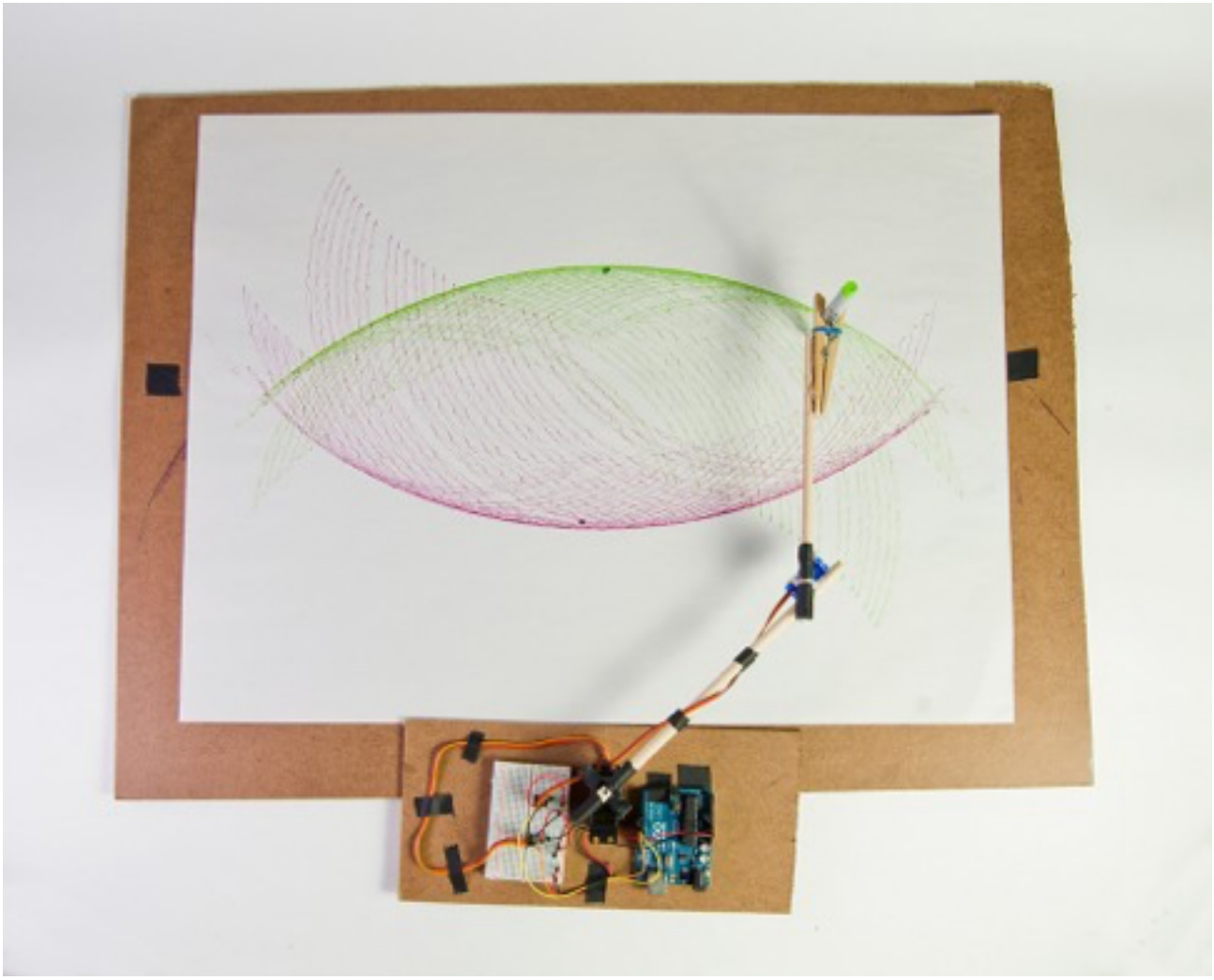
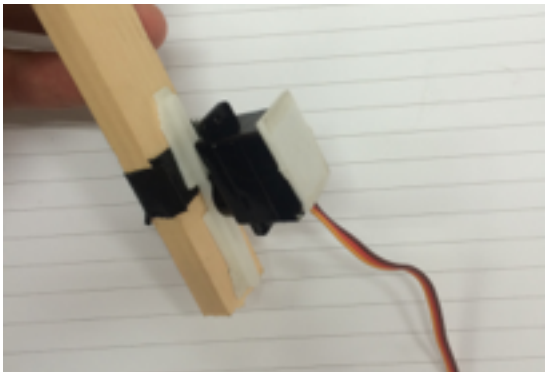
Arc-o-matic
Manual



The arm of the robot

First we will build the "arm" of the robot. This means we will connect the motors to the sticks, and make its "hand" by attaching the clothing pin to the second stick.

1 We will start with the bigger servo motor, which is the base.



2 Cut of small strips of the double-sided tape, that fit on the head. Stick them on top of it.
3 Remove the protective film of the tape to reveal its sticky side. Attach one stick to the head. We want this arm to be slightly short, about 3/4 of the stick, so attach it accordingly. The exact position is not crucial, but dont use the full length of the stick. Above is what the finish part could look like.

4 Cut off another strip of the tape, the size of the head of the smaller motor. Attach the second arm to the smaller motor, just like you did with the larger servo. Here you can use the full length of the stick.
5 Cut off another strip of the tape, the size of the base of the smaller motor, and stick it right there. Like this:
6 Remove the film, and stick the small servo ON TOP of the stick you just connected to the larger motor.

7 Now we attach the hand: Take the clothing pin, and hold it to the very end of the arm. Hold it so that hole points downwards. Imagine the pin holding a pen. This is definitely a team exercise: while one of you holds the pin and the stick together, another team member cuts of strips of the duct tape. wrap the tape around the stick and the pin, attaching it tightly. Make sure the pin and the arm are tightly connected.

Connecting the arm

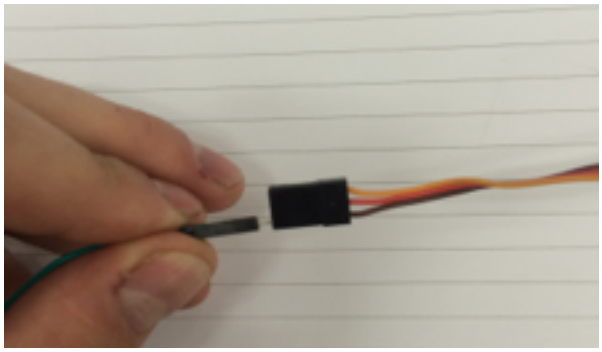
First we will connect the motors to the breadboard. Then the board to the microcontroller

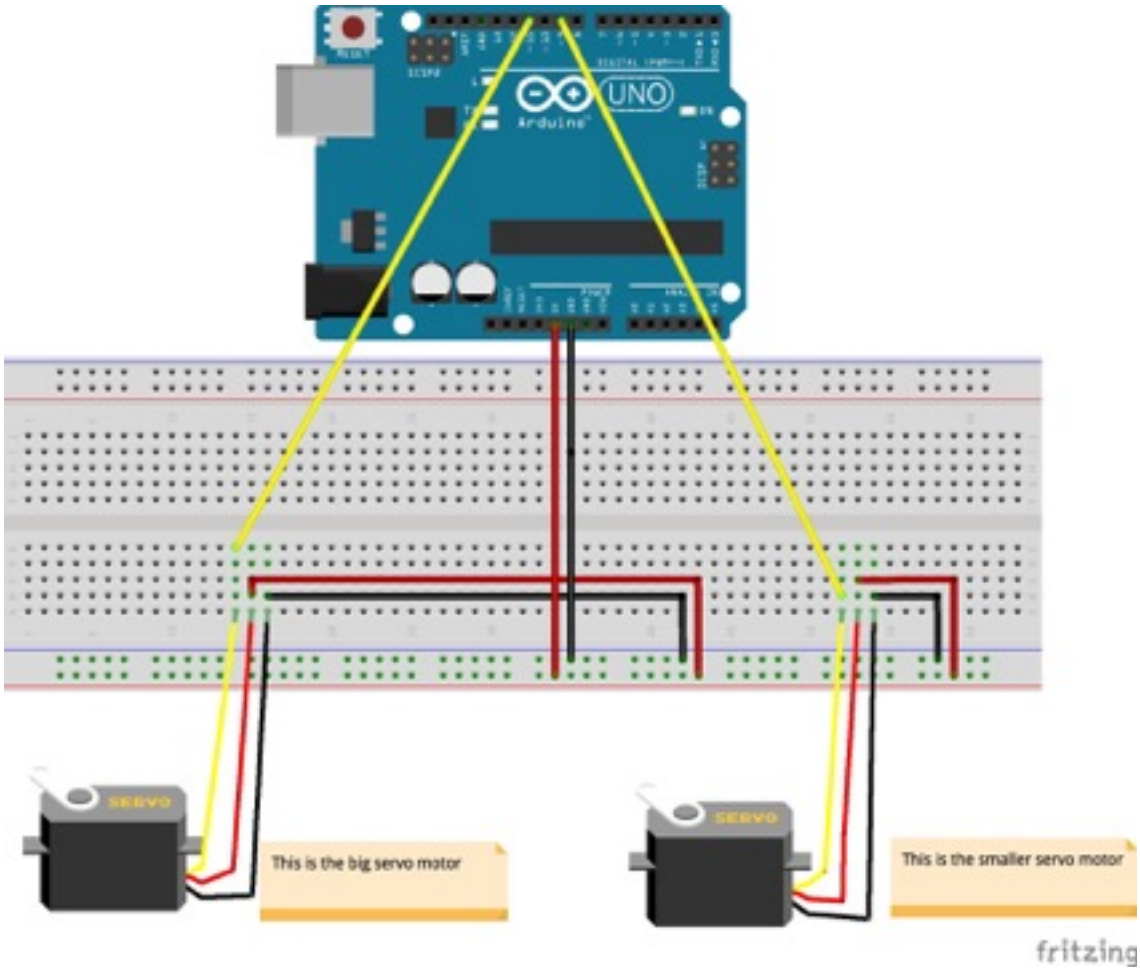
1 The cables of the servos have 3 colours: Red, black and yellow. "Red" connects to power or "+", black to ground or "-" and yellow is where the data comes in that controls the motor.
2 Select 4x3 "male to male" cables. Select matching colour, for example 4x black, 4x red, 4x yellow. This helps you connect the right cables to the right parts of the breadboard or the Arduino, as a sketch can quickly look confusing.
3 Attach the cables you just selected to the cables coming from the motor, by sticking them together. Like this:
4 Connect the other end of each cable to the breadboard. Attach the smaller servo to right side of the board, and the larger motor to the left side. Have a look at this drawing to figure out where exactly

5 Now with 4 of the remaining cables connect "+" and "-" to G10 (-) and 11 (+) (small servo) and H10 (-) and H11 (+) (larger servo).

6 With two more cables connect F10 (-) to GND on the Arduino and F11 (+) to 5V.

7 With two more cables connect the yellow cable of the small servo to pin 9 of the Arduino and the yellow cable of the large servo to Pin10. The final product looks like this:





Last preparations

1 Cut off a strip of the double-sided tape in the shape of the bottom of the large servo. Stick the servo on the table. Be careful when you handle the motor to keep all cables connected!

2 With a strip the duct tape stick the cables coming from the smaller motor to the stick, so that they dont get in the way. Look at this picture to see how.

The code

1. Open the sketch called “Sketch_arc-o-matic”. This looks quite complicated, right? Luckily engineer Umar has added comments that help you understand what each part does. But fear not, you are not required to change anything, the code controls the movements of the motors exactly how we want them. You can of course change the values later, if you want the arm to move in a different way.
2. Check the code by clicking the tick. No mistakes found? We thought so.
3. Connect the Arduino to the USB port and upload it by clicking on the arrow. The robot should now start moving!

Congratulations! You have created your first robot!

Now its time to actually draw. Look at where the arm moves on the table surface, and where a pen would draw lines. Unplug the Arduino from the computer, thereby stopping the movement. Place a sheet of paper exactly where the arm will draw. Select a marker and let the clothing pin or hand grab it. Make sure the tip touches the paper. Plug in the Arduino and run the code.

WATCH THE ARTIST AT WORK! You created this. Very good job!

Whats next?

Tutorials on
* arduino.cc
* instructables.com
* in the books on the USB

Get your own Arduino and equipment:
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* roboticspk.com
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Software to visualize circuits:
* fritzing.org
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