Study Notes of Iteaduino Part VIII

- To Drive DC Motor with L298N

Iteaduino cannot only sense the environment through a variety of sensors, but also can send feedback and influence on environment by controlling lights, motors and other devices. In the last study notes, we introduced several sensors: light sensor, temperature sensor as well as track sensor. Here, I will describe how to use MotoMama motor drive shield to drive DC motor. MotoMama is a shield compatible with Arduino using L298N driver chip which is a monolithic integrated high-voltage, high-current and dual full-bridge drive chip for motors, each bridge supplies 1A rated current and peak current of maximum 3A. It can drive two DC motors simultaneously or a four-wire two-phase stepper motor. Wireless communication is needed in many motors and robot projects. In MotoMama board, we set up a wireless LAN, thus we can connect XBee (or other modules compatible with XBee, such as BTBee) and nRF24L01 modules to MotoMama board directly.

To do this test, we will need:

- Iteaduino board x 1
- MotoMama motor drive module x 1
- DC motor x 1

Introduction of materials

The actual MotoMama motor drive module is shown in figure 1:

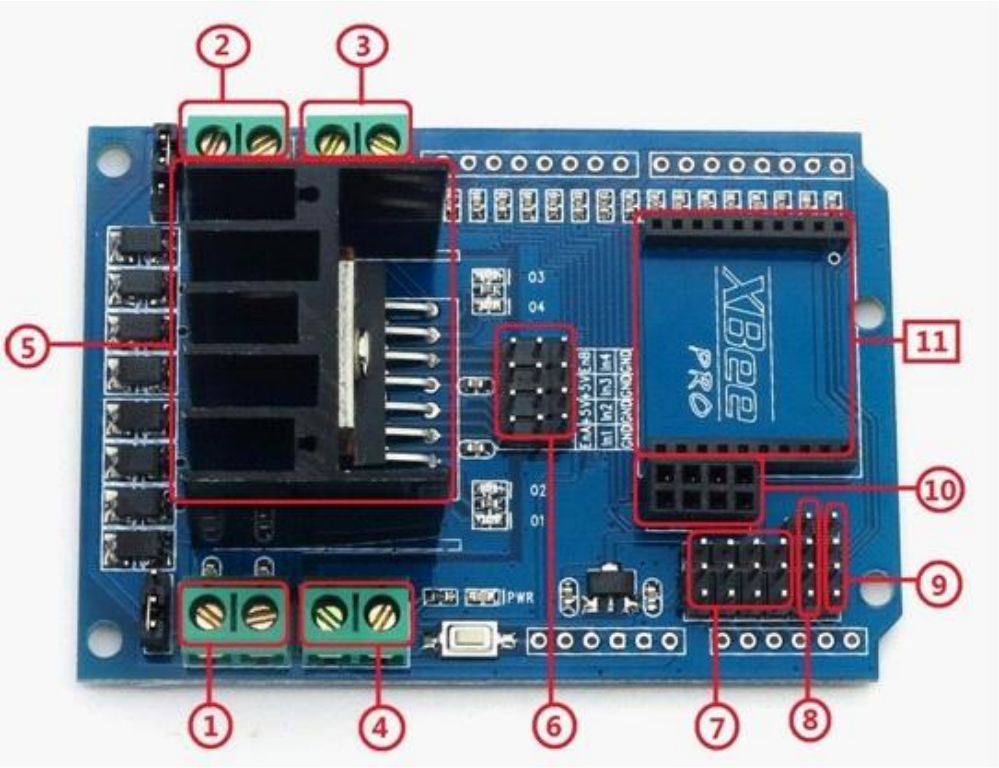

Figure 1

(1) Interfaces for motor 1, to connect to DC motor 1.

(2) Interfaces for motor 2, to connect to DC motor 2.

(3) Driving power for motors. "VIN" and "GND" are marked at the two interfaces respectively. "VIN" interface provides motor driving voltage, value of which ranges from +7V ~ +24V, thus Iteaduino board will need an external power supply with voltage value from +7V ~ +24V. "GND" interface refers to grounding terminal.

(4) Logic power part. "+5V" and "GND" are marked at the two interfaces respectively, where "+5V" interface supplies +5V logic voltage and "GND" interface refers to grounding terminal.

(5) L298N dual-H-bridge chip. L298N is a driving chip for high-voltage and high-current motors which contains two H-bridge high-voltage and high-current full-bridge driver, and it can be used to drive

inductive load such as DC motor, stepper motor and relay coil. L298N adopts standard logic level signal control with two enable control terminals, which allows or disallows the devices to work under condition of no interference from the input signals. There is a logic power input terminal in L298N which makes the internal logic circuit work at low voltage. L298N can be externally connected to a detection resistor to send feedback of variations to the control circuit. The chip can drive a two-phase stepper motor or two DC motors simultaneously.

(6) Motor control, among which ENA (which connects to D10 pin of Iteaduino), In1 (which connects to D8 pin of Iteaduino) and In2 (which connects to D9 pin of Iteaduino) are to control motor 1, while EnB (which connects to D11 pin of Iteaduino), In3 (which connects to D12 pin of Iteaduino) and In4 (which connects to D13 pin of Iteaduino) are to control motor 2. Both D10 (ENA) and D11 (EnB) support PWM output, thus voltage value output by D10 and D11 can be controlled by function analogWrite (), and voltage value of EnA and EnB can also be controlled. By changing voltage value of EnA and EnB, the rotation speed of motor 1 and motor 2 can also be changed. The higher the voltage value, the higher the rotation speed. The relationship between value of control pin and motor status is shown in the following table:

EnA	In1	In2	Motor Status		EnB	In3	In4	Motor Status
0	X	X	Stop		0	X	X	Stop
1	1	0	Clockwise rotation		1	1	0	Clockwise rotation
1	0	1	Reverse rotation		1	0	1	Reverse rotation
1	In1=In2		Stop		1	In3=In4		Stop

(7) Analog input interface, can also be used for digital input/output.

(8) Either analog input interface or IIC interface, supporting IIC serial communication

(9) Either analog input interface or UART interface, supporting UART serial communication

(10) nRF24L01+ interface, can be directly connected to nRF24L01+ module for wireless communication

(11) Xbee module interface, can be directly connected to Xbee module for wireless communication.

Construction of hardware circuit

First, insert MotoMama motor drive shield directly into Iteaduino board, and draw two cables from OUT1 and OUT2 interfaces and connect them to the two pins of DC motor respectively. In addition to connecting Iteaduino to the computer with a USB cable, the Iteaduino board should also be linked to a 9V-12V external power supply.

The actual circuit schematic is shown in figure 2:

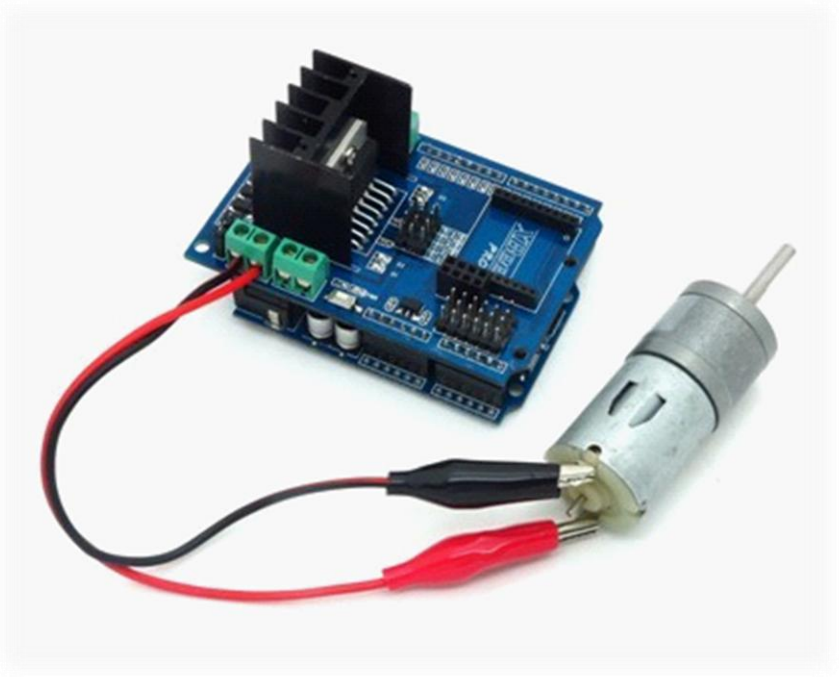

Figure 2

Writing of control program

The complete program used in the test is as below:

```
int EnA=10;
void setup()
{
  pinMode(8,OUTPUT);      //to set D8 as output interface
  pinMode(9,OUTPUT);      //to set D9 as output interface
pinMode(EnA,OUTPUT);    //to set D10 as output interface
}
void loop()
{
  digitalWrite(8,HIGH);      //D8 outputs high level
  digitalWrite(9,LOW);      //D9 outputs low level
  analogWrite(EnA, 127); //D10 outputs a waveform with 50% duty ratio
  delay(5000);                    //delay by 5s
```

```
  analogWrite(EnA, 255); //D10 outputs a waveform with 100% duty ratio
  delay(5000);                //delay by 5s

  digitalWrite(9,HIGH);     //D9 outputs high level
  digitalWrite(8,LOW);      //D8 outputs low level
  analogWrite(EnA, 127); //D10 outputs a waveform with 50% duty ratio
  delay(5000);                //delay by 5s
  analogWrite(EnA, 255); //D10 outputs a waveform with 100% duty ratio
  delay(5000);                //delay by 5s
  digitalWrite(9,LOW);      //D9 outputs low level
  digitalWrite(8,LOW);      //D8 outputs low level
  delay(1000);                //delay by 5s
}
```

Compiling and uploading of program

Then compile and download the above program into Iteaduino, the operation of which is the same with that in last tests.

After downloading the program, you can see motor rotate clockwise at certain speed for 5s, accelerate for 5s, then rotate counter-clockwise at certain speed for 5s, and then accelerate for 5s, finally stop for 1s. The cycle repeats in this way.

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