Marty Scratch Examples

This document shows a selection of things you can do with Marty through the Scratch interface, from the very basic to the fairly complicated. Everything here is in prototype stage, but hopefully it's a good start!

I've made some quick videos showing the scripts being run on a Marty. They're very much not a finished article (and apologies for the christmas music playing in the background), but you can see what each script looks like when it runs:
https://www.youtube.com/playlist?list=PLiBgsWjIRfInizbzagjLnoQjoeb0psS33
And the individual videos are linked below

We'll be making starter projects for many of the examples, to get people started. Those should be appearing at www.robotical.io/scratch shortly

Basic commands

Get used to controlling Marty from scratch by playing around with the built in functions

Controlling Marty

The "Get Ready" block will return Marty to a normal standing position and do a little eyebrow wiggle. The "Turn off motors" block will… turn off the motors. It's good to call it at the end of a script.

Longer chains of command (Video)

Have a play around with making Marty do more complicated things. Make a little dance routine or a play.

Looping (Video)

Sometimes you want to do the same thing a few times, but copying and pasting code looks messy and is time consuming. Have a play with the “repeat” blocks to get the hang of looping

Define a function (Video)

Another way to avoid repeating code is to make a “function”

Make Marty walk!

There is a built in walk function, but that’s no fun. In this challenge you have to teach Marty to walk! You’ll have to think about balance and how individual joints need to move to create a complex movement.

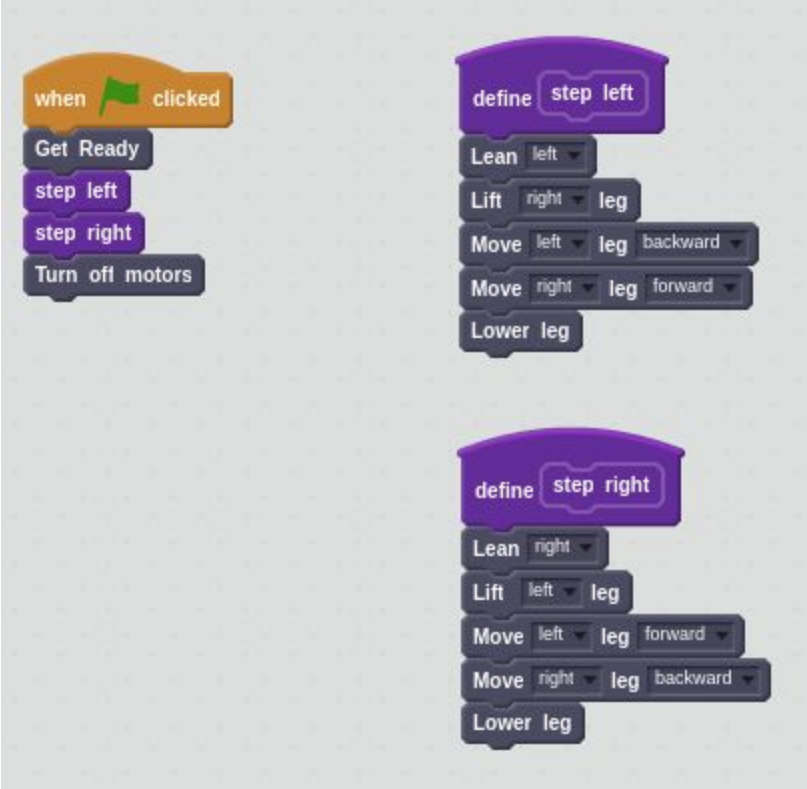
Take a step (Video)

The basic movements for taking a step - in this case with the right leg

Take two (Video)

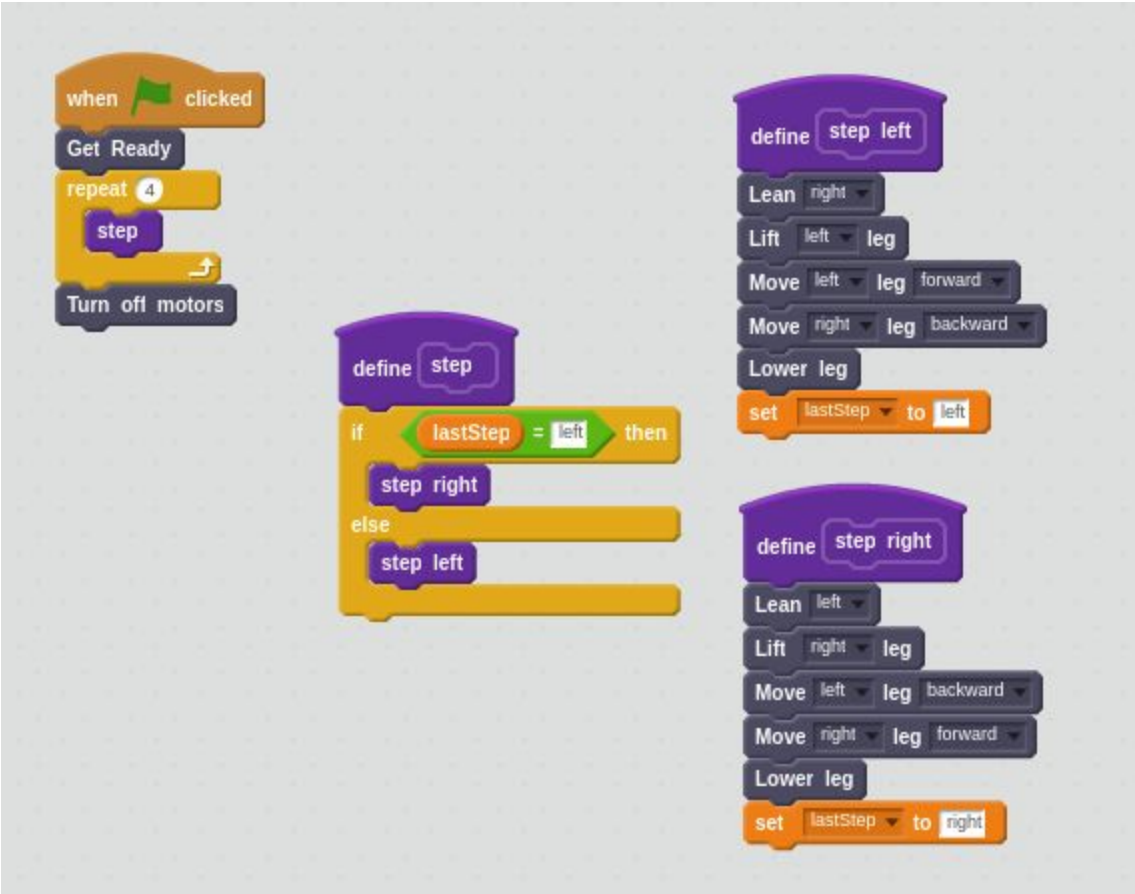
And then add a step with the other leg

Step functions (Video)



Move the individual steps into their own functions

Put the best foot forward (Video)

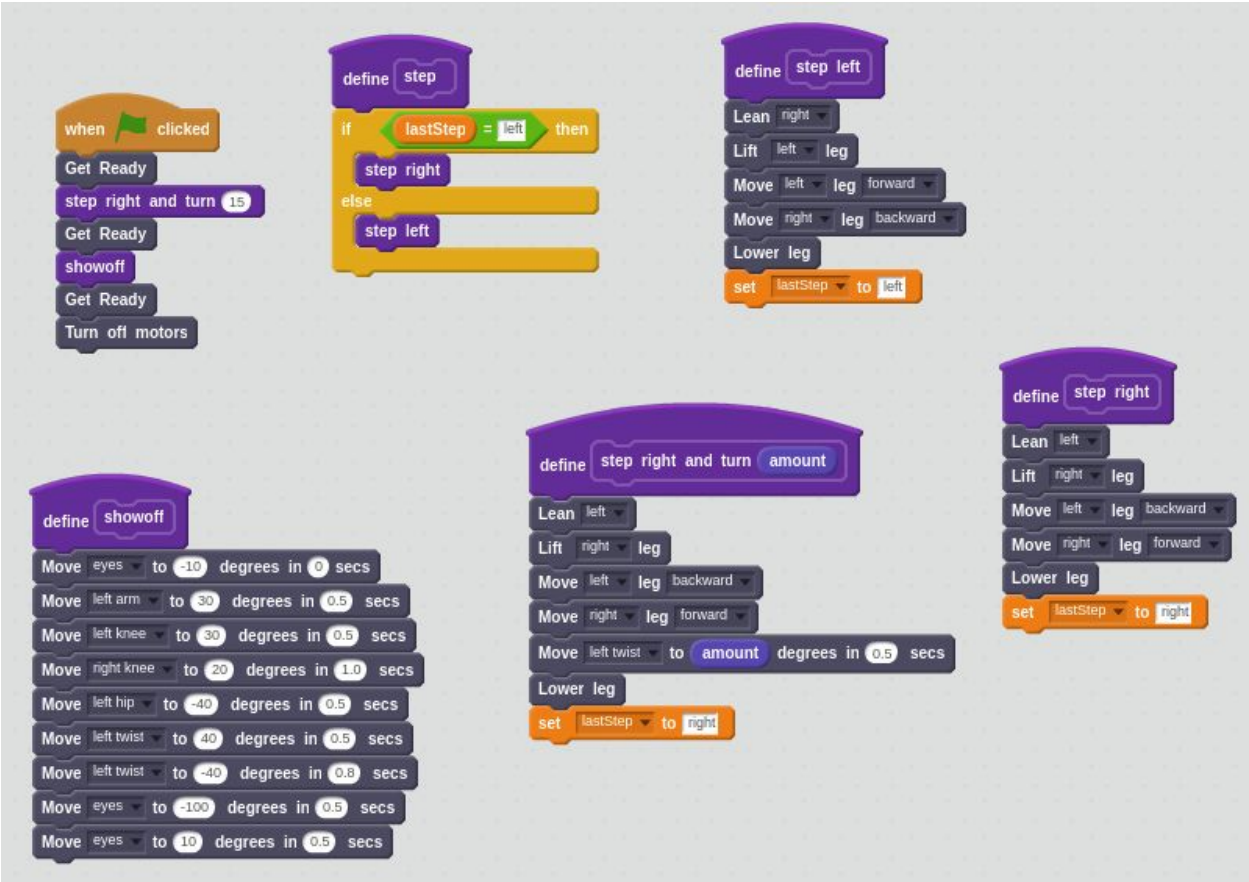


It would be nicer to just be able to say “step” rather than specifically stating which leg to step with. This can be done by creating a variable to keep track of which foot the last step used

Make your own movement (Video)

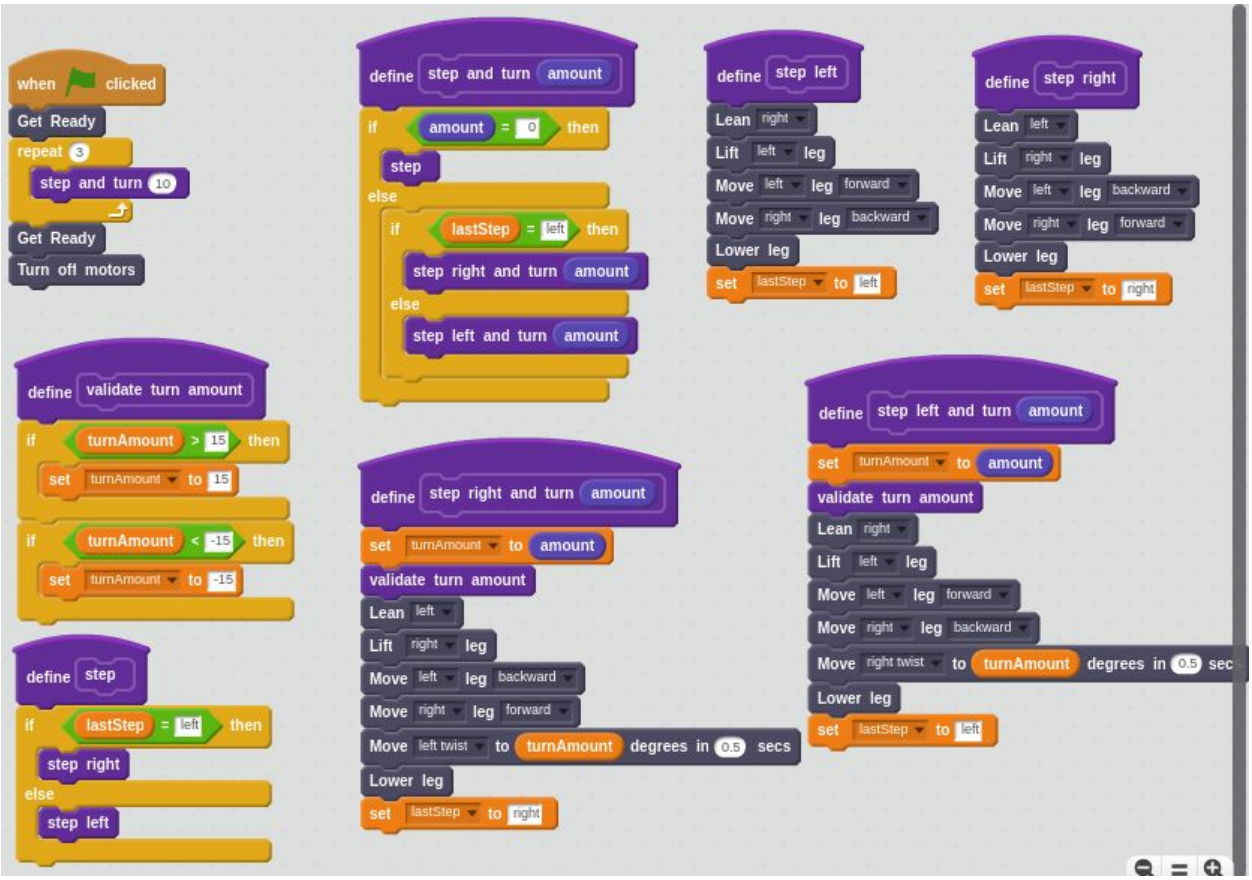
Have a play with the “Move Joint” block to create a more complicated custom movement function

A turning point (Video)



Make a function which steps with a turn, this function can take an argument to define the amount of turning

Parameter validation, and function-ception (Video)



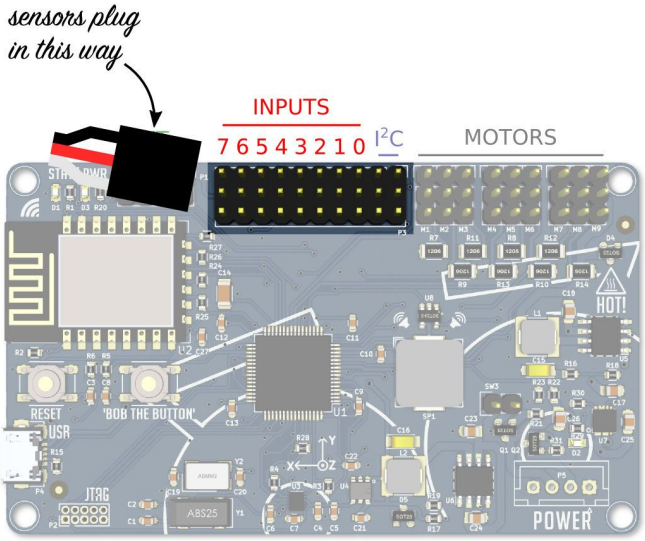
There are a couple of things going on here:

- Parameter validation: If you tell Marty to turn too much, his feet will hit each other and bad things will happen. To avoid accidentally sending a bad command, we can “bound” the turn amount to within certain limits
- Making more general functions. Functions can call other functions - in this case the “step and turn” function wraps the “step” function, as well as adding some functionality.

Sensors

Marty has a few sensors built in - electrical current sensing on most of the motors, an accelerometer for measuring tilt and acceleration, and a set of ports to which sensors like bump switches can be attached.

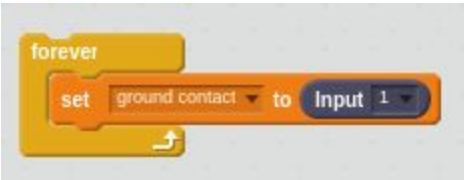
The electronics wiring diagram below shows how sensors can be attached, but these examples assume there is a bump switch on port 0 which is at the front of a foot, and a bump switch on port 1 which is on the bottom of a foot.



Connecting sensors to Marty. Cables go in with the black wire at the top, and the numbers here correspond to the “Input *n*” block in Scratch.

Reading a sensor (Video)

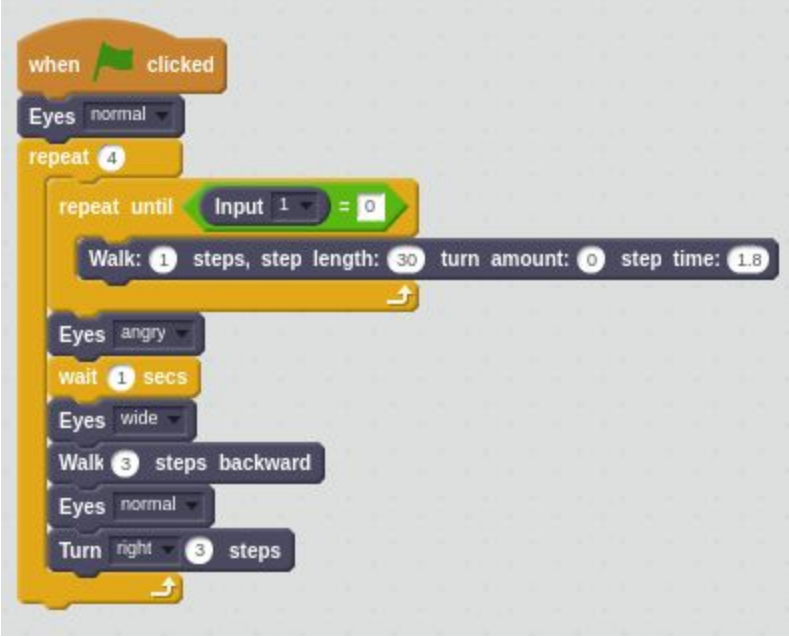
The “Input” block will let you read the current state of a switch. By assigning the sensor reading to a variable you can observe it in Scratch.
The switch will read “1” when pressed, and “0” when not pressed



Walking to the edge (Video 1) (Video 2)

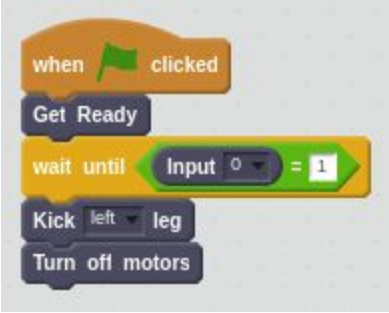
This example assumes there is a bump switch on the bottom of a foot and attached to port 1.
At the end of each step, the switch can be checked to see if it is pressed. If it is a “1”, the foot is touching the ground, if it is a “0” then it’s not!
We can use this to check if Marty has come to a ledge

Walking back from the edge (Video)



It's useful to do something a bit better than just reacting. Add some more blocks to make Marty do something useful when he reaches an edge. In the example above he'll walk back from the edge and turn around before walking more

Responding to a button press (Video)

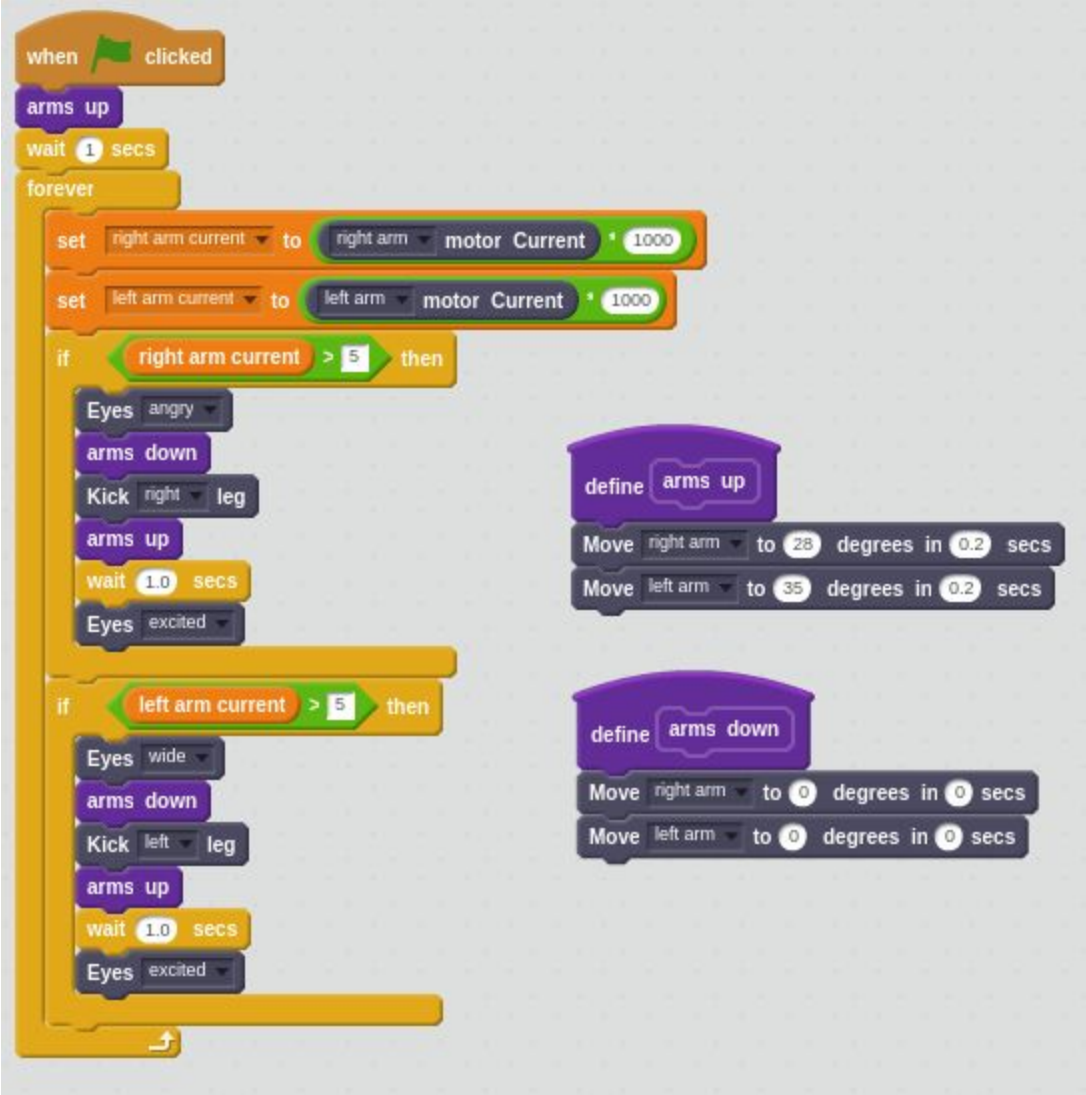


This is a simple example of reacting to a button being pushed. Marty will wait until something touches the bump switch and will then kick

Reading motor current (Video)

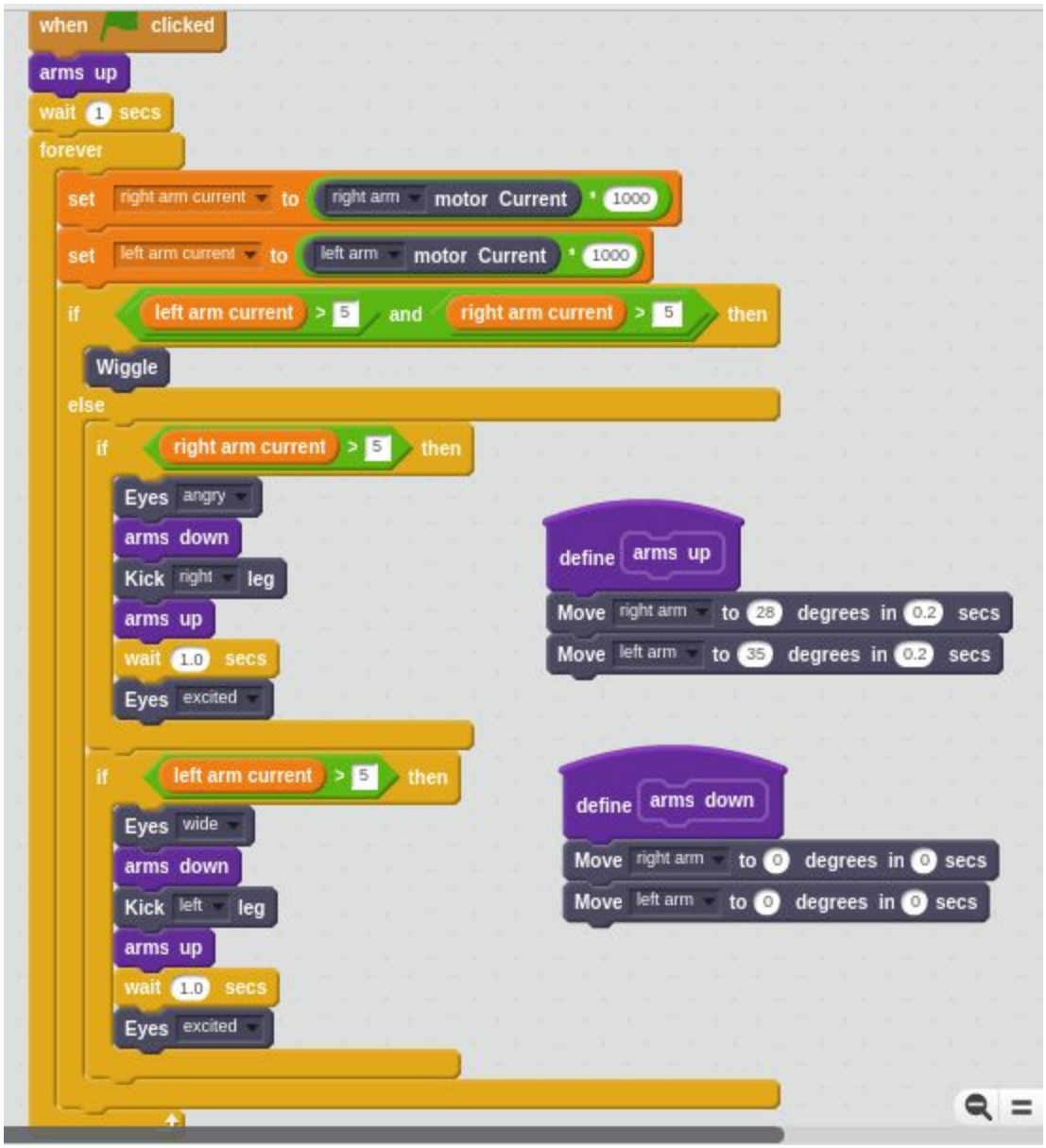
Motor current sensing lets you see roughly how much torque a motor is producing. The sensor reads a small value so you'll need to multiply it up as shown above.
In this example we link the torque on the right arm to the eyebrow position - push Marty's arm or put something heavy on it and he'll get angry!

Using motor current as an input (Video)



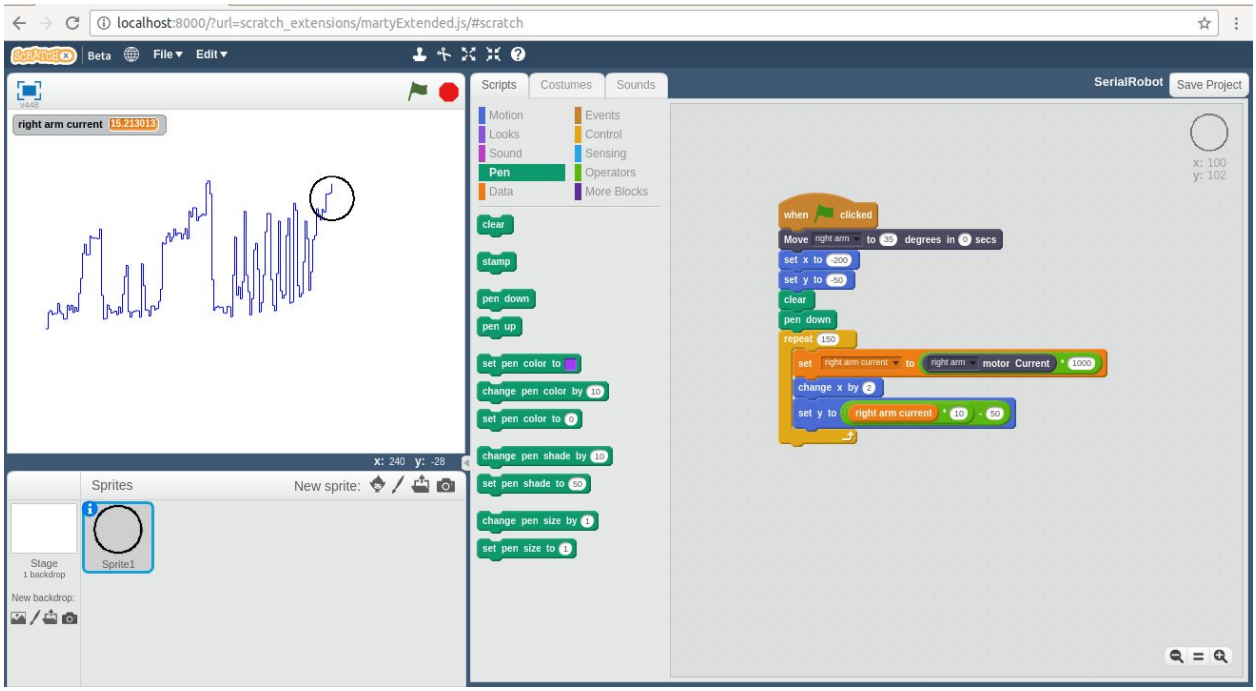
In this example, we're letting somebody give Marty instructions by pushing down on one of his arms. Pushing the right arm will make him kick his right leg, and pushing the left arm will make him kick the left leg.

AND behaviour (Video)



If you want to get really snazzy you can make Marty do something different when *both* arms are pushed at the same time

Getting Graphic (Video)



Scratch is also cool for displaying sensor readings. In this example we're showing the output from one of the motor current sensors as a graph.

To do this we create a sprite which is a simple circle in the center, then animate it with a pen