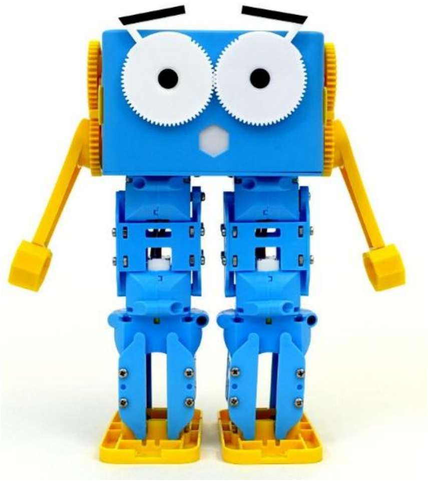
Useful info



It’s also worth checking out the Intro to Marty Behaviour article for details on how Marty behaves and reacts. But in brief

- Marty’s motors are turned off by default, they’re enabled using the `Get Ready` block (which will also move Marty to the zero position), or the `Enable motors` block.
- Fall protection will turn off Marty’s motors if it looks like Marty is falling over
- Motor over-current protection will deactivate a motor if it gets a large instantaneous load, or a sustained heavy load
- Buzz prevention will try to reduce the torque on Marty’s motors when movements are finished - so Marty might move a little bit to get comfy. It’ll also let you move his motors (except for the eyes) by hand, if you push gently.

Function Reference

This section will give details on each block available through the Scratch interface.

Action Blocks
Circle dance

Enable motors

Eyes
Get Ready

Kick

Lean
Lift leg
Lower leg
Move joint
Move leg forward/backward
Play sound
Set blocking mode
Side Step

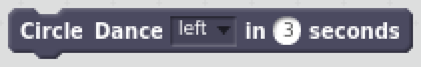
Sensor Blocks
Accelerometer

Battery Voltage

Input
Motor current
TODO: motor position
TODO: motor enabled

Marty Selector
Select Marty
Select Marty on IP

Action Blocks

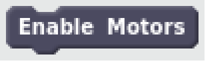
Circle Dance 

Circle Dance left in 3 seconds

`Circle dance` will make Marty lean right->forward->left->backward, or left->backward->right->forward, depending on the setting. His head will therefore move round in a clockwise or anticlockwise direction.

The time is for a complete cycle.

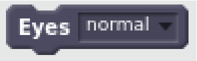
The movement will end with Marty leaning either forward or backward, so you can send several `circle dance` commands in a row to produce a continuous motion

Enable Motors 

Enable Motors

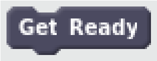
`Enable motors` will activate Marty's motors so they're ready to receive commands, but won't send any movement commands.

`Enable motors` will also un-pause any queued movements, so if you've previously used the `stop and pause` block, you can use `enable motors`to resume movement.

Eyes 

Eyes normal

The `Eyes` block will let you move Marty's eyebrows near-instantly to a predefined position - either *angry*, *normal*, *excited*, or *wide*

Get Ready 

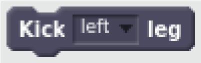
Get Ready

The `Get ready` block is designed to get Marty's motors activated and finish with all joints in their zero positions. It'll also wiggle the eyebrows, so you know that it's done something even if Marty was already standing straight.

It will `enable motors`

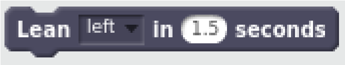
It's a good idea to call this at the beginning of a script, to make sure Marty's joints are enabled and in a known position.

When Marty's motors have been deactivated, he has no way to tell where they are. So **when you call `Get ready` Marty may move very quickly** and jerk a bit. Keep fingers clear!

Kick 

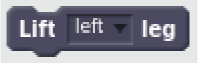
`Kick` will make a kicking movement with Marty's right or left legs.

TODO: Add time and twist parameters for extended interface

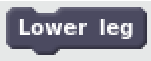
Lean 

Lean will make Marty lean forward, backward, left or right, in the given number of seconds.

Forwards and backwards will move Marty's hip joints together, while left and right will move Marty's knee joints.

Lift leg 

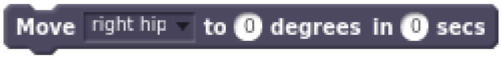
`Lift leg` will move either Marty's left or right knee outward to lift that leg up. This might make Marty tilt sideways, depending on his current position

Lower leg 

`Lower leg` will measure which of the two knees is higher up, and then lower it to the same angle as the lower knee. This will have the effect of lowering a raised leg to the ground.

This function currently doesn't take into account hip angles, so you might get unexpected behaviour if the hip angles don't have the same magnitude.

Move joint

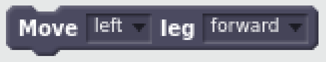

Move right hip to 0 degrees in 0 secs

`Move joint` will move a single one of Marty's joints to a specified angle in a specified time.

The angle is given as a percentage of max for that joint.

By default queuing up `move joint` blocks will make the movements happen sequentially, one after the other. If you want to tell multiple joints to move simultaneously, you can disable blocking using the set blocking mode block.

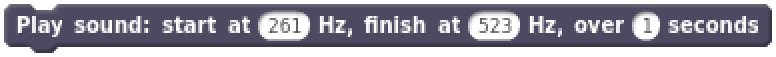
Move leg forward/backward


Move left leg forward

The `Move leg` block will move either the left or right leg forwards or backwards, by moving the hip joint.

Note that forward or backward is relative to Marty - so moving a leg backwards can move the rest of Marty forwards!

Play sound

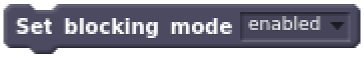

Play sound: start at 261 Hz, finish at 523 Hz, over 1 seconds

This block will make Marty's buzzer make a noise. It takes three parameters, the starting frequency, end frequency, and the duration. The frequency of the output will be linearly moved between the start and end frequencies, so you can make chirps. You can also set the start frequency and end frequency to be the same to generate single tones.

Marty will queue up multiple sound commands, so you can send whole tunes across to be played.

The play sound block will return straight away (it won't pause operation while the sound is played).

Set blocking mode

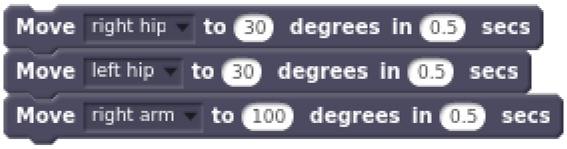

Set blocking mode enabled

The `Set blocking mode` block affects the operation of all other movement blocks.

By default, blocking is enabled - and that means that a movement block (like a walk or move joint block) will take the same time to execute as the movement takes. So if you say to lean left in two seconds, that block will take two seconds to finish, before the next block is executed.

However, if blocking is disabled, movement commands will be sent to Marty, but operation will continue immediately.

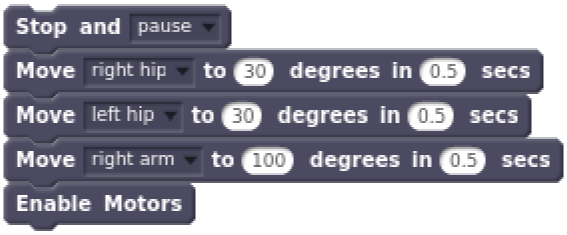
This is most useful if you want to combine movements. For example, if you had three move joint blocks in a row like this:



```
Move right hip to 30 degrees in 0.5 secs
Move left hip to 30 degrees in 0.5 secs
Move right arm to 100 degrees in 0.5 secs
```

With blocking *enabled*, Marty would move the right hip, then the left hip, then the arm. With blocking *disabled*, Marty would move all three joints near simultaneously.

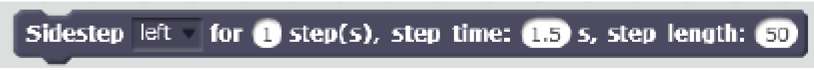
If timing is really really critical, you might want to pause operation, queue up some movements on Marty, and then set them all off at the same time, like this:



```
Stop and pause
Move right hip to 30 degrees in 0.5 secs
Move left hip to 30 degrees in 0.5 secs
Move right arm to 100 degrees in 0.5 secs
Enable Motors
```

That'll avoid any slight timing differences due to network lag.

Side Step



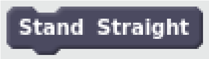
```
Sidestep left for 1 step(s), step time: 1.5 s, step length: 50
```

`Side step` will make Marty take a specified number of side steps to the left or right.

It defaults to a direction of left, a step time of 1.5s and a step length of length of 50.

For more information on the step parameters see the walk function.

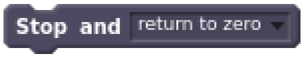
Stand straight


Stand Straight

Stand straight will return all of Marty's joints (including the eyes and the arms) to their zero positions.

It'll move them simultaneously over 2 seconds.

Stop

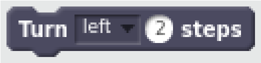

Stop and return to zero

Stop will let you stop or pause the movements of a Marty. It's especially useful in non-blocking mode

There are several options types of stop:

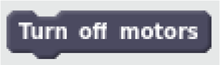
Stop type	Effect
finish move	Clear movement queue only (so finish the current step/wiggle/movement)
freeze	Clear movement queue and servo queues (freeze where you are)
disable motors	Clear everything and disable motors
return to zero	Clear everything, and make robot return to zero
pause	Pause, but keep servo and movequeue intact and motors enabled
pause and disable motors	As pause, but disable motors too

Turn


Turn left 2 steps

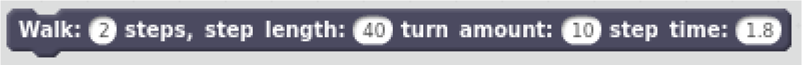
Turn will make Marty turn on the spot in the left or right direction. For faster turning try using the walk block to set your own parameters

Turn off motors


Turn off motors

The Turn off motors block will disable all of Marty's servos. That'll make them moveable by hand, and you'll need to re-enable them with an enable motors or Get ready block before they'll move again

Walk


Walk: 2 steps, step length: 40 turn amount: 10 step time: 1.8

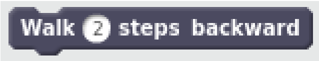
The walk block lets you set specific parameters for walking.

The step length is a percentage of maximum, from -100 to +100. Negative step sizes will make Marty walk backwards.

Turn is also a percentage of maximum.

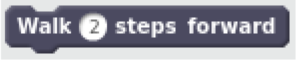
Step time is in seconds, down to a minimum of 0.5s.

Walk backward



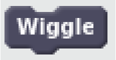
This block will make Marty take a specified number of steps backwards. It defaults to a step length of -40 and a step time of 1.8 seconds.

Walk forward



This block will make Marty take a specified number of steps forwards. It defaults to a step length of 40 and a step time of 1.8 seconds.

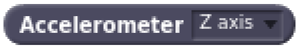
Wiggle



This’ll make Marty wiggle.

Sensor blocks

Accelerometer (tilt sensing)



The accelerometer block lets you read from Marty’s three axis accelerometer. This can tell you information about acceleration, but also about tilt.

There are three axes:

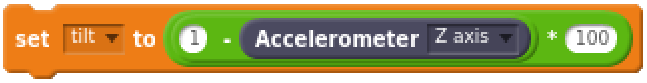
Axis	Marty dimension
Z-axis	Vertical
Y-axis	
X-axis	

Each axis will give a number representing the acceleration in that direction, but will also show the direction gravity is pulling. That’s because accelerometers are basically little weights attached to springs, and while acceleration causes the weights to move, so does gravity.

When Marty is standing straight and not moving, the Z-axis should read around 1.0.

The Z-axis of the accelerometer is also used for fall detection.

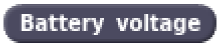
To measure tilt, you could try doing something like this:



```
set tilt to ((1 - Accelerometer Z axis) * 100)
```

That'll set tilt to around 0 normally, going up to 100 if Marty is horizontal. You could also use the X and/or Y axis to measure tilt in a particular direction

Battery Voltage

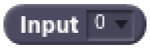


```
Battery voltage
```

This block will tell you Marty's battery voltage, which can be pretty useful to let you know when you should recharge.

It gives back the actual voltage. About 8.4 is fully charged, and 7.4 is getting low.

Input



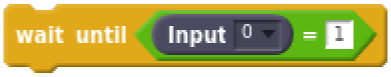
```
Input 0
```

The `input` block reads one of Marty's GPIO channels.

For example, you can connect a bump switch to one of the channels, and the input block will return with a 1 if it's pressed, or a 0 otherwise.

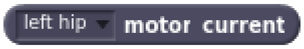
The ports are labelled on Marty's control board, and bump switches connect up the same way as the motors do, with the white cable at the top

So, to wait until a switch connected to port 0 is pressed you could do:



```
wait until (Input 0 = 1)
```

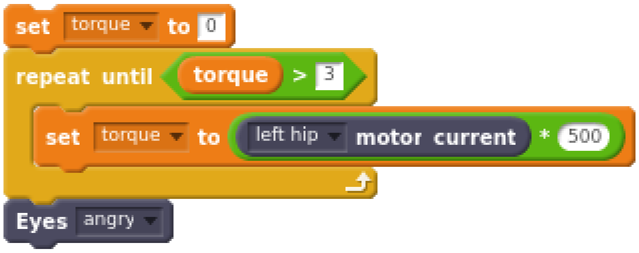
Motor current



```
left hip motor current
```

The `motor current` block lets you read the electrical current going through one of the motors. That gives an estimate of the force on the motor.

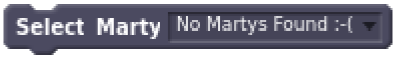
It’s normally a very small number, so it might be easier to multiply it. To react to somebody pressing Marty’s arm, you could do this:



```
set torque to 0
repeat until torque > 3
    set torque to left hip motor current * 500
Eyes angry
```

Marty Selector

Select Marty

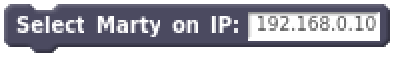


```
Select Marty No Martys Found :-(
```

When the Marty scanner detects more than one Marty on the network, this block will give you the option to pick which Marty you’d like to control.

Note - you need to double click the block to run it, or run it as part of a chain of blocks, before it will work!

Select Marty by IP



```
Select Marty on IP: 192.168.0.10
```

If the Marty scanner doesn’t detect your Marty (or even if it does), you can select a Marty by IP.

Again, you’ll need to run the block by double clicking it or having it a chain of blocks, for it to have effect