Micro DC Motor with Encoder-SJ01 SKU: FIT0450

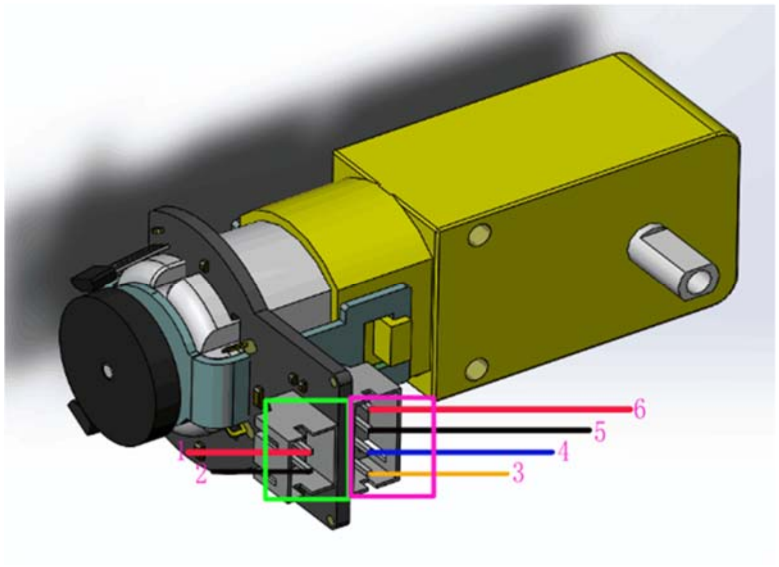
Introduction

This is the DFRobot Micro DC geared motor with encoder. It is a motor with a 120:1 gearbox and an integrated quadrature encoder that provides a resolution of 16 pulse single per round giving a maximum output of 1920 within one round.
With an Arduino controller and motor driver, applications for this might include a closed-loop PID control or PWM motor speed control. This motor is an ideal option for mobile robot projects. The copper output shaft, embedded thread and reinforced connector greatly extends the motor's service life.

Specification

- Gear ratio: 120:1
- No-load speed @ 6V: 160 rpm
- No-load speed @ 3V: 60 rpm
- No-load current @ 6V: 0.17A
- No-load current @ 3V: 0.14A
- Max Stall current: 2.8A
- Max Stall torque: 0.8kgf.cm
- Rated torque: 0.2kgf.cm
- Encoder operating voltage: 4.5~7.5V
- Motor operating voltage: 3~7.5V (Rated voltage 6V)
- Operating ambient temperature: -10~+60℃

Pin Description



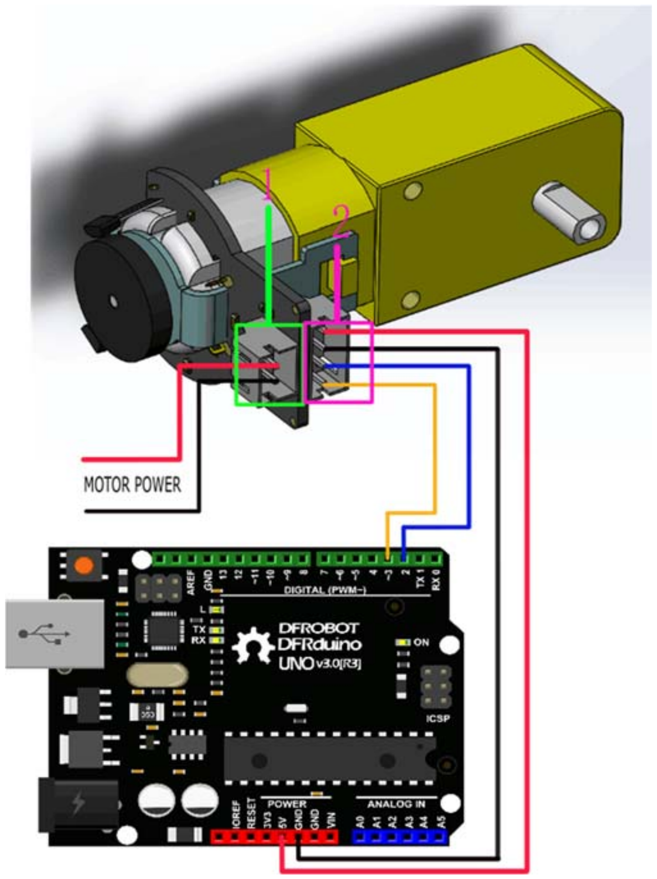
Grade	Name	Functional Description
1	Motor power supply pin +	3-7.5V， Rated voltage6V
2	Motor power supply pin -	
3	Encoder A phase output	Changes square wave with the output frequency of Motor speed
4	Encoder B phase output	Changes square wave with the output frequency of Motor speed(interrupt port)
5	Encoder supply GND	
6	Encoder supply +	4.5-7.5V

Tutorial

Ready to Work

- **hardware**
- ARduino UNO x1
- DC power supply x1
- L298 2x2A Motor Shield for Arduino Twin x1
- **software**
- Arduino IDE Download Arduino IDE

Wiring Diagram



This tutorial is about Encoder usage. We are using D2&D3 as driving pins, you can select other ones, but it requires at least 1 interrupt pin. (We selected D2, Interrupt 0 in this tutorial).

Interrupt Port with Different Board

Notice: attachInterrupt()

Board	int.0	int.1	int.2	int.3	int.4	int.5
Uno, Ethernet	2	3				
Mega2560	2	3	21	20	19	18
Leonardo	3	2	0	1	7	

If using an Arduino UNO and you want to use interrupt port 0 (Int.0), you need to connect digital pin D2 on the board. The following code is only used in UNO and Mega2560. If you want to use Arduino Leonardo, you should change digital pin D3 instead of digital pin D2.

See the link for details http://arduino.cc/en/Reference/AttachInterrupt

Encoder Sample Code 1

```
//The sample code for driving one way motor encoder
const byte encoder0pinA = 2;//A pin -> the interrupt pin 0
const byte encoder0pinB = 3;//B pin -> the digital pin 3
byte encoder0PinALast;
int duration;//the number of the pulses
boolean Direction;//the rotation direction



void setup()
{
  Serial.begin(57600);//Initialize the serial port
  EncoderInit();//Initialize the module
}

void loop()
{
  Serial.print("Pulse:");
  Serial.println(duration);
  duration = 0;
  delay(100);
}

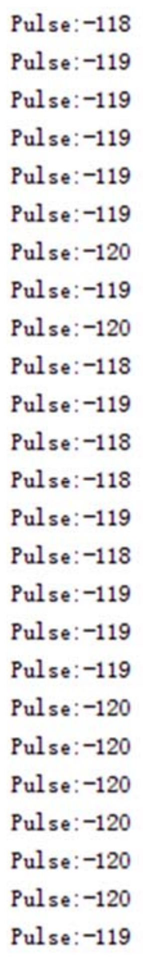
void EncoderInit()
{
  Direction = true;//default -> Forward
  pinMode(encoder0pinB,INPUT);
  attachInterrupt(0, wheelSpeed, CHANGE);
}

void wheelSpeed()
{
  int Lstate = digitalRead(encoder0pinA);
  if((encoder0PinALast == LOW) && Lstate==HIGH)
  {
    int val = digitalRead(encoder0pinB);
    if(val == LOW && Direction)
    {
      Direction = false; //Reverse
    }
    else if(val == HIGH && !Direction)
    {
      Direction = true;  //Forward
    }
  }
  encoder0PinALast = Lstate;

  if(!Direction)  duration++;
  else  duration--;
}
```

Code 1 phenomenon:

Explanation: Serial data, when the motor forward, the output value> 0, when the motor reverse rotation, digital output <0. The faster the motor speed, the greater the absolute value of number.



```
Pulse:-118
Pulse:-119
Pulse:-119
Pulse:-119
Pulse:-119
Pulse:-119
Pulse:-120
Pulse:-119
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Pulse:-118
Pulse:-119
Pulse:-118
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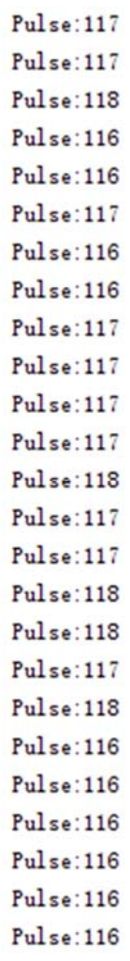

```
Pulse:117
Pulse:117
Pulse:118
Pulse:116
Pulse:116
Pulse:117
Pulse:116
Pulse:116
Pulse:117
Pulse:117
Pulse:117
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Pulse:118
Pulse:117
Pulse:118
Pulse:116
Pulse:116
Pulse:116
Pulse:116
Pulse:116
Pulse:116
```

Encoder Sample Code2

PID control : PID algorithm to control the motor speed by L298P DC motor driver board

1. Motor power port is connected to the L298 drive motor M1 port
2. Download and install Arduino PID

```
//The sample code for driving one way motor encoder

#include <PID_v1.h>

const byte encoder0pinA = 2;//A pin -> the interrupt pin 0

const byte encoder0pinB = 3;//B pin -> the digital pin 3

int E_left =5; //The enabling of L298PDC motor driver board connection to the
digital interface port 5

int M_left =4; //The enabling of L298PDC motor driver board connection to the
digital interface port 4

byte encoder0PinALast;

double duration,abs_duration;//the number of the pulses
```

```
boolean Direction;//the rotation direction

boolean result;


double val_output;//Power supplied to the motor PWM value.

double Setpoint;

double Kp=0.6, Ki=5, Kd=0;

PID myPID(&abs_duration, &val_output, &Setpoint, Kp, Ki, Kd, DIRECT);


void setup()

{

  Serial.begin(9600);//Initialize the serial port

   pinMode(M_left, OUTPUT);   //L298P Control port settings DC motor driver b
oard for the output mode

   pinMode(E_left, OUTPUT);

   Setpoint =80;  //Set the output value of the PID

   myPID.SetMode(AUTOMATIC);//PID is set to automatic mode

   myPID.SetSampleTime(100);//Set PID sampling frequency is 100ms

  EncoderInit();//Initialize the module

}


void loop()

{

      advance();//Motor Forward

      abs_duration=abs(duration);

      result=myPID.Compute();//PID conversion is complete and returns 1

      if(result)

      {

        Serial.print("Pluse: ");

        Serial.println(duration);

        duration = 0; //Count clear, wait for the next count

      }




}
```

```
void EncoderInit()
{
  Direction = true;//default -> Forward
  pinMode(encoder0pinB,INPUT);
  attachInterrupt(0, wheelSpeed, CHANGE);
}

void wheelSpeed()
{
  int Lstate = digitalRead(encoder0pinA);
  if((encoder0PinALast == LOW) && Lstate==HIGH)
  {
    int val = digitalRead(encoder0pinB);
    if(val == LOW && Direction)
    {
      Direction = false; //Reverse
    }
    else if(val == HIGH && !Direction)
    {
      Direction = true;  //Forward
    }
  }
  encoder0PinALast = Lstate;

  if(!Direction)  duration++;
  else  duration--;

}
void advance()//Motor Forward
{
     digitalWrite(M_left,LOW);
     analogWrite(E_left,val_output);
}
void back()//Motor reverse
```

```
{
     digitalWrite(M_left,HIGH);
     analogWrite(E_left,val_output);
}


void Stop()//Motor stops
{
     digitalWrite(E_left, LOW);
}
```

Code 2 phenomenon:

The code PID value has been set as 80, so the motor will stabilize at about 80 rpm. If outside forces such as changes in motor drive voltage, the motor's resistance, etc affect the speed, the program will adjust the PWM value to stabilize the rotational speed at 80.