Assembling the Hardware for Testing

This file contains instructions for connecting hardware for testing.

Required Hardware:

1. ATmega2560 Development Board.
2. XBee Module
3. Motor Board which you previously made
4. L298 Motor Driver
5. Li-ion Pack Battery (11.1 V, 2200mAH)
6. 2 Quadrature Encoder Motors with Shaft attachments
7. 2 Wheels
8. 1 Electromagnet

ATmega2560 Development Board:

ATMEGA2560 is the versatile AVR architecture based microcontroller from Atmel featuring 256K Flash, 8K RAM, 86 I/O lines arranged in ten 8-bit ports, 16 ADCs, 4 UARTs, 6 timers, 8 external interrupts and much more. ATmega2560 Development Board exposes all the pins of the microcontroller in neat PORT wise configuration. It is made from double sided PTH PCB board to provide extra strength to the connector joints for increased reliability. Board can work on 7 to 15V AC or DC supply. It has built-in reverse polarity protection. 7805 voltage regulator has heat sink for heat dissipation so that it can supply 1A current continuously without getting over heated. It has switches for boot loading, reset and power. It also has XBee/USB interface based on FT232.

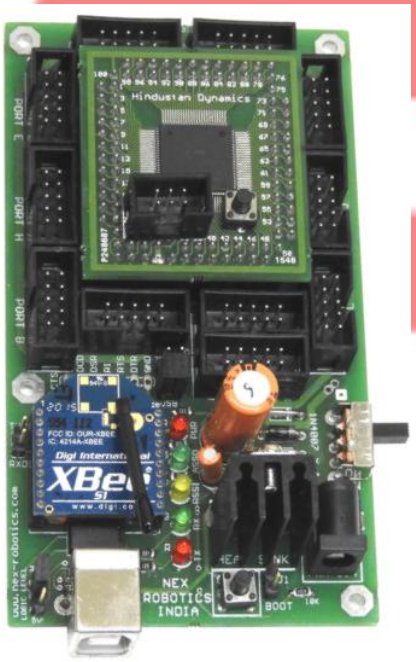

Figure 1: ATmega2560 Development Board

For further details regarding this Development board visit this link.

L298N Motor Driver:

This motor controller is based on the L298N heavy-duty dual H-bridge controller, which can be used to drive two DC motors at upto 2A each, with a voltage between 5 and 35V DC. The controller has fast short-circuit protection diodes, and a heat sink to keep the motor driver safe.

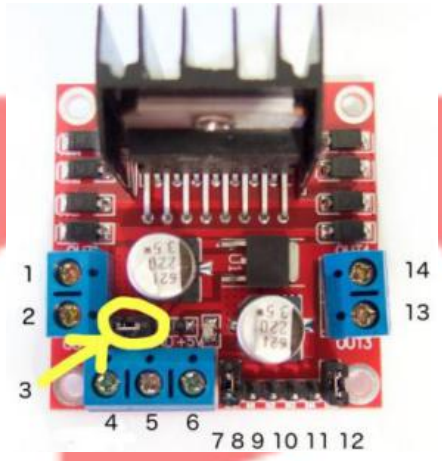

Figure 2: L298N Motor Driver

1. DC motor 1 - Out1 (DC motor wire-1)
2. DC motor 1 - Out2 (DC motor wire-2)
3. 12V jumper – This jumper has to be removed if supply voltage is greater than 12V DC.
4. Motor supply voltage
5. GND
6. 5V output if 12V jumper is in place
7. DC motor 1 enable jumper. Connect to PWM output for DC motor speed control.
8. IN1 - Direction control pin for motor 1
9. IN2 - Direction control pin for motor 1
10. IN3 - Direction control pin for motor 2
11. IN4 - Direction control pin for motor 2
12. DC motor 2 enable jumper. Connect to PWM output for DC motor speed control.
13. DC motor 2 - Out1 (DC motor wire-1)
14. DC motor 2 - Out2 (DC motor wire-2)

Connection Instructions:

1. First take ATmega2560 Development Board with one of the XBee modules placed at XBee module slot as shown in Figure 1.

Note: *For connecting XBee to the microcontroller, place the jumpers in XBee mode in ATmega2560 Development Board.*

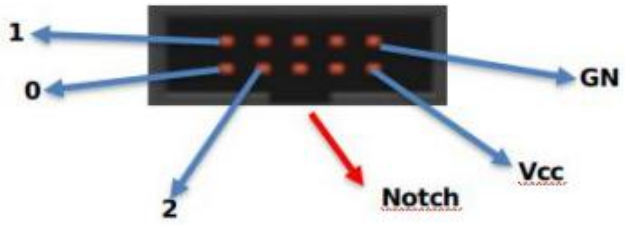

Figure 3: Pin Alignment for FRC Connector

Figure 3 shows the order of numbering pins in a port. Please note that the pins in a port are numbered according to the positions of the notch. Please be careful while numbering pins in PORTA, PORTK and PORTF as you are likely to make mistake because the position of notch on these ports are different compared to other ports.

2. Make the following connections between Motor driver and ATmega2560 Development board.

Note: *Make sure that the 12V jumper is in place and DC motor enable jumper 1 and jumper 2 (7 and 12 in Figure 2) are removed.*

L298N Motor Driver	**ATmega2560 Development Board**
ENA	PORTL3
IN1	PORTA0
IN2	PORTA1
ENB	PORTL4
IN3	PORTA2
IN4	PORTA3

After making the above connections, setup will look like as shown in Figure 4.

3. Connect the motors to the following pins on the ATmega3560 development board and the L298N motor driver.

Motor 1	**L298N**	**Motor 2**	**L298N**
5V	5V	5V	5V
GND	GND	GND	GND
M1	OUT1	M1	OUT4
M2	OUT2	M2	OUT3

Motor 1	**ATmega2560**	**Motor 2**	**ATmega2560**
A	PORTE4	A	PORTE6
B	PORTE5	B	PORTE7

4. Connect servo motors with ATmega Development Board according to the following table.

Servo Motor	**ATmega2560 Development Board**
PWM (white wire)	PORTC0
Vcc (Red wire)	12V (Power distribution board)
GND (Black wire)	GND

After making the above connections. The setup will look like as shown in Figure 5 for the Servo.

5. Connect the motor board you have previously made to the motor driver in pin number 4 and 5 (Figure 2). Make sure that you are connecting the Vcc end of the power supply distribution circuit to pin number 4 and the GND end to pin number 5. Plug in the DC Jack into the ATmega Development board's socket. Plug in the power supply to the DC Jack socket of the distribution circuit.

6. Connect the buzzer module to the following pins on the ATmega2560 development board.

Buzzer Module	ATmega2560 Development Board
GND	GND
5V	5V
I/O	PORTB0

7. Connect the white-line sensor to 3 potentiometers and the following pins on the ATmega2560 development board.

White-Line Sensor	ATmega2560	Potentiometers
PIN1	PORTF1	
PIN3	PORTF2	
PIN5	PORTF3	
PIN2		P1 (Middle Terminal)
PIN4		P2 (Middle Terminal)
PIN6		P3 (Middle Terminal)
PIN15, 16, 17, 18	GND	
PIN19, 20	5V	

Note: *The first and last terminals of each potentiometer will be connected to a 5V source and ground respectively.*

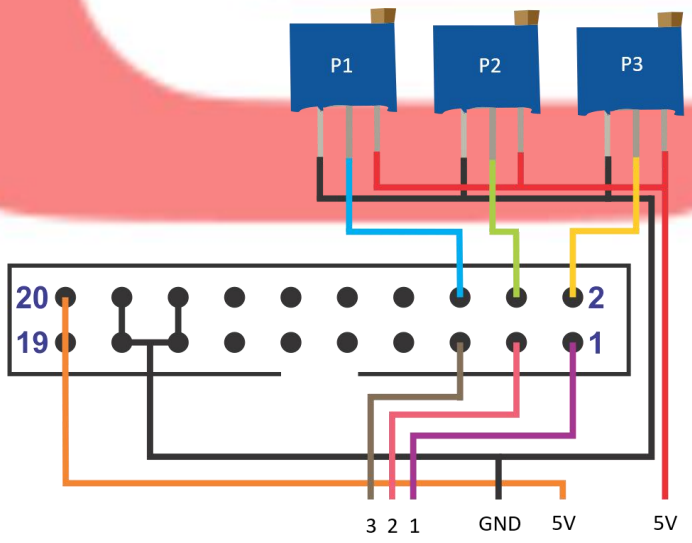

Figure 4: White-Line Sensor and Potentiometers' Connections

Figure 5: Pin Alignment for White-Line Sensor Module

8. Connect the electromagnet circuit to the following pins on the ATmega2560 development board and the power distribution board.

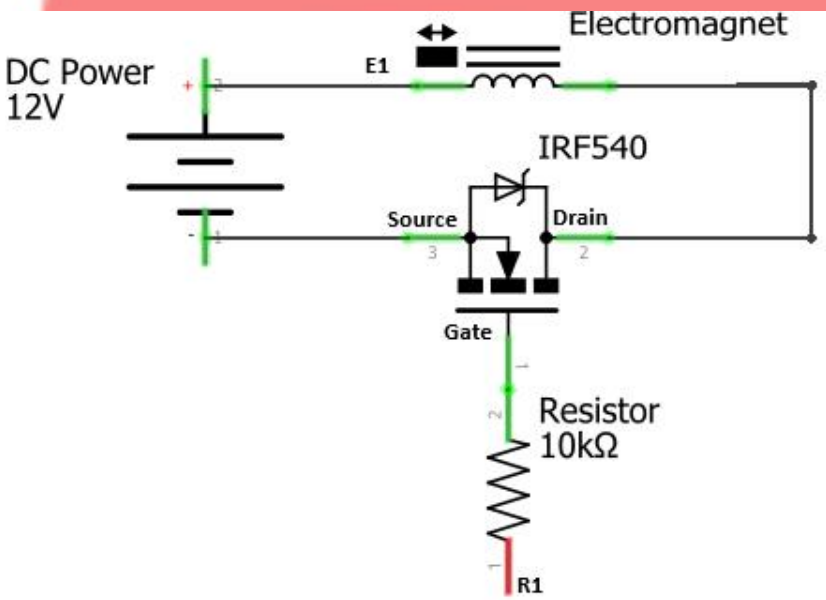

Figure 6: Electromagnet and MOSFET circuit

Electromagnet Circuit	ATmega2560/Power Distribution Board
R1	PORTH0
Source	GND
E1	12V

Complete Circuit

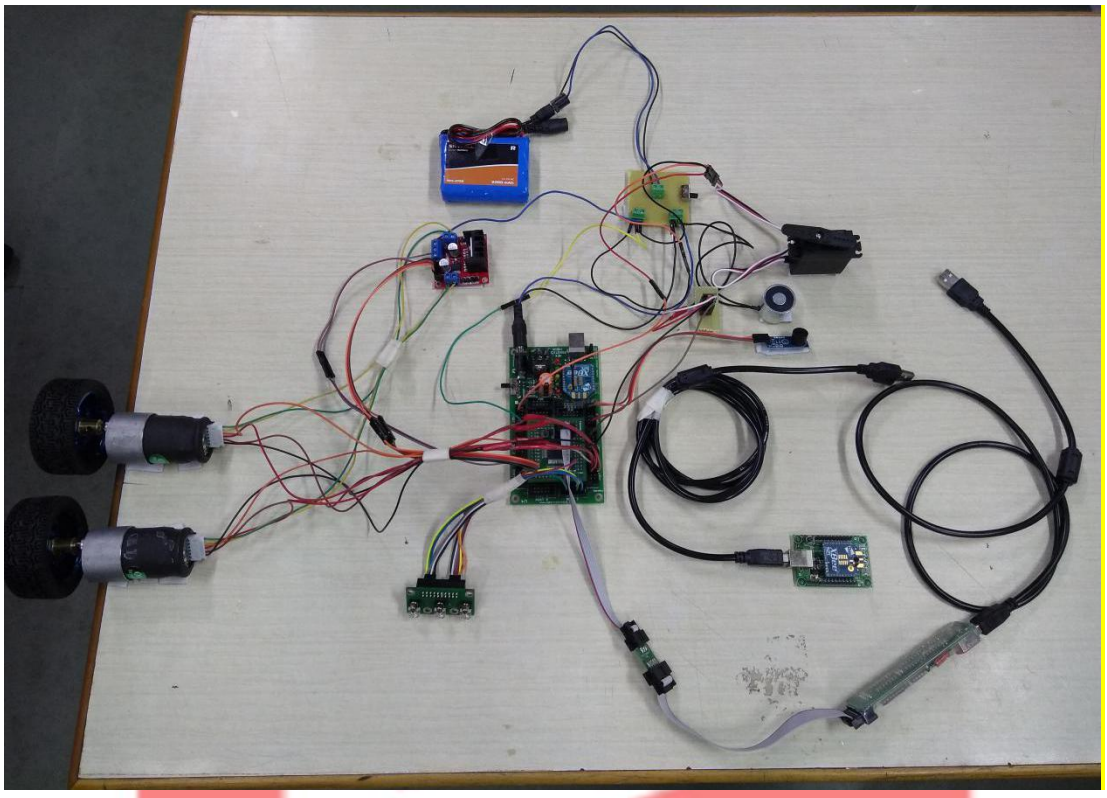

Figure 7: Complete circuit

After making all these connections, your setup will look like as shown in Figure 7.

9. Switch on both the Power distribution circuit (as explained in Making_board_for_Motor.pdf) and ATmega Development Board. You will notice a red led both on the motor driver and the ATmega Development Board. A green led marked as ASSO in ATmega Development board keeps on blinking indicating that your XBee module connection is correct. If you don't see green led blinking, switch off the circuit and make sure that you have connected the XBee module properly on the Development Board.