Stepper Motor Basics

What you get

- Stepper motor, 28BYJ48, with a 5-way connector
- Driver board, containing 4 Darlington drivers (ULN2003) and 4 LEDs

Motor Connections

The diagram to the left shows the 5 wires connected to the motor. Plug the motor into the driver board.

The Arduino should be connected to the ULN2003 driver board as shown below:

- 5V+ connect to +5V
- 5V- connect to 0V (Ground)
- IN1: to Arduino digital input pin 8
- IN2: to Arduino digital input pin 9
- IN3: to Arduino digital input pin 10
- IN4: to Arduino digital input pin 11

Driving the Motor

You should drive the motor by enabling the pins in an 8-phase order as shown to the left (Clockwise movement):

- Drive IN4 only
- Drive IN4 and IN3
- Drive IN3 only
- Drive IN3 and IN2
- etc.

For anti-clockwise motion, simply follow the sequence in reverse

Example Code

```
// This Arduino example demonstrates bidirectional operation of a
// 28BYJ-48, using a ULN2003 interface board to drive the stepper.
// The 28BYJ-48 motor is a 4-phase, 8-beat motor, geared down by
// a factor of 68. One bipolar winding is on motor pins 1 & 3 and
// the other on motor pins 2 & 4. The step angle is 5.625/64 and the
// operating Frequency is 100pps. Current draw is 92mA.
```

```
/////////////////////////////////////////

//declare variables for the motor pins
int motorPin1 = 8;   // Blue   - 28BYJ48 pin 1
int motorPin2 = 9;   // Pink   - 28BYJ48 pin 2
int motorPin3 = 10;  // Yellow - 28BYJ48 pin 3
int motorPin4 = 11;  // Orange - 28BYJ48 pin 4
                     // Red    - 28BYJ48 pin 5 (VCC)

int motorSpeed = 1200;  //variable to set stepper speed
int count = 0;          // count of steps made
int countsperrev = 512; // number of steps per full revolution
int lookup[8] = {B01000, B01100, B00100, B00110, B00010, B00011, B00001, B01001};

/////////////////////////////////////////////////////////////////////////
void setup() {
  //declare the motor pins as outputs
  pinMode(motorPin1, OUTPUT);
  pinMode(motorPin2, OUTPUT);
  pinMode(motorPin3, OUTPUT);
  pinMode(motorPin4, OUTPUT);
  Serial.begin(9600);
}
/////////////////////////////////////////////////////////////////////////
void loop(){
  if(count < countsperrev )
    clockwise();
  else if (count == countsperrev * 2)
    count = 0;
  else
    anticlockwise();
  count++;
}
/////////////////////////////////////////////////////////////////////////
//set pins to ULN2003 high in sequence from 1 to 4
//delay "motorSpeed" between each pin setting (to determine speed)
void anticlockwise()
{
  for(int i = 0; i < 8; i++)
  {
    setOutput(i);
    delayMicroseconds(motorSpeed);
  }
}
void clockwise()
{
  for(int i = 7; i >= 0; i--)
  {
    setOutput(i);
    delayMicroseconds(motorSpeed);
  }
}
void setOutput(int out)
{
  digitalWrite(motorPin1, bitRead(lookup[out], 0));
  digitalWrite(motorPin2, bitRead(lookup[out], 1));
  digitalWrite(motorPin3, bitRead(lookup[out], 2));
  digitalWrite(motorPin4, bitRead(lookup[out], 3));
}
```