ABCs of Arduino

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Bio: Kurt is a web designer (java/php/UI-jquery),
project manager, instructor (PHP/HTML/...), and arduino enthusiast,
Kurt is founder of www.trailpeak.com and contracts for several online projects.

Kurt has 20 years in IT (nortel, DSET, trailswest, Canada Post, …)

Arduino -- it's Italian!

- What is a micro-controller?
  - C coding style in a simple editor to control …
    - . sensors (PIR, range, temperature, ...
    - . motors (for your robot!)
    - . electronics (A / D input, digital I/O)

- Safety - not yours so much, the arduinos!
  - . I/O pins can sink or source 40 milliamps
  - . drive an LED with a resistor (limit current in components)

- Lots of 3rd party sensors, kits, examples, books ...
  - . free IT books (tons of free Arduino Youtube, books, examples)
    - google "arduino books"
    - arduino.cc

Robotshop.ca is quality! Cheap sensors and even arduino at Deal-Extreme (DX) !?
Electronics Goldmine another favourite! Oh, and most importantly - arduino.cc!!

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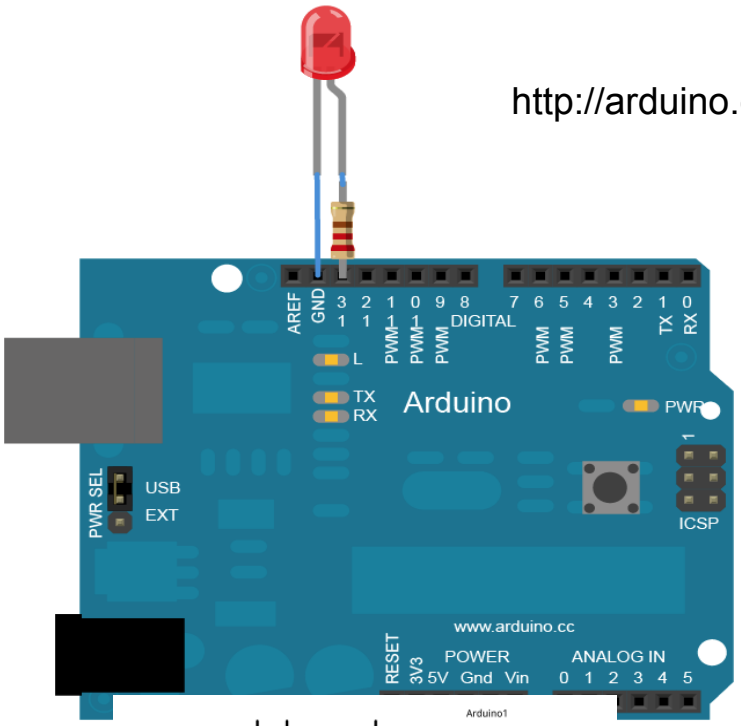
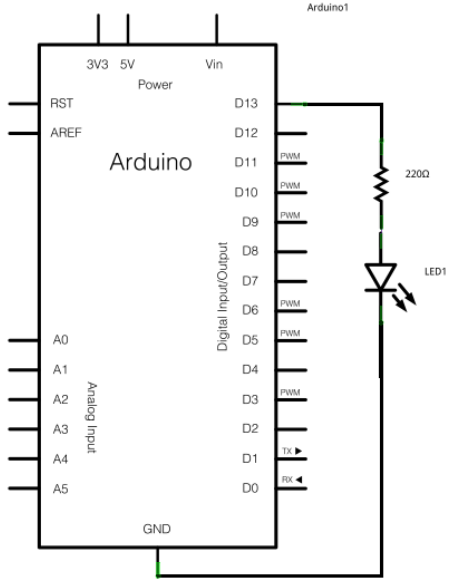
Coding - IDE comes with it!





220 to 1K resistor

http://arduino.cc/en/tutorial/blink

arduino.cc - go get your IDE!

1 | Get an Arduino + USB
2 | Download the IDE
3 | Install the Software
4 | Connect the board
5 | Launch
6 | Open blink
7 | Select your board
8 | Select your serial port
9 | Upload the program

```
 This example code is in the public domain.
 */

// Pin 13 has a LED connected on most Arduinos
// give it a name:
int led = 13;

// the setup routine runs once when press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again
forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on
  delay(1000);               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off
  delay(1000);               // wait for a second
}
```

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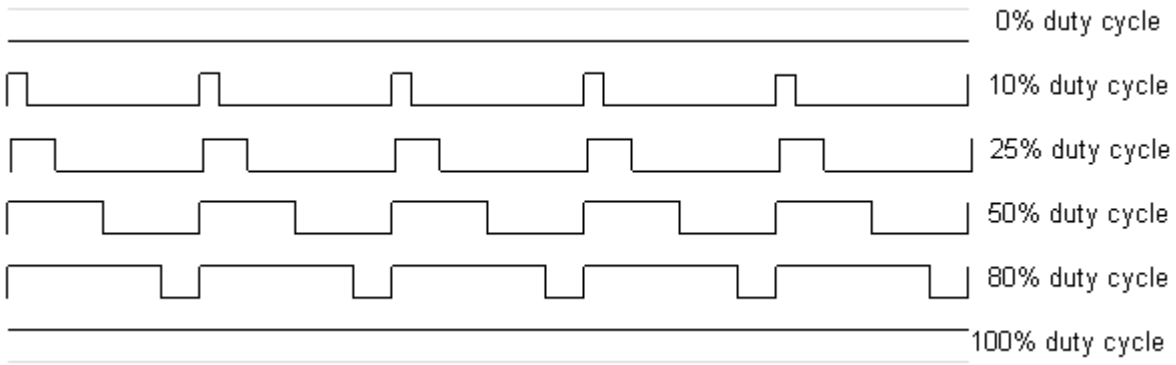
exercise - PWM Blink (Fade)

```
/*
 Fade - This example shows how to fade an LED on pin 9
 using the analogWrite() function.
 */

int led = 9;           // the pin that the LED is attached to
int brightness = 0;    // how bright the LED is
int fadeAmount = 5;    // points to fade the LED by

// the setup routine runs once
void setup()  {
  // declare pin 9 to be an output:
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over
void loop()  {
  // set the brightness of pin 9:
  analogWrite(led, brightness);

  // change the brightness for next time through the loop:
  brightness = brightness + fadeAmount;

  // reverse the direction of the fading at the ends of the fade:
  if (brightness == 0 || brightness == 255) {
    fadeAmount = -fadeAmount ;
  }
  // wait for 30 milliseconds to see the dimming effect
  delay(30);
}
```



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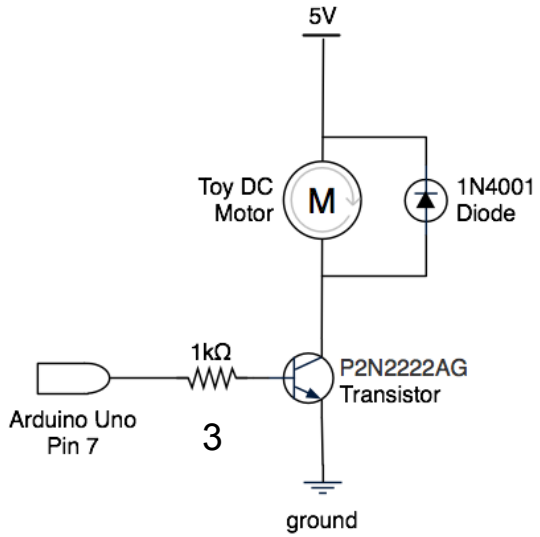
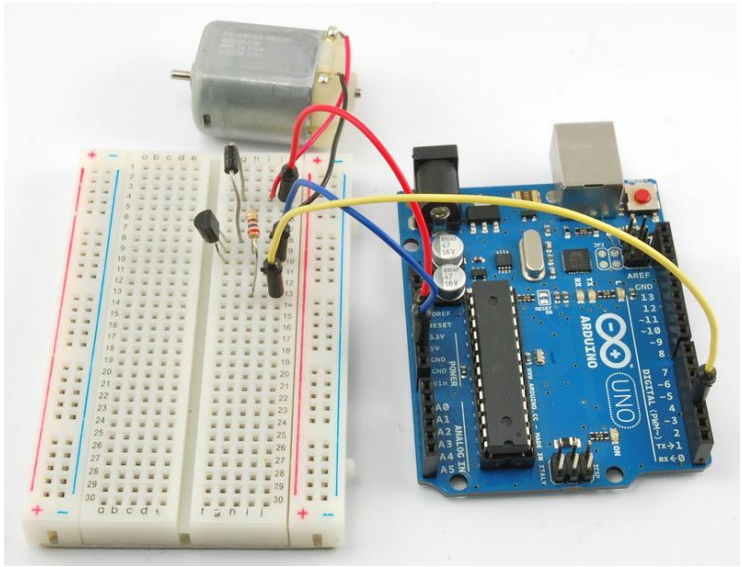
PWM a motor with Tranistor (simple)

```
/*
Adafruit Arduino - Lesson 13. DC Motor
*/
int motorPin = 3;
void setup()
{
pinMode(motorPin, OUTPUT);
Serial.begin(9600);
while (! Serial);
   Serial.println("Speed 0 to 255");
}

void loop()
{
if (Serial.available())
{
    int speed = Serial.parseInt();
    if (speed >= 0 && speed <= 255)
    {
      analogWrite(motorPin, speed);
    }
}
}
```





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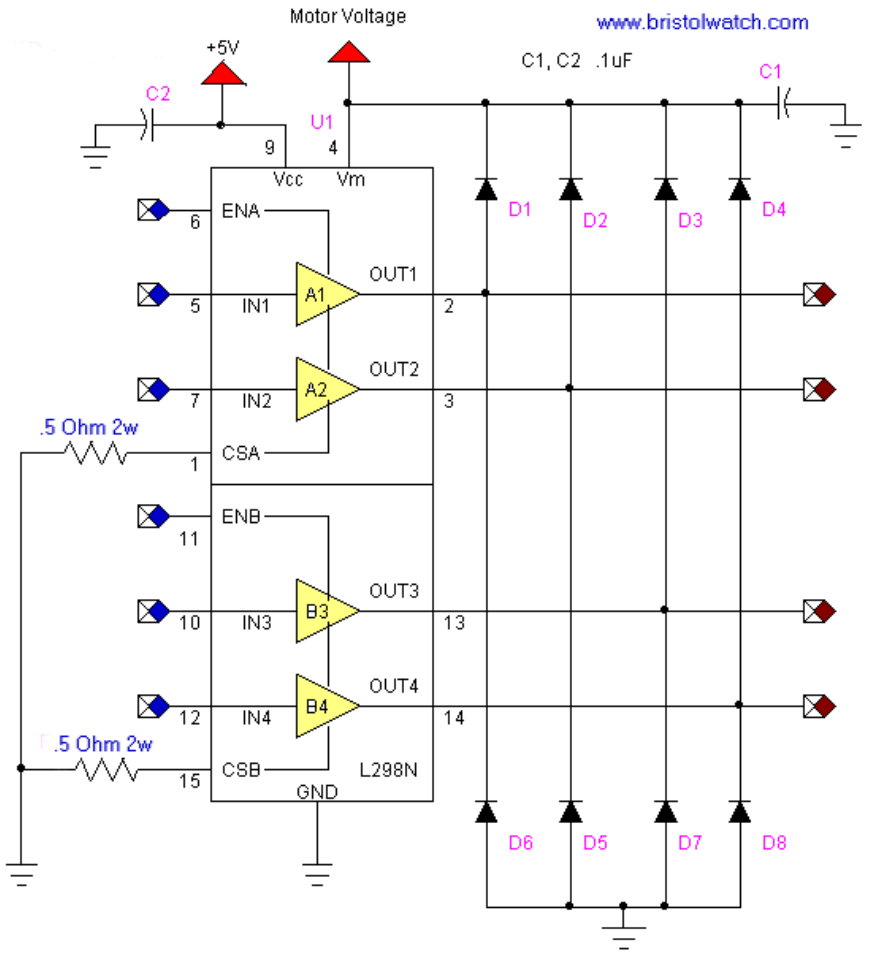
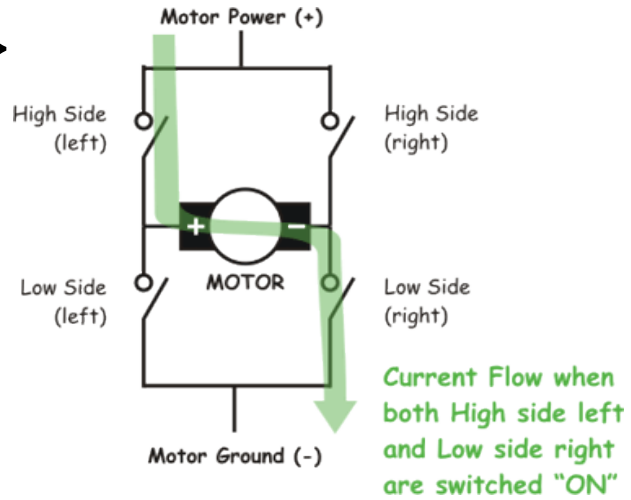
Control 2 DC brushed motors L298N

a) H-bridge (dual) using L298N

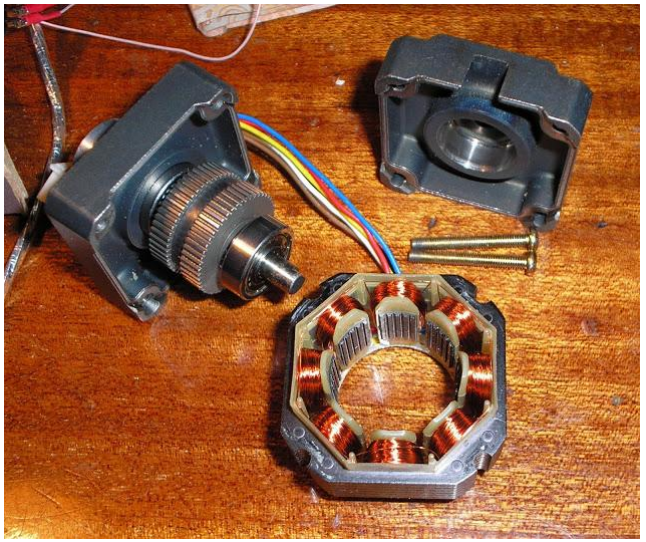


H-bridge



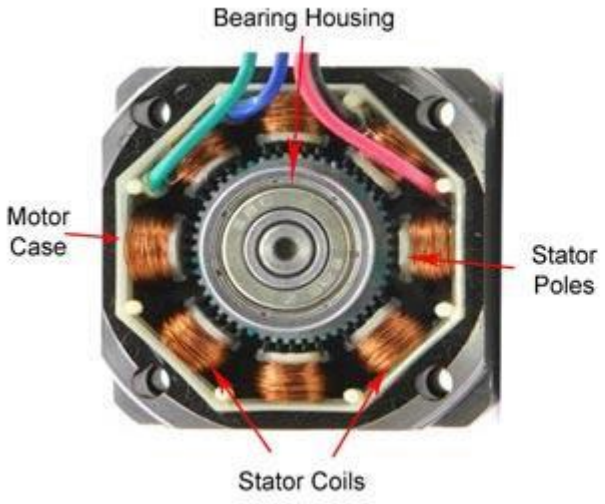
http://www.bristolwatch.com/L298N/index.htm

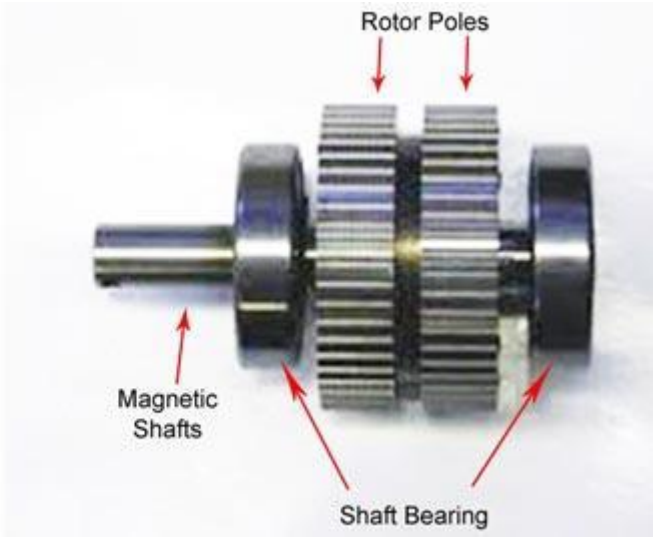
Stepper Motor



- precise movement,
- high holding torque at lo-speed
- continuous

https://www.youtube.com/watch?v=t-3VnLadIbc





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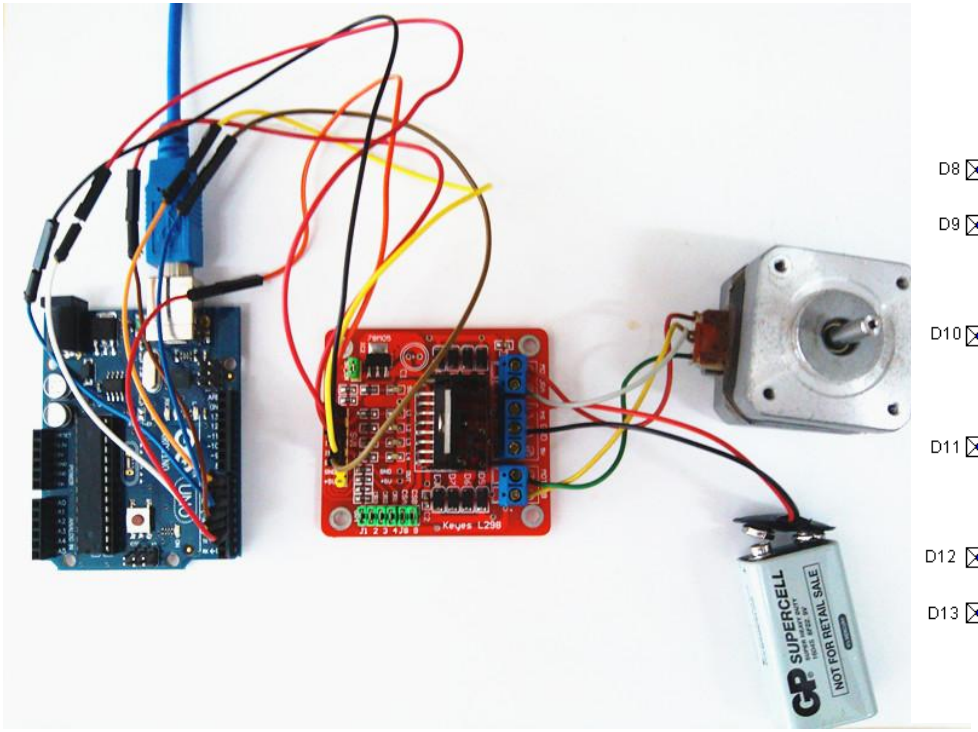
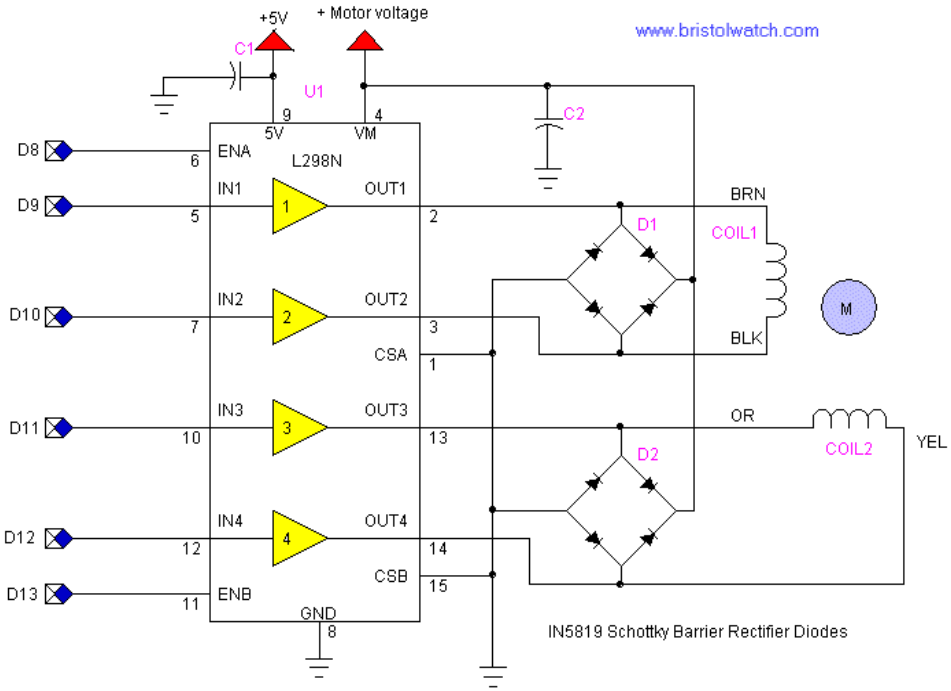
Stepper's Cont'd - Arduino hookup

- PWM on ENA and ENB pins controls speed (on off)
- H-bridge changes direction of current in each phase (pair of windings)
- http://www.geekonfire.com/wiki/index.php?title=Dual_H-Bridge_Motor_Driver





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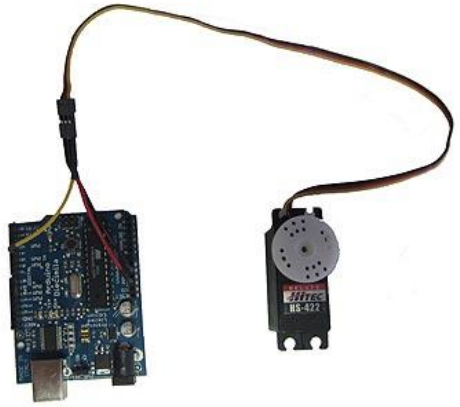
Servo Motors



- Go to a position and stop
- Control circuitry built in (black box)
- 0-180 deg only (unless modify for rotation)
- simple arduino connection and control via “yellow” control wire

http://www.robotshop.com/blog/en/arduino-5-minute-tutorials-lesson-5-servo-motors-3636

```
#include <Servo.h>
Servo myservo;  // create servo object to control a servo
int pos = 0;    // variable to store the servo position
void setup()
{
  myservo.attach(9);  // attaches the servo on pin 9 to the servo object
}
void loop()
{
  for(pos = 0; pos < 180; pos += 1)  // goes from 0 degrees to 180 degrees
  {                                  // in steps of 1 degree
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
  for(pos = 180; pos>=1; pos-=1)     // goes from 180 degrees to 0 degrees
  {
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
}
```

.. code as usual from arduino.cc

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Contact Kurt Turchan for ...

- Wall Avoiding Robot Instruction
  - class of 5 or more (3-4 week build)
    - soup to nuts Arduino course

- Aquatic Arduino (ROV) projects

- Web Design / Project Management
  - Java / Spring / JSP/JSTL based
  - PHP based (Laravel)
  - jquery / UI

- Kurt is founder of www.trailpeak.com
  - 10,000+ trails with GPS across Canada
  - popular across Canada at 1.5 Million uniques