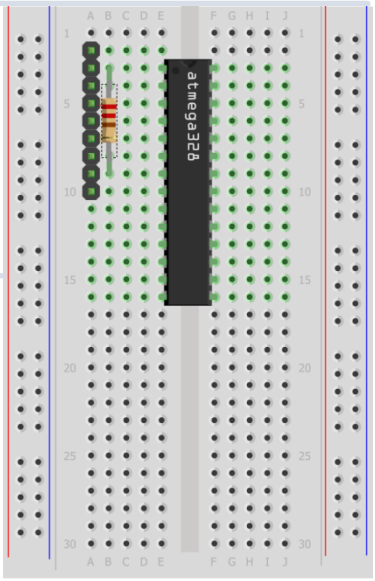
Step 3 – Adding a resistor





1. Bend the resistor into a rainbow shape
2. Put the ends into holes B3 and B9 (you can see the location on the picture too)

The resistor does what it says, it is a material that resists (or stops) current (electricity). This means it just lets a little bit through so that the components are not damaged by too much power.

You can see that this will connect two pins of the chip together, to begin to form a circuit

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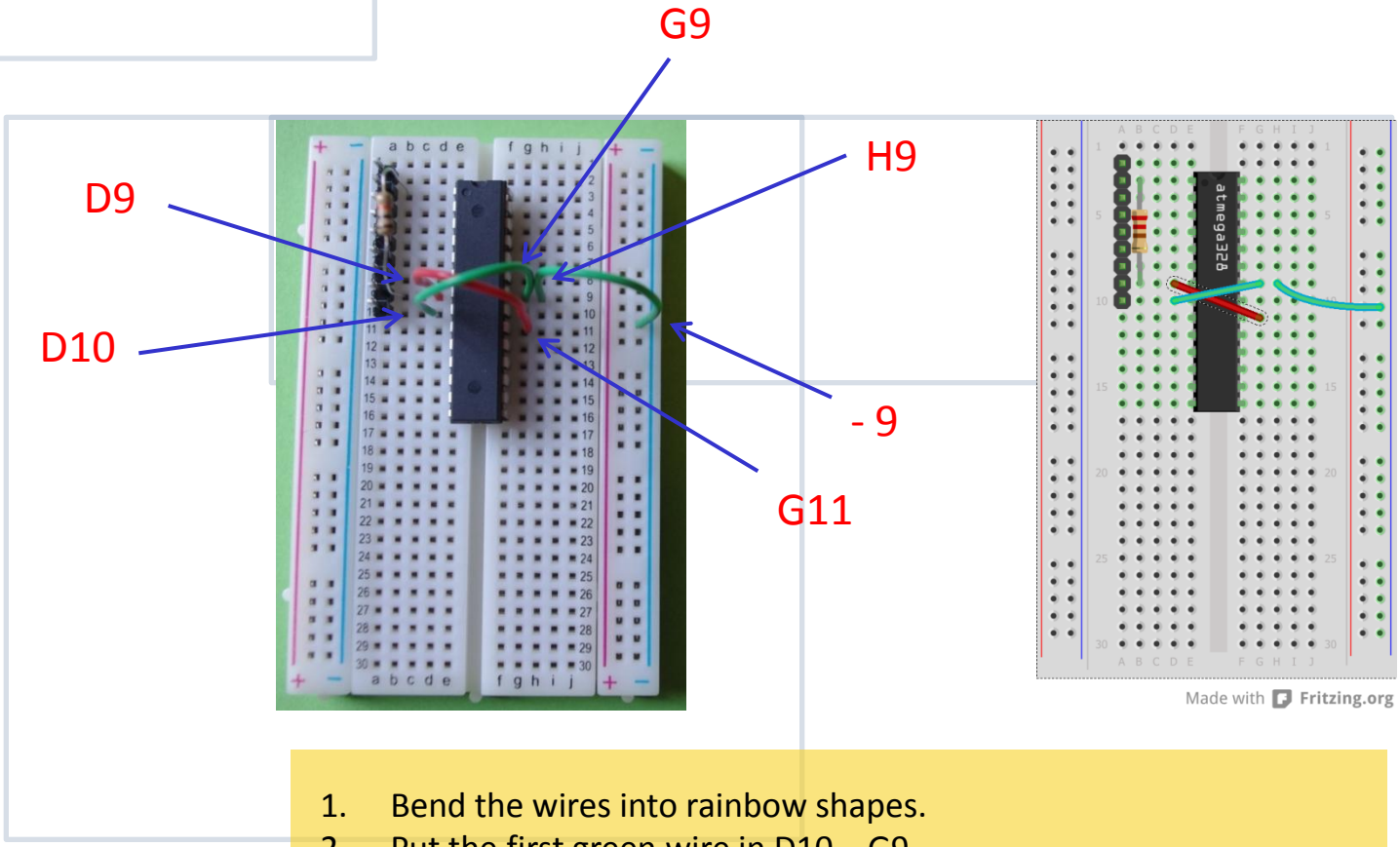
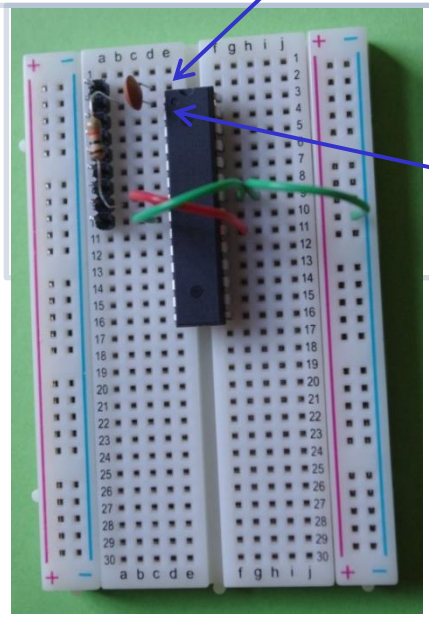
Step 4 – adding wires!

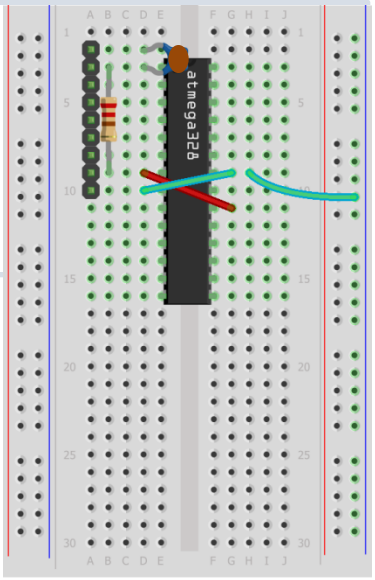


1. Bend the wires into rainbow shapes.
2. Put the first green wire in D10 – G9
3. Put the second green wire H9 – (negative rail (9th hole)

The negative rail is the vertical column on the right hand side of the board that is labelled - . Ground is the return path for a circuit. When the LED has been lit the current (electricity) needs to get back to the power supply so that it can start the loop again. A more powerful circuit actually connects to the “ground” (the one you are standing on) as this makes sure you do not get an electric shock.

Step 5 – Adding a capacitor

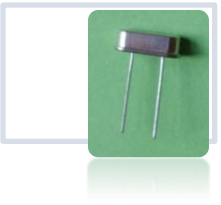


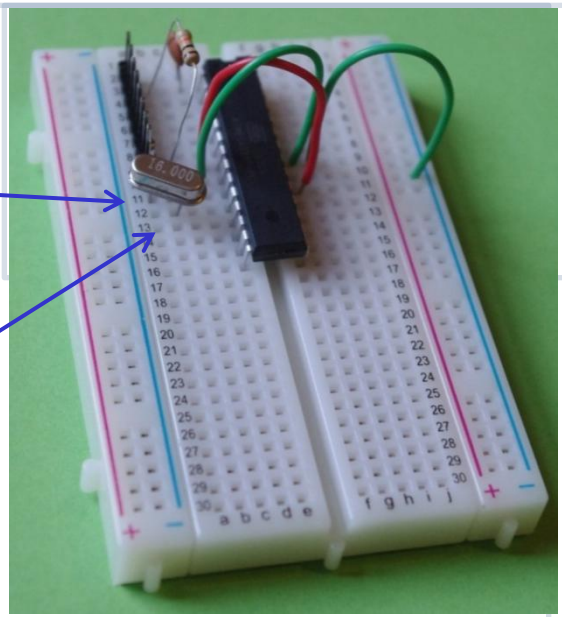


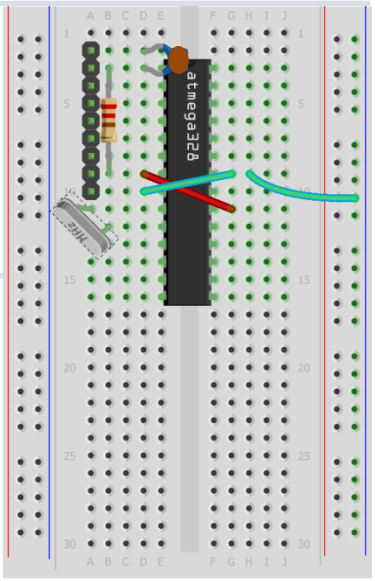
1. Find the capacitor labelled 104 on the side
2. Put the capacitor in D2 and D3

The capacitor is a little like a battery. It takes energy from the battery and then releases the energy very quickly. It keeps the power level consistent.

Step 6 – The Quartz Crystal



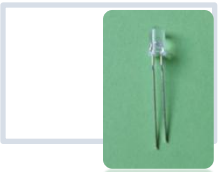


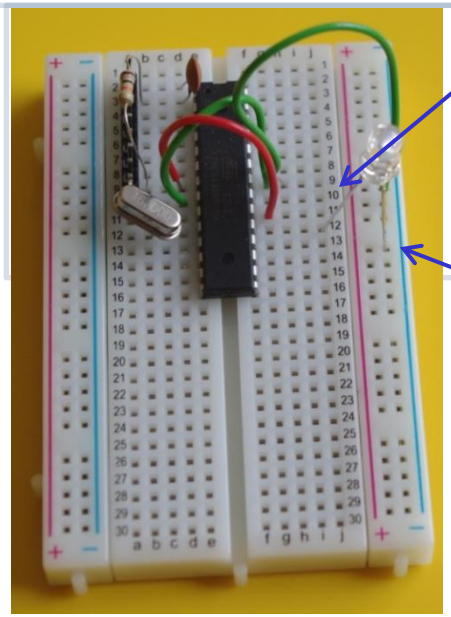


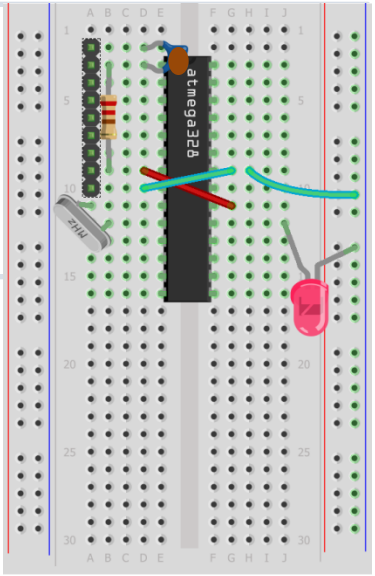
1. Put the crystal in A11 and B12

The quartz crystal is like a clock, providing a pulse that makes the chip function (on-off-on-off).

Step 7 – Blink – adding an LED







1. Look at the LED, and notice that one leg is longer than the other. LED's only work in one direction.
2. Insert the long leg into J12 where it connects to the pin of the chip.
3. Insert the short leg goes in the top hole on the third group of holes on the rail (the negative rail) or hole 11.

A diode is a one way gate for electricity. A light-emitting diode (LED) glows when electricity passes through it. Most LEDs are made from a semi-conducting material called gallium arsenide phosphide.

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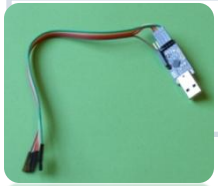
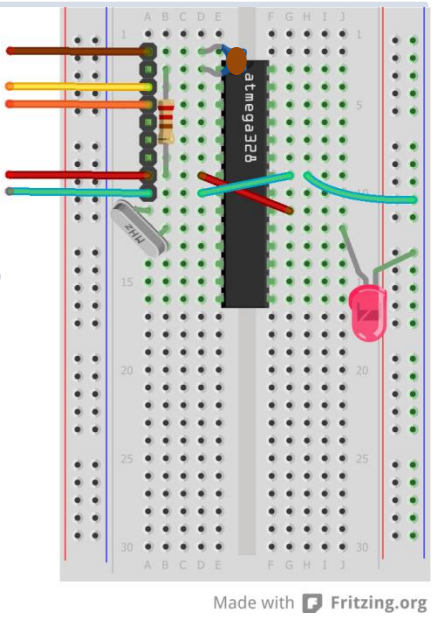
Step 8 – Wiring up the USB connector





You'll need to wire up the USB connector on both ends. Start with the connector piece itself, and wire as shown in the picture. The colours from the left are brown, red, orange, yellow and green. The brown goes on the single pin halfway down the connector.

On the breadboard end:

Brown – PIN A2 Yellow – PIN A4 Orange – PIN A5

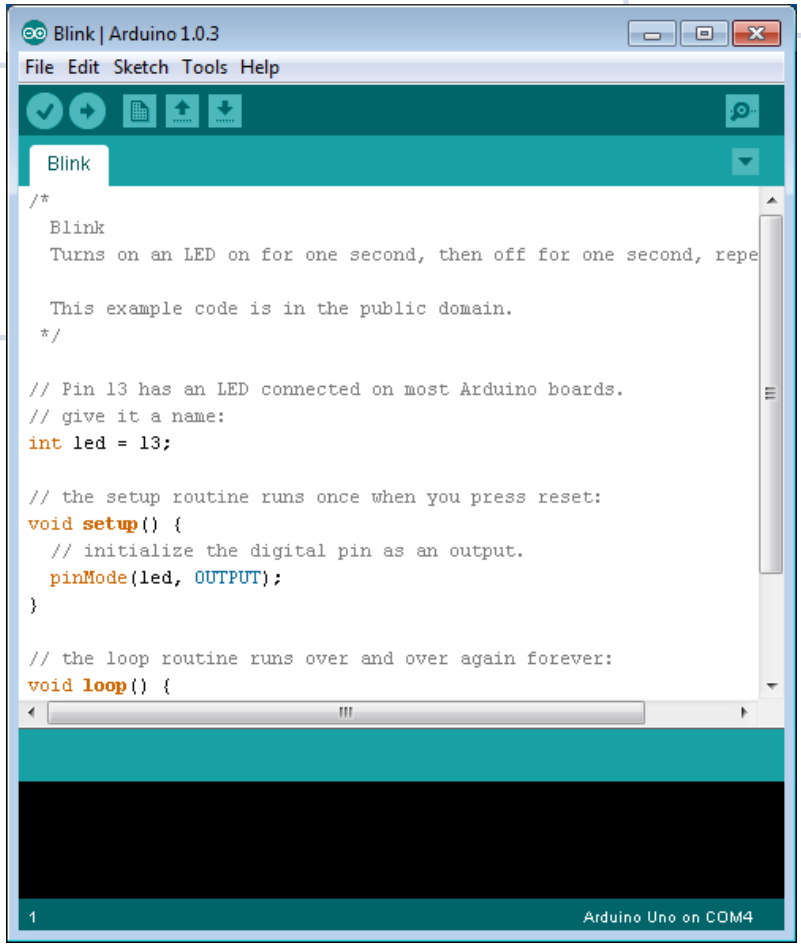
Red– PIN A9 Green – PIN A10

Step 9 – Uploading the code – let's test it!

Plug the USB into your computer or laptop.

1. Open up the Arduino Software which you can find here:
2. Under tools choose

3. File -> Examples -> Basic –> Blink
4. Click the upload icon (underneath "edit", the arrow in a circle)
5. If it works the LED will BLINK – Hooray!



Nothing happened!
It's easy to have overlooked something. Don't worry, we can fix it.

1. Check the LED is the right way round.
2. Check all pieces are pushed into the breadboard firmly.
3. Check that all of the pieces are in the right places, and pushed straight down
4. Check under "Tools, Board" to see the shrimp is identified as 'Arduino Uno'.

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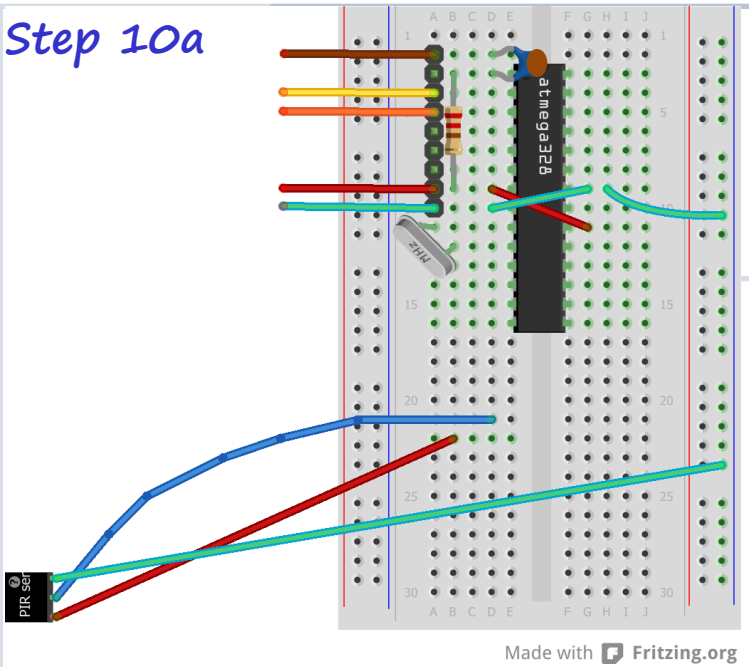
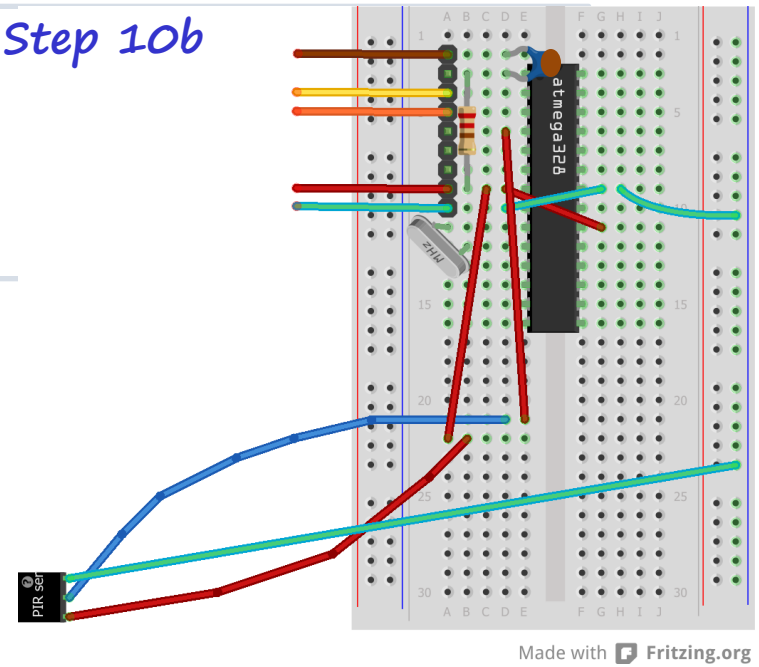
Step 10 – attaching the PIR sensor!

Remove the test LED!

Step 10a



Step 10b



We need to wire up the sensor. This will detect movement and sound the alarm. Look at the pins on the sensor and connect as follows:

Sensor		Breadboard
GND (ground)	to	-20 (negative rail)
OUT	to	D21
+5V	to	B22

Now connect the sensor to our circuit:

Run a wire from A22 to C9 (to power the sensor)
Run a wire from E21 to D6 (to connect it to the chip)

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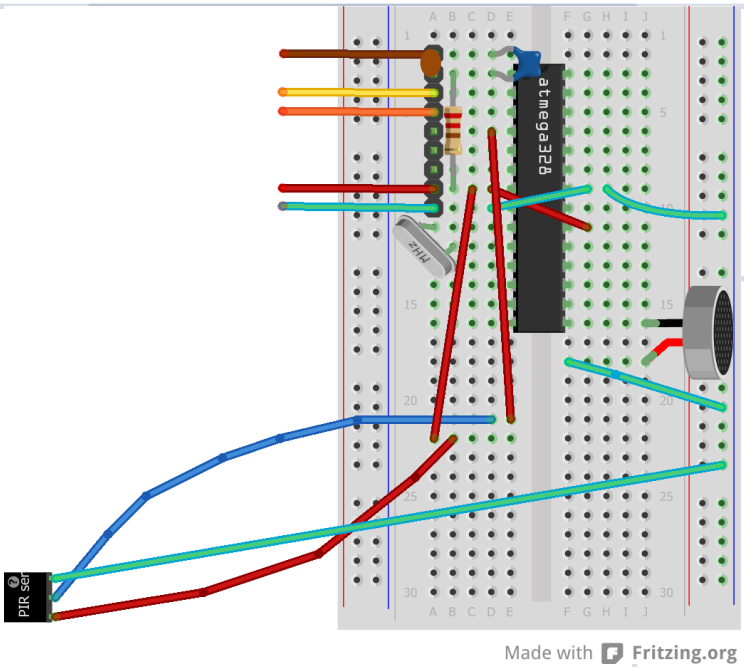
Step 11 – attaching the buzzer!



Connect the buzzer by pushing it's legs gently into J16 and J18.

We need to ground it by putting one more wire from F18 to -17 (negative rail 17).

The piezo buzzer makes a noise by vibrating. It can be told to play different notes by vibrating at different speeds.

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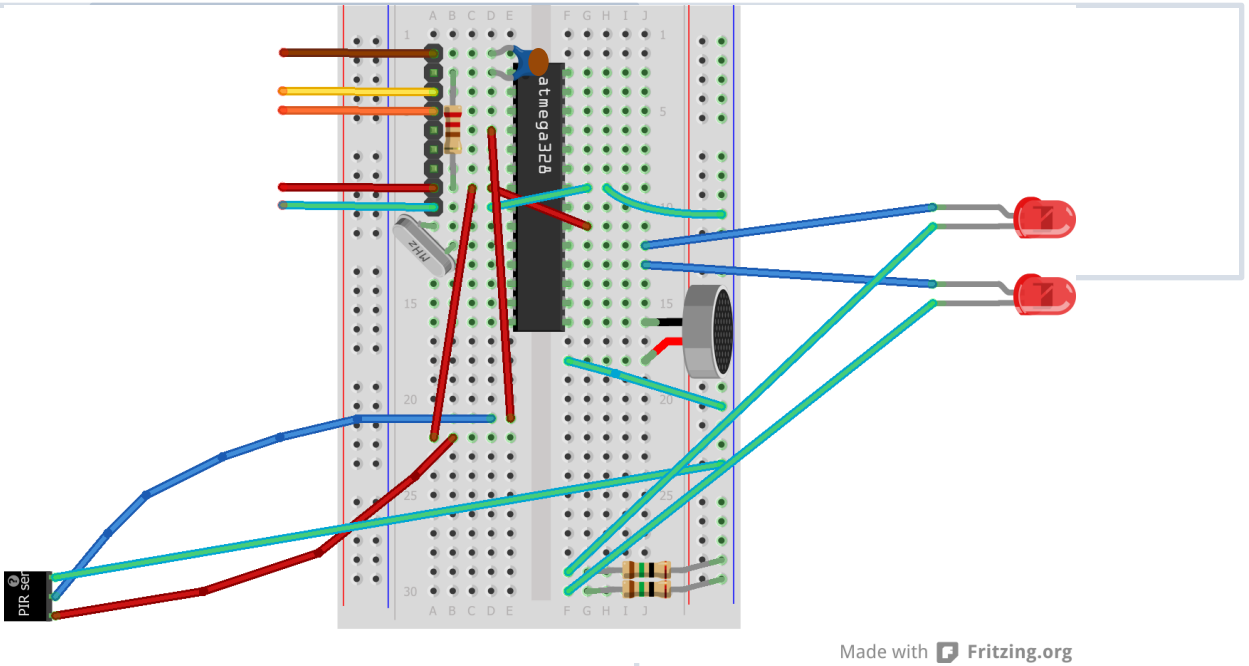
Step 12 – attaching the lights!



Almost finished – just the lights now!
We need these to be on wires away from the breadboard so that they can be displayed as part of your robot. Use the special wires with a black connector end. Push a wire onto each leg of the two LEDs.

Put one LED into J12 (long leg) and F29
Put the other LED into J13 (long leg) and F30

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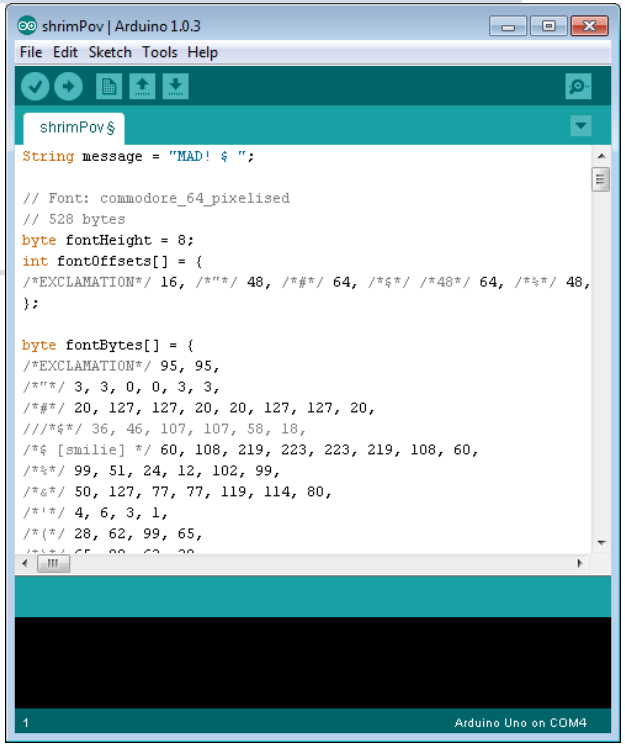
Step 13 – programming the robot!

1. Plug the USB into your computer or laptop.
2. Open up the Arduino Software
3. In the Arduino app load “robotguard” from the USB / Folder
4. Click the upload icon (the arrow with a circle.
5. If it works the LEDs will flash and the buzzer will sound – Victory !



Last step!

All you need to do now is attach your little computer to the robot shell and personalise it to make it yours.

Top tip: To run the kit from a battery:
Step 1: turn the battery pack off!
Step 2: connect the black wire to the negative rail at the side
Step 3: Connect the red wire to J11

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