MicroBit Robot Interface Board

Revision A, 01/2016

Introduction

The MicroBit Robot Interface Board has been developed to allow the forthcoming BBC micro:bit educational micro-controller board to be used to control the existing fleet of 4tronix robots used in the Robot Challenge programme. The robots are currently controlled via Arduino Uno boards, using 5V logic level sensors. The micro:bit is powered at 3.3V, and its IO pins are not 5V tolerant.

The logic level conversion functions of the interface board are based heavily on the SparkFun Bi-Directional Logic Level Converter board[1]. The designs for the SparkFun board are released under the Creative Commons Attribution Share-Alike 3.0 licence (CC-BY-SA 3.0). As derivative works the designs for the robot interface board are released under the CC-BY-SA 4.0 licence[2], using the "all later versions" compatibility provisions.

Description

The MicroBit Robot Interface Board has the following features:

- Four 3-pin input channel connectors for 5V sensors. These are currently used for left and right infra-red obstacle sensors, and left and right infra-red line follower sensors. These connectors deliver 5V to power the sensors, and each 5V input signal line is shifted down via a BSS138 FET to 3.3V for connection to a micro:bit IO pin. The 5V supply is derived directly from the supply to the interface board.
- Current limiting series resistors (R5, R8) are included for the sensor connections which re-use micro:bit "button" pins, to protect the sensor outputs from being shorted to ground in the event that the buttons are pressed while a sensor is connected.
- Four output pins for connection to the L298N H-bridge motor control board. These are connected directly to micro:bit 3.3V outputs, and are not level shifted up to 5V: The data sheet for the L298N indicates that 3.3V is adequate for logic HIGH detection.
- Two switched GND/5V pins for connection to the L298N H-bridge enable pins. The switch allows the robot motors to be disabled without removing power to the L298N or micro:bit boards. The enable jumpers fitted to the L298N board are removed.
- A 3.3V regulated power supply for the micro:bit board, and an indicating LED. This 3.3V supply is derived from the 5V supply to the interface board via a LM3940 voltage regulator.
- A screw terminal power connector for a regulated 5V power feed derived from the 5V voltage regulator on the L29N motor control board.
- A 40-way edge connector for the micro:bit board. This is arranged so that micro:bit will be vertical with the LED matrix facing forward.

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[1] https://www.sparkfun.com/products/12009
[2] https://creativecommons.org/licenses/by-sa/4.0/

Pin Allocations

The interface board connections to the micro:bit connector are listed in the following table.

PCB Label	Description	Micro:bit Software Pin	Notes
LF-LEFT	Left Line Follower Sensor	16	
LF-RIGHT	Right Line Follower Sensor	0	Large Pad
IR-LEFT	Left Obstacle Sensor	11	BTN B
IR-RIGHT	Right Obstacle Sensor	4	BTN A
L1	L298N Bridge Controller	2	Large Pad, PWM
L2	L298N Bridge Controller	12	
L3	L298N Bridge Controller	8	PWM
L4	L298N Bridge Controller	1	Large Pad

Parts List

All part codes are Farnell (http://uk.farnell.com) unless otherwise indicated.

Quantities are per interface board. Note that these are component quantities, not minimum order quantity multiples.

Reference	Description	Part Code	Quantity
C1	470nF 0603 SMD 25V MLCC	1856365	1
C2	47uF 2.5mm 25V Electrolytic	1870939	1
R1	470R 0603 SMD Resistor	9332146	1
R2, R3, R4, R6, R7, R9, R10, R11, R12	10K 0603 SMD Resistor	9331700	9
R5, R8	100R 0603 SMD Resistor	9331689	2
Q1, Q2, Q3, Q4	BSS138 FET (SOT23 Package)	2053833	4
LED1	3mm Green LED	1581123	1
VR1	LM3940 (SOT223 Package)	1469104	1
S1	Knitter-Switch MFP106D	807527	1
Screw Terminal Block	Multicomp MA522-500M02	2396252	1
Header Pins	Harwin M20-9992046 0.1" x 20	1022262	1
Edge Connector	Sullins RBB40DHHN	Digi-Key S3389-ND[3]	1

PCBs

Eagle and Gerber files for the interface board PCB are available on GitHub[4]. Prototype PCBs were fabricated by OSH Park[5].

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[3] http://www.digikey.co.uk/product-search/en/connectors-interconnects/card-edge-connectors-edgeboard-connectors/1441939?k=S3389-ND
[4] https://github.com/daverobertson63/RoboticsChallenge
[5] https://oshpark.com/