CIRCUITRY FOR 5V REGULATOR AND H-BRIDGE

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1. Breadboard preparation

Here the construction of the breadboard circuit for the robot is explained.
The columns marked with blue and red on either side of the board are split in the middle, where there is a longer break. These must be connected, use 4 short orange wires to complete the connection and ensure that the lines are connected all the way along the board. Also the red line on the left must be joined to the red line on the right, and the same for the blue. The longer red wires are used for this. This ensures that no matter where we connect into the red or blue line they are the same electrical connections.

1.1. **5V regulator.** The first connection is a 2 screw terminal. The battery will be connected to this. It is connected to *62J 64J*.
The 5V regulator, when lying flat on the table with its pins facing towards you, has the connections from left to right: input ground output. It is connected to the breadboard in that same order to connections *60H 59H 58H*.
To connect the battery ground (*GND*) to the 5V regulator *GND* a short white wire is used. It is inserted to the breadboard in holes *62G 59G*.
The 9.6V battery is connected to the 5V regulator input using a short brown wire in connections *64F 60F*. This wire is temporary, it will be replaced by the switch once the breadboard is connected to the robot.
To connect the *GND* to the blue bar a short blue wire is used in connections *59I blue line*.
The output of the regulator must be connected to the red line. This then allows the power and ground connections to be available all around the board for close access. Connect *58I red line* using a short brown wire.

1.2. **H-bridge.** The two 3 screw terminals are used for connecting the motor to the board. Only two of each of these terminals are actually required, but it is used for distinction from the battery connection. The first is placed at *50F 52F 54F* and the second at *33A 35A 37A*.
The H-bridge is now added to the breadboard. The SN754410 chip is a 16-pin package. It therefore must straddle the centre of the breadboard where there is a break in the connections. The pins on the chip are numbered 1-16, and are

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identified by the small notch found on one end of the chip. Pin 1 is to the left of the notch and pin 16 to the right. The pins 1-8 are on the left, with 8 on the bottom, and pins 9-16 are on the right hand side of the chip, with pin 9 on the bottom.
Connect pin 1 of the H-bridge to *40E* with pin 16 in *40F*. This means that pins 8 and 9 are in *47E and 47F* respectively. Take care to get this connection correct.
Next the GND wires must be connected for the H-bridge. There are 4 wires to be connected. *43D 44D and 43G 44G* must all be connected to the blue line on the side of the breadboard. This is done using the short blue wires, connecting left to left and right to right.
The power lines can now be connected to the H-bridge. The chip requires two power connections. One to power the internal circuitry (*pin 16*), and one to provide power to the motors (*pin 8*). Using two short brown wires connect holes *47D and 40G* to the red line along the side of the breadboard.
The outputs of the H-bridge are separated into 2 motors halves, located on pins 3 and 6 and 11 and 14. They are connected via the 3 screw terminals. Using a short grey wire connect *42J to 50J*, and using a short purple wire connect *45I to 52I*. Using ashort grey wire connect *45C to 37C*, and using a short purple wire connect *42D to 35D*.
The final two pins on the H-bridge are Enable lines pins 1 and 9. Using the longer red wire connect these pins to the 5V line on the side of the board (*47G to red, 40B to red*).

1.3. **Connecting the motors and the arduino.** Split the wire on the end of the motors 2cm. use the wire strippers to strip 1cm of wire. Fan the fibrous wire and twist the wires so as to create one strong wire from many.
Affix the breadboard to the robot platform using velcro.
Connect the motor wires to the 3 screw terminals. take care to connect the black to purple and red to grey. *Black to 35, Red to 37, and Red to 50, Black to 52.*
Remove the brown wire in 60F 64F and replace with the two wires from the switch. The orientation of these do not matter.
Connect the motor control wires to the Arduino. Using a long yellow wire connect the first motor to the Arduino, *41G to pin 6, and 46G to pin 5.* Using a long green wire connect the second motor as follows, *41A to pin 9, and 46A to pin 10.* Note that all the pins on the Arduino that are being used for controlling the motors are PWM (pulse width modulation) output. This allows for the accurate control of the voltage provided to the motors, and thus their speed.
Power the Arduino using the 9.6V connection straight from the battery. The Arduino has an inbuilt 5V regulator for its own use, so the higher voltage is required. Using the long green wire connect *60J to Vin*, and connect the *blue line to GND*

on the Arduino.

1.4. **Connecting the sensors.** The servo motor has a GVS connector. This means that the ground and signal lines are on the outside, and the voltage is in the centre. Usually the signal line is either white or yellow, the ground is black and the voltage is red. Connect the servo wires to the breadboard in holes *20F 21F 22F* using the male to male headers supplied. Using further wire, connect these to *Arduino pin 11, red line, blue line*. The signal wire is the one that is extended to the Arduino board to control the servo motor.
The wires on the IR sensor also have to be stripped using a wire strippers. The wires are connected as follows, *red to red line, black to blue line, yellow to pin A0* on the Arduino. Pin A0 is an analog pin, which allows the robot to read much more accurate values than the binary on or off.