Robo:Bit Robotics Controller and Buggy for Micro:Bit

Robo:Bit is a general purpose robotics controller for the BBC Micro:Bit, that also converts easily into a self-contained little buggy.

Overview

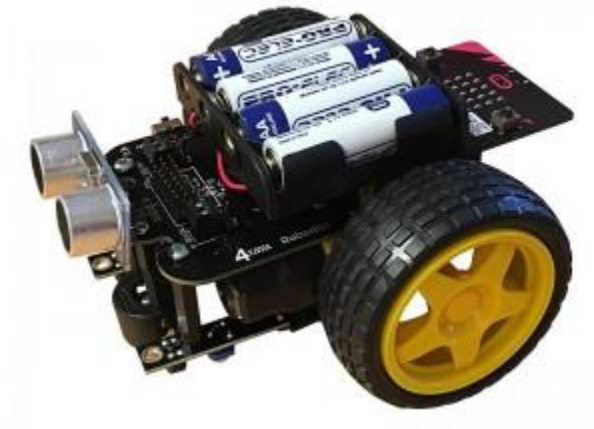
The Robo:Bit controller has the following features
Ready assembled (NB. headers for the underside are not fitted unless the complete buggy is purchased, but they are included in case you want to add these)
Edge connector for easy attachment of your BBC Micro:Bit
Dual motor driver with full control of each motor for both direction and speed (uses DRV8833)
3.3V Regulator to power the BBC Micro:Bit
Power On/Off switch with LED indicator
Mounting holes for either 3-cell or 4-cell AA battery holder
Front interface for ultrasonic distance sensor (simply push-fit an HC-SR04, or solder for added security) [NB. You can also plug the McRoboFace into here directly and it will work as required!]
7 of the Micro:Bit pins are broken out to a header with GVS connections (Ground, Volts, Signal) for ease of connecting external devices and sensors
I2C signals broken out in case you want to add more complex peripherals

Usage

Robo:Bit uses the same connections for the motors as Bit:Bot, so most of the software will continue to work. The Pins are used as follows:
Left Motor: Pin 0 (PWM) and Pin 8 (Direction)
Right Motor: Pin 1 (PWM) and Pin 12 (Direction)
Ultrasonic detector: Pin 13 (alternatively neopixel output pin)
Left line sensor: Pin 11 (bottom 3×2 header)
Right Line sensor: Pin 5 (bottom 3×2 header)
For each motor there is a 2-pin screw terminal and a 2-pin male header. If fitted, there is also a 2-pin JST header underneath the board (used in the buggy). All three connectors for each motor are connected together
Power Options. We are starting to use new battery holders for the 4tronix mini-robots that include a switch, indicator LED and a fuse. They also provide power via the same screw positions as they are mounted with, so no wires are required. This provides a very neat and very robust connection. Robo:Bit is ready for a suitable battery holder to be developed in either 3-cell or 4-cell AA format. These may be available in future. But for now, power should be applied to the 2-pin screw terminal near the power switch.

Assembling the Robo:Bit Buggy

Note that this buggy can be purchased in modular form. You can use your own motors and wheels if you already have them – the little yellow motors are pretty ubiquitous, so many schools and hobbyists will already have them. This guide to assembly assumes you have purchased the complete kit, including the ready-soldered wires on the motors – if not you would have to connect the wires to the motors and use the screw terminals on the top of the board.
Click on the image below for a quick assembly GIF



Step 1. Check you have all the Parts

Robo:Bit
Battery Holder
Yellow gear motors x 2
1 caster (metal ball plus plastic housing)
10mm black nylon male-female pillars x 2
15mm black nylon female-female pillars x 2
25mm black nylon female-female pillar (M3)
25mm brass female-female pillar (M3) with fitted attachments
11mm brass female-female pillars x 2
25mm M3 screws x 4
6mm M2.5 screws (pan head) x 8
8mm M2.5 screws (CSK) x 6
M2.5 nuts x 4
4-cell AA battery holder

Step 2. Make the Motor Assembly

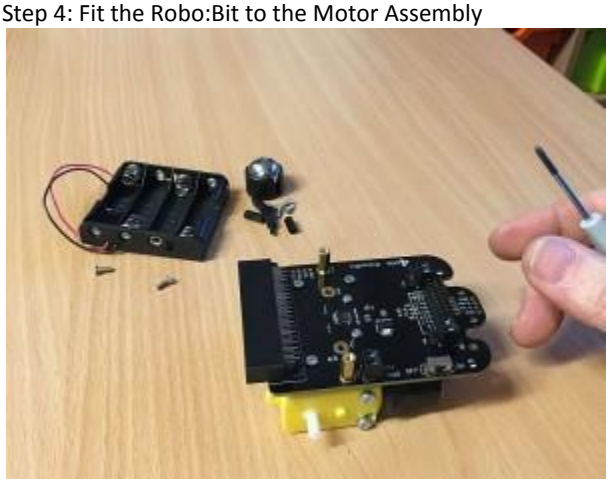
Place the motors into position as shown above, with the axles facing outwards
Use 2 of the 25mm screws to fit the M3 black nylon 25mm female-female spacer to the bottom holes in the motor
Use the other 2 of the 25mm screws to fit the brass bracket assembly to the top holes, making sure that the connector parts point upwards as shown above

Step 3. Prepare the Robo:Bit for Fitting

Fit 4 of the 8mm M2.5 CSK screws and the 4 nuts to the Robo:Bit as shown above. Pass each screw from the top of the board into a nut on the bottom. Tighten securely.

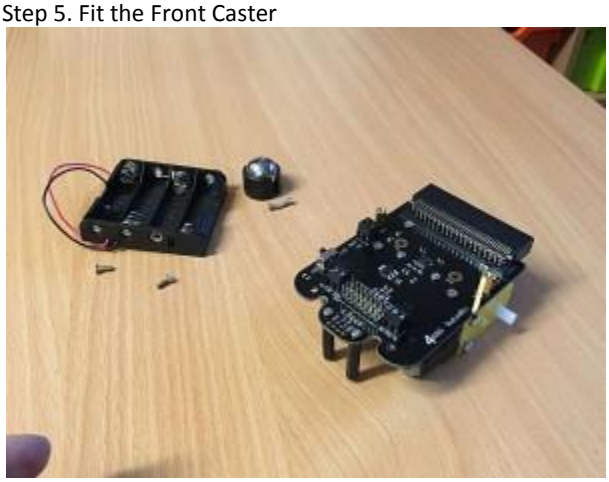
Using 2 of the 6mm M2.5 pan head screws, fit the 11mm brass pillars in place for the 4-cell battery holder – the outermost two holes – as shown above. Tighten securely

Step 4: Fit the Robo:Bit to the Motor Assembly

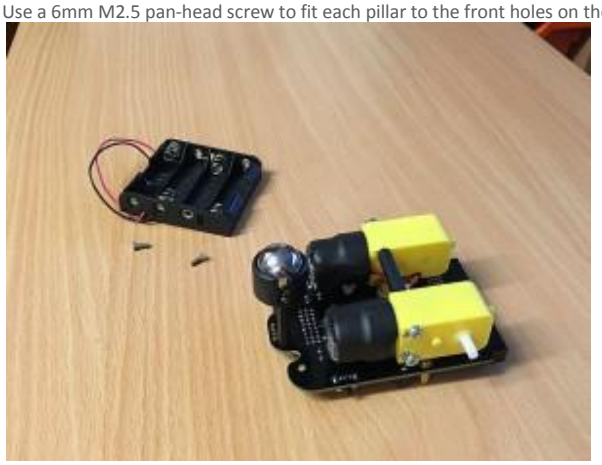


Use 2 of the 6mm M2.5 pan-head screws to attach the Robo:Bit to the upwards-facing connectors on the brass bracket assembly as shown above. Tighten securely.
Push the JST plugs from the motors into the sockets underneath the Robo:Bit controller. The wires are short enough to stay tidy.

Step 5. Fit the Front Caster

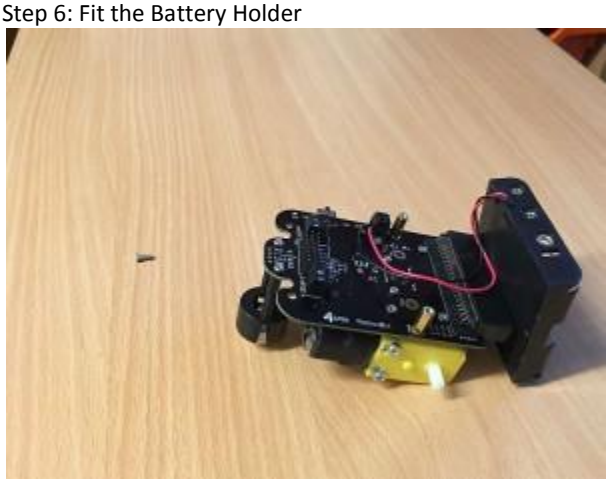


Screw each 10mm black nylon male-female pillar into a 15mm making it into a 25mm female-female pillar.
Use a 6mm M2.5 pan-head screw to fit each pillar to the front holes on the Robo:Bit



Then use two more 6mm M2.5 pan-head screws to fit the caster housing to the pillars (you will have to remove the metal ball while you do this)

Step 6: Fit the Battery Holder



Screw the wires into the power terminal. Red to 5V and Black to GND. Wrap the wires tidily out of the way under the battery holder

Use the remaining 2 of the 8mm M2.5 CSK screws to screw the battery holder to the brass mounting pillars.

Step 7. Finish off and Go!

Push on the wheels. Be careful to hold the motor as the wheels can be quite stiff to fit, especially the first time
Push in the Ultrasonic Sensor (if you have one)
Push the BBC Micro:Bit into the edge connector (LED display and buttons upwards)

Program -> Switch On -> Go!

Fitting the Line Sensors

Step 8. Check you Have the Parts

30mm black nylon M3 pillars
6mm M3 screws x 4
Line follower sensors x 2
10cm GVS cables x 2

Step 9. Fit the pillars to the Robo:Bit

Use 2 of the 6mm M3 screws to fit a 30mm black nylon pillar to each front corner of the Robo:Bit board

Step 10. Fit the Sensors

Push one of the GVS leads onto each line follower sensor. Make sure you use the colour coding: Brown for Ground (G), Red for volts (V+) and Orange for Signal (S)
Then use the remaining 2 of the 6mm M3 screws to to fit the line sensors to the bottom of each pillar. Use the hole near the centre of the sensor, not the one at the front. The wires should be at the back, as shown above

Step 11. Plug the GVS leads into the Connector

Pass the wires around the motor supports and then into the 3×2 male header underneath the Robo:Bit board. Make sure brown goes to Ground (GND), Red to power (3V) and Orange to Signal (SIG)
Also make sure you connect the left one to the left set of pins, and the right one to the right set of pins. It is VERY confusing when writing programs with these reversed (trust me, I know this)

Step 12. Trim the Sensors

Each sensor has a little preset potentiometer (pot) which can be turned to define the position at which it detects a line.
Turn the pot until the red LED on the sensor _just_ turns off. It is then at its most sensitive.
When using 3V, these sensors are not as sensitive. With a little ingenuity (and a different cable) you can connect the power line to VCC (the bottom 3 pins on the 8×3 header on the top of the board). This will make the sensors more sensitive.