

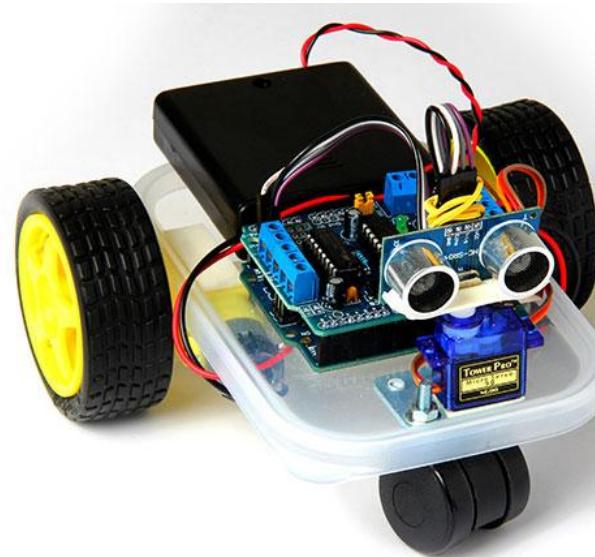


EP486 Microcontroller Applications

Topic 4

Arduino Apps:

LED &
7-Segment-Display



Department of
Engineering Physics

University of Gaziantep

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Content

We'll study some arduino applications:

- LED Applications
- 7-segment display applications

Getting Started

1. Get an Arduino board and USB cable



2. Download the Arduino environment at:
<http://arduino.cc/en/Main/Software>

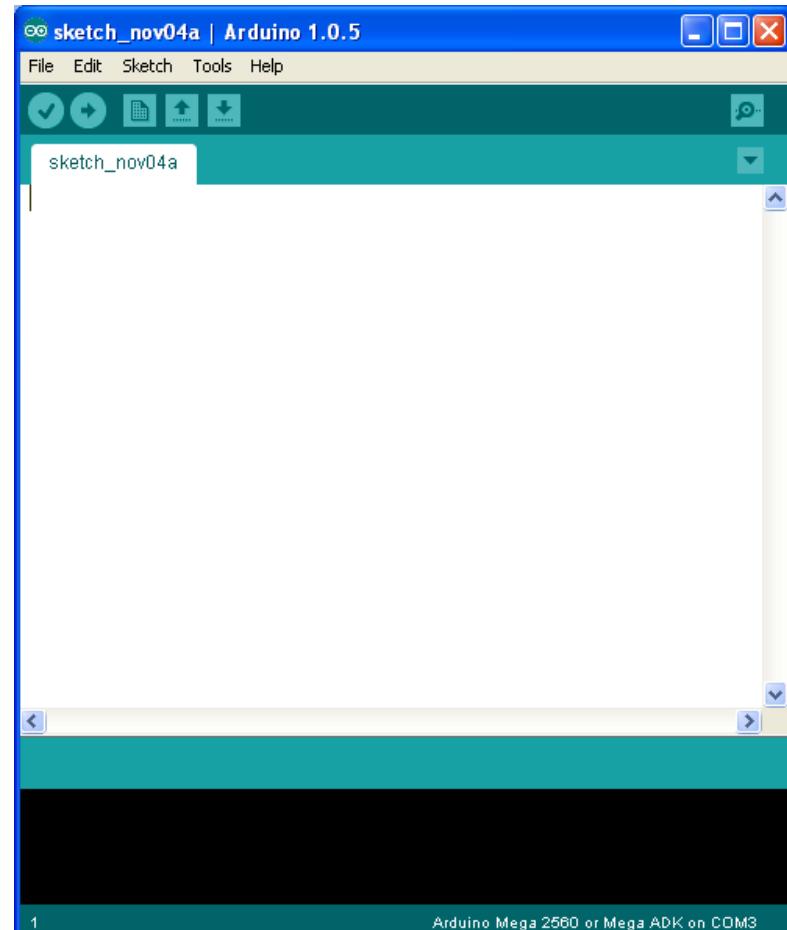
Getting Started

3. Install the drivers

(See for details: <http://arduino.cc/en/Guide/Windows>)

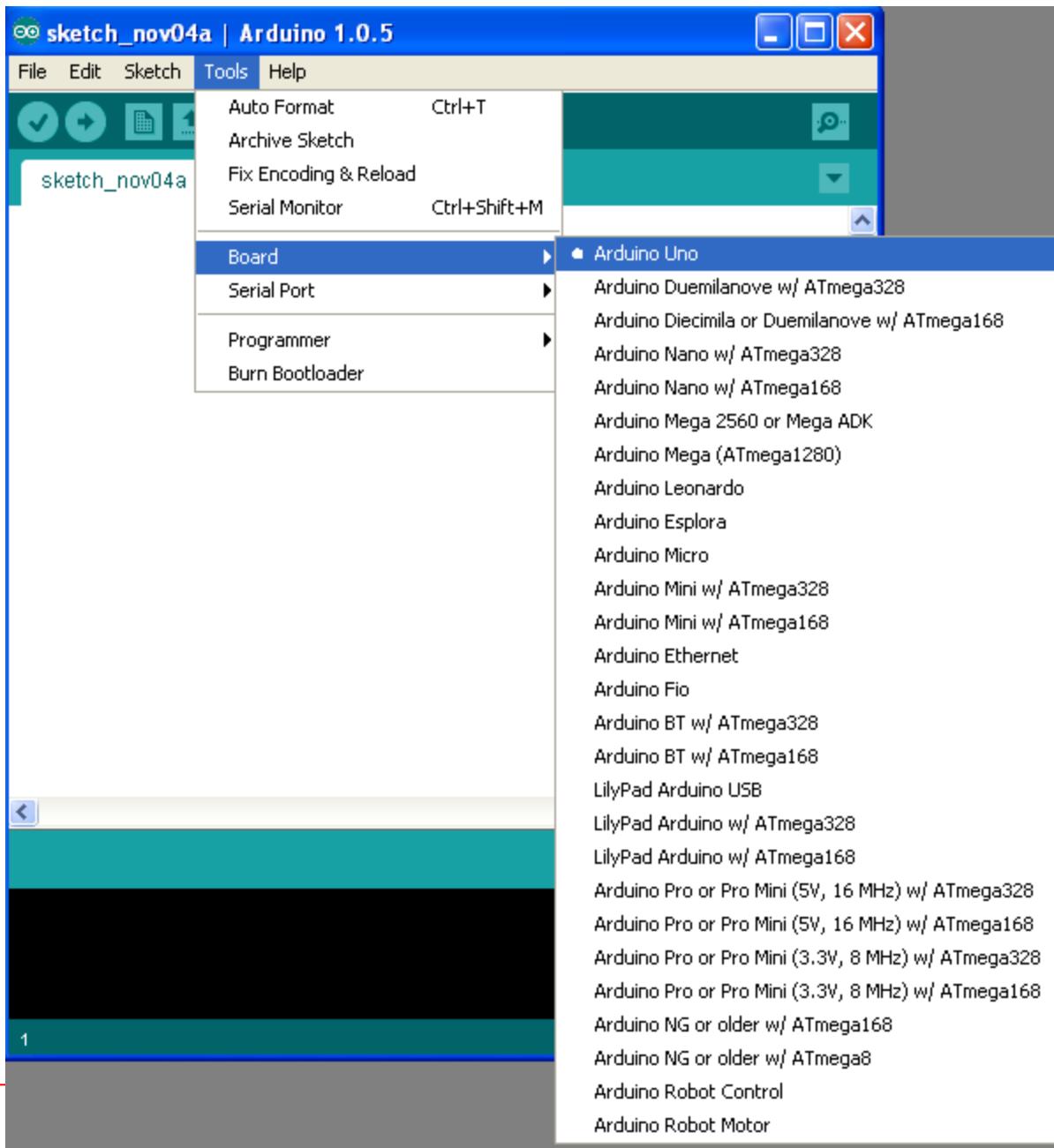
4. Launch the Arduino application.

*It is very similar platform
as the Processing*



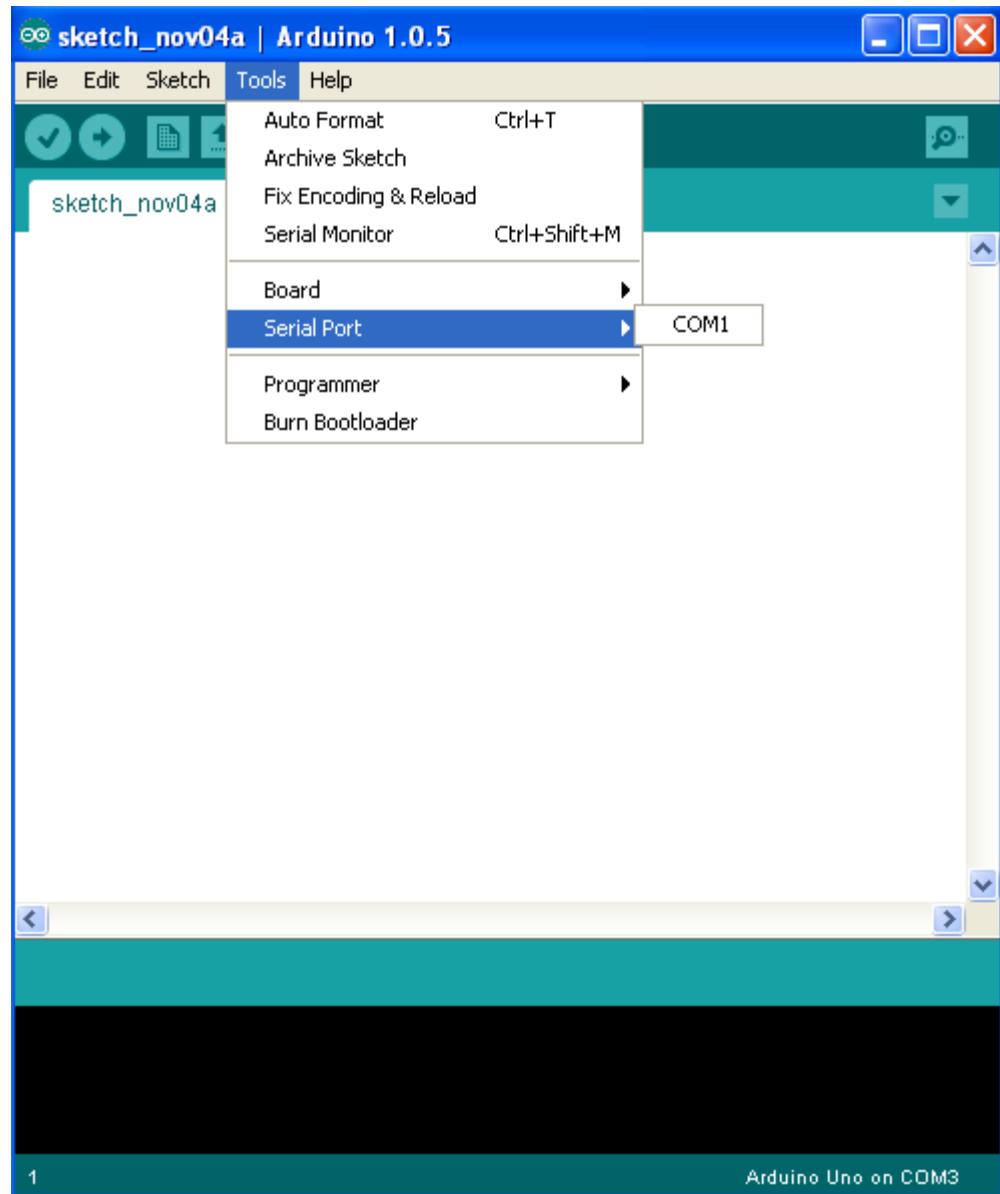
Getting Started

5. Select your board



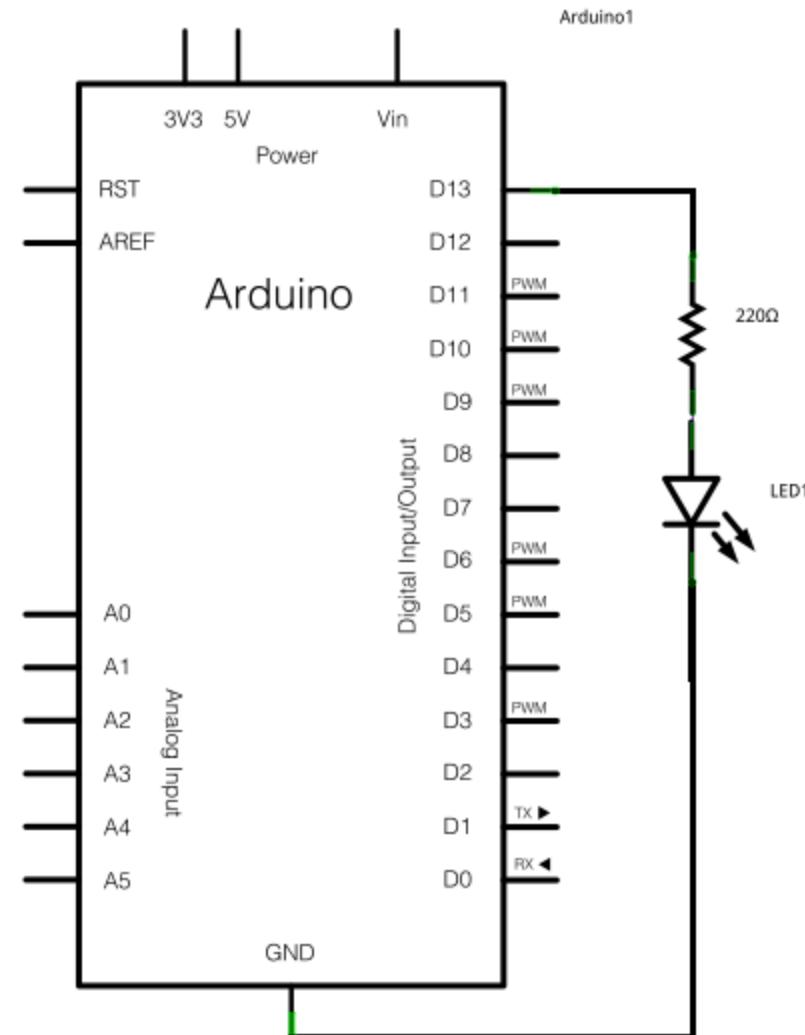
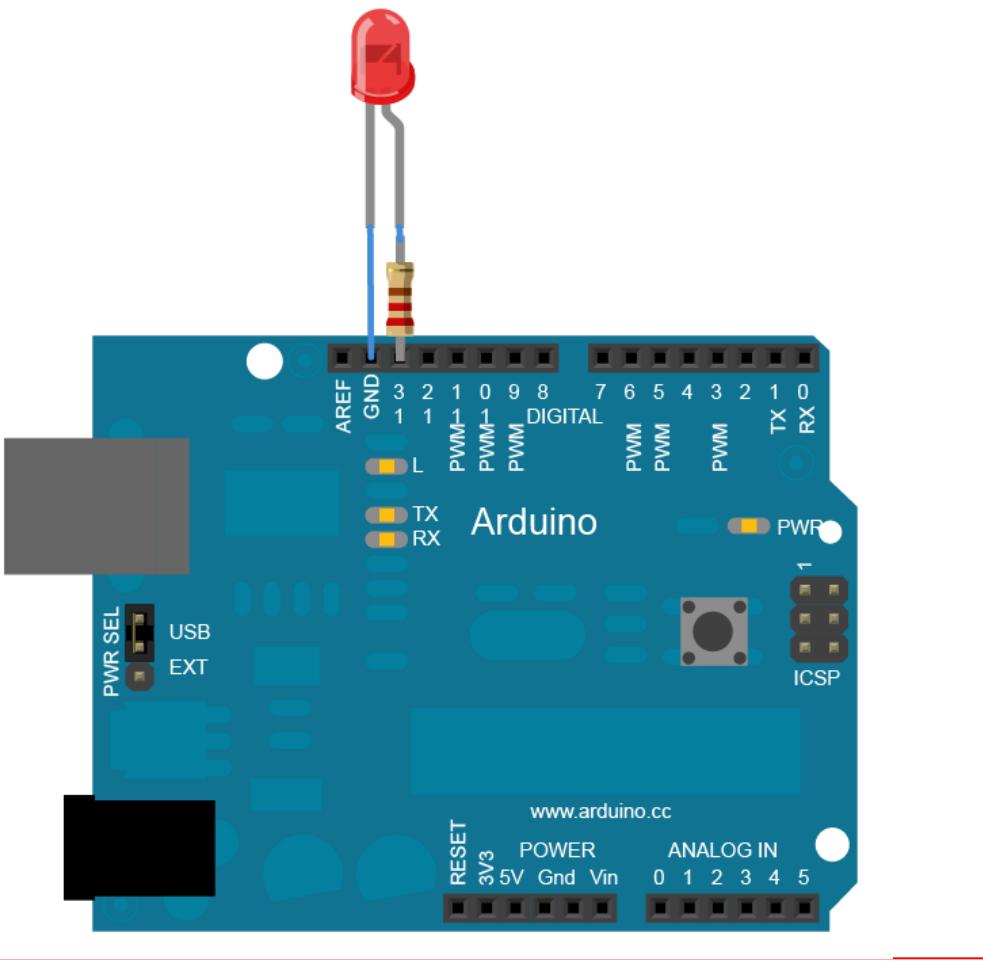
Getting Started

6. Select your serial port



LED 1 (Arduino Hello World)

- This example shows the simplest thing you can do with an Arduino to see physical output: it blinks an LED.



LED 1 (Arduino Hello World)

- The Code (Files->Examples->01.Basics->Blink)

```
// led blink example
int led = 13;

void setup() {
  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
}
```

LED 2 (flip-flop)

```
int led1 = 13;
int led2 = 12;
int tt = 1000;

void setup() {
    pinMode(led1, OUTPUT);
    pinMode(led2, OUTPUT);
}

void loop() {
    digitalWrite(led1, HIGH);
    digitalWrite(led2, LOW);
    delay(tt);
    digitalWrite(led1, LOW);
    digitalWrite(led2, HIGH);
    delay(tt);
}
```

LED 3 (Knight-Rider = Kara Şimşek)

- http://www.youtube.com/watch?v=A7a0loNwz_g



LED 3 (Knight-Rider = Kara Şimşek)

```
int led1=13; int led2=12; int led3= 11;
int led4=10; int led5= 9; int sure=150;

void setup() {
  pinMode(led1,OUTPUT); pinMode(led2, OUTPUT);
  pinMode(led3,OUTPUT); pinMode(led4, OUTPUT); pinMode(led5, OUTPUT);
}

void loop() {
  digitalWrite(led1, HIGH);
  digitalWrite(led2, LOW);
  digitalWrite(led3, LOW);
  digitalWrite(led4, LOW);
  digitalWrite(led5, LOW);
  delay(sure);

  // ...

  digitalWrite(led1, LOW);
  digitalWrite(led2, HIGH);
  digitalWrite(led3, LOW);
  digitalWrite(led4, LOW);
  digitalWrite(led5, LOW);
  delay(sure);
}
```

LED 3 (more simple solution)

```
int led ={13, 12, 11, 10 ,9};  
int sure=150, i, j;  
  
void setup() {  
    for(i=; i<5; i++) pinMode(led[0],OUTPUT);  
}  
  
void loop() {  
    for(i=0;i<5 ;i++) knightRider(i);  
    for(i=3;i>=0;i--) knightRider(i);  
}  
  
void knightRider(int k){  
    for(j=0; j<5; j++){  
        if(j==k) digitalWrite(led[j], HIGH);  
        else      digitalWrite(led[j], LOW);  
    }  
    delay(sure);  
}
```

Digital Read (Intro)

- This example shows you how to monitor the state of a switch by establishing serial communication between your Arduino and your computer over USB.

- **Hardware Required**

Arduino Board

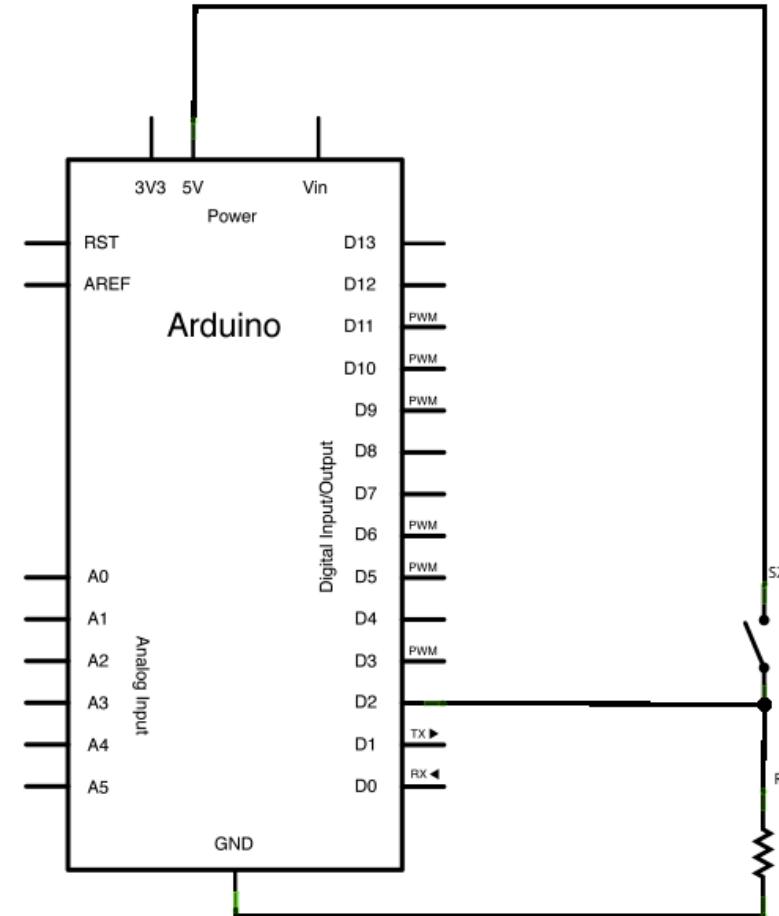
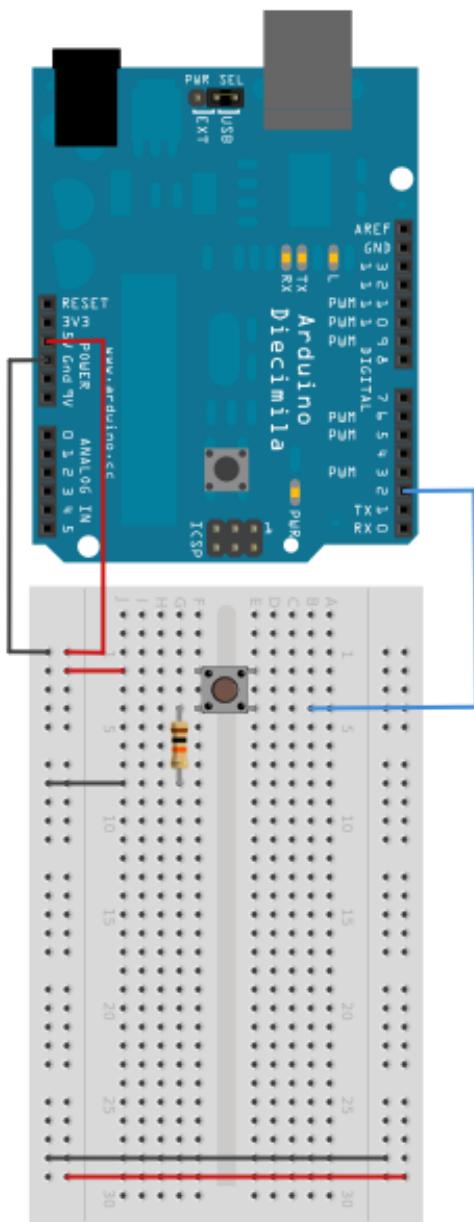
A momentary switch, button, or toggle switch

10k ohm resistor

breadboard

hook-up wire

Digital Read (Circuit)



Digital Read (code)

```
/* DigitalReadSerial
   Reads a digital input on pin 2,
   prints the result to the serial monitor
*/
int pushButton = 2;

void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
  // make the pushbutton's pin an input:
  pinMode(pushButton, INPUT);
}

void loop() {
  // read the input pin:
  int buttonState = digitalRead(pushButton);
  // print out the state of the button:
  Serial.println(buttonState);
  delay(1);
}
```

Analog Read (Intro)

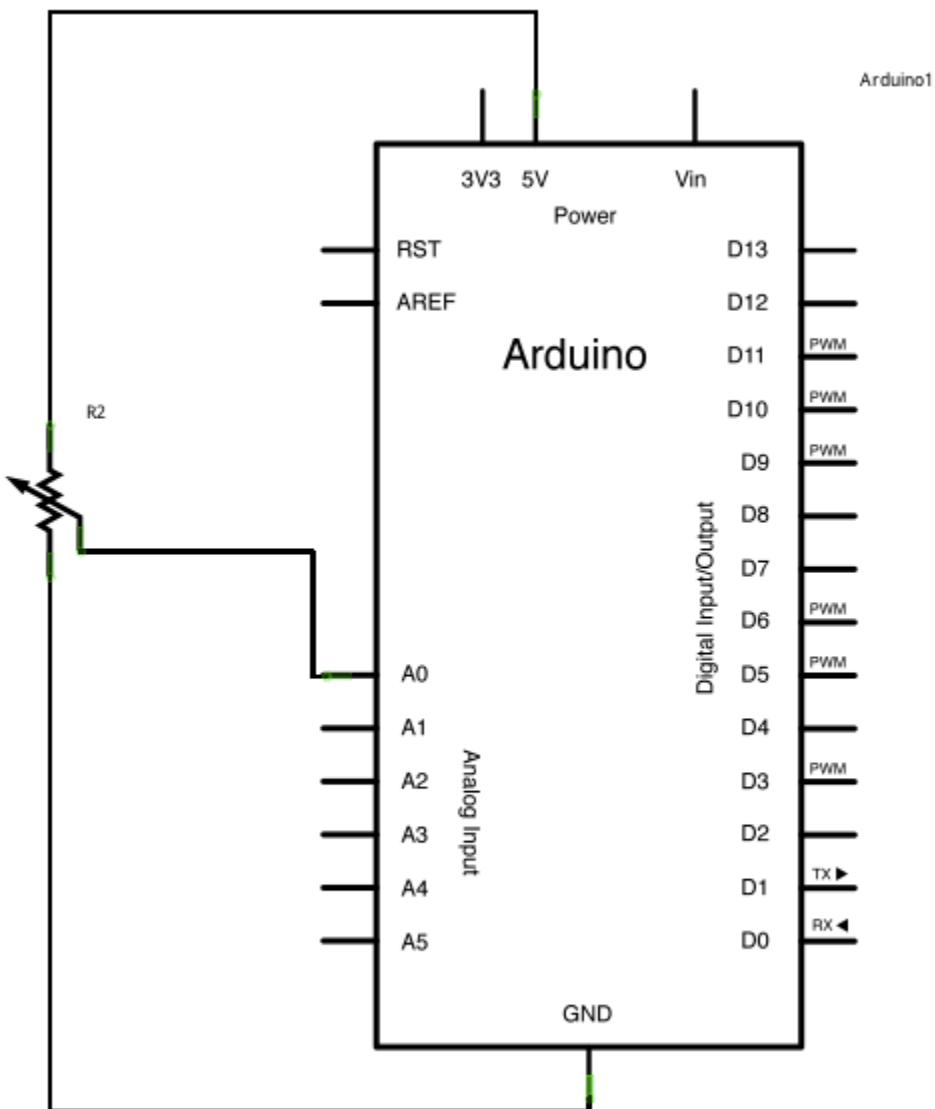
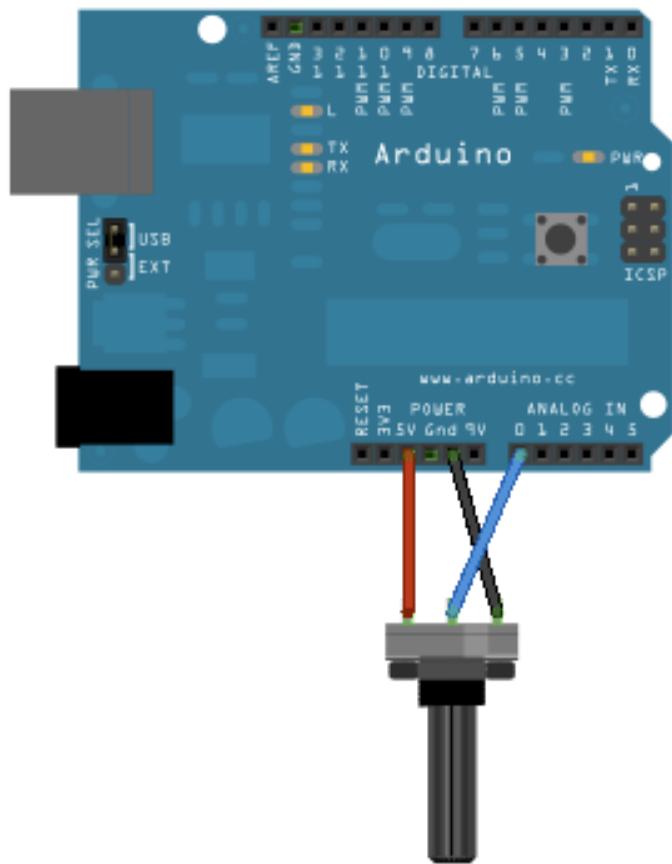
- This example shows you how to read analog input from the physical world using a potentiometer.

- **Hardware Required**

Arduino Board

10k ohm potentiometer

Analog Read (Circuit)



Analog Read (code)

```
/* AnalogReadSerial
   Reads an analog input on pin 0,
   prints the result to the serial monitor.
*/
// the setup routine runs once when you press reset:
void setup() {
    // initialize serial communication at 9600 bits per second:
    Serial.begin(9600);
}

void loop() {
    // read the input on analog pin 0:
    int sensorValue = analogRead(A0);

    // print out the value you read:
    Serial.println(sensorValue);

    delay(1);
}
```

Analog *Voltage* Read (code)

```
/* ReadAnalogVoltage
   Reads an analog input on pin 0, converts it to voltage,
   and prints the result to the serial monitor.
*/
void setup() {
  Serial.begin(9600);
}

void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);

  // Convert the analog reading (which goes from 0 - 1023)
  // to a voltage (0 - 5V):
  float voltage = sensorValue * (5.0 / 1023.0);

  // print out the value you read:
  Serial.println(voltage);
  delay(1);
}
```

Fading LED (Intro)

- This example demonstrates the use of the `analogWrite()` function in fading an LED off and on.

- **Hardware Required**

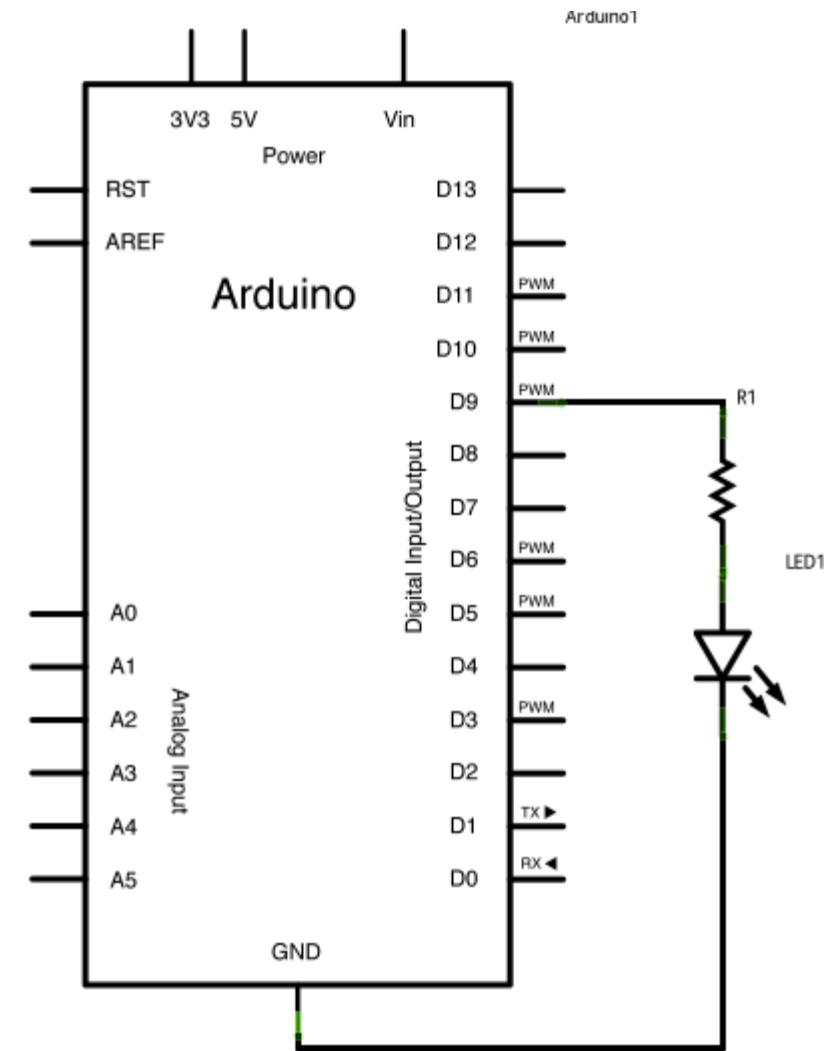
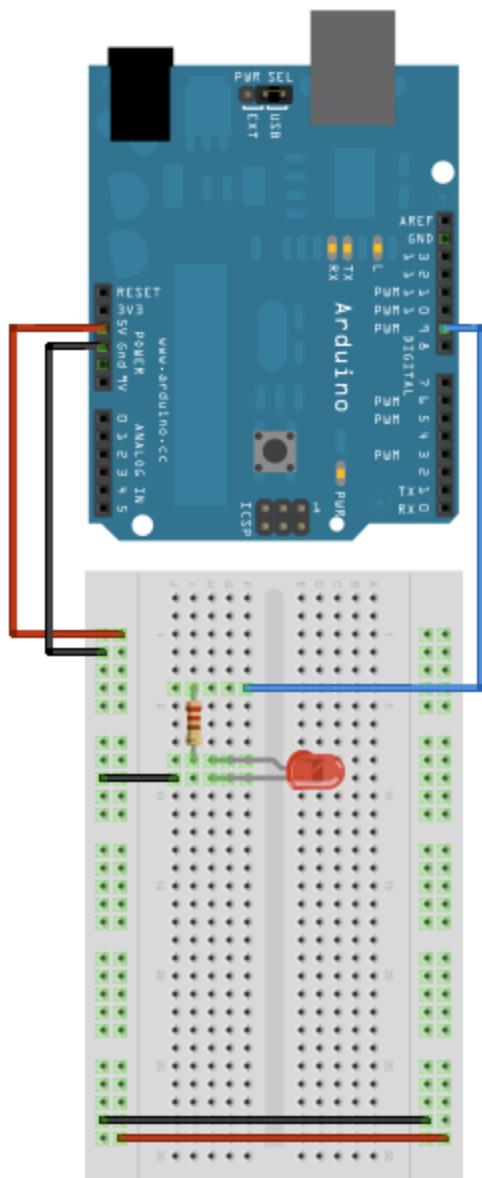
Arduino board

Breadboard

a LED

a 220 ohm resistor

Fading LED (Circuit)



Fading LED (code)

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

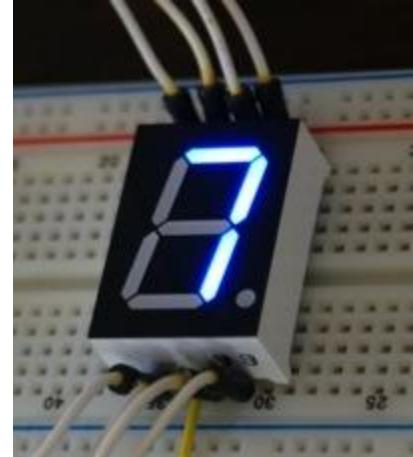
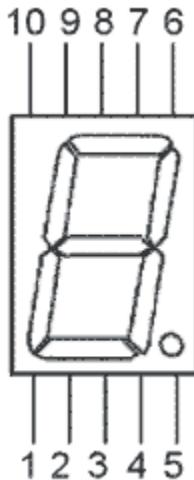
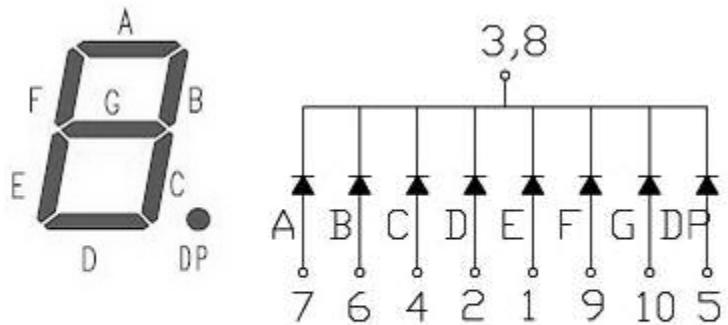
*/
int led = 9;          // the pin that the LED is attached to
int brightness = 0;    // how bright the LED is
int fadeAmount = 5;    // how many points to fade the LED by

void setup() {
  pinMode(led, OUTPUT);
}

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 ;
  }
  delay(30);
}
```

7 Segment Display

- Pins:



- Connections:

Arduino Pin	7 Segment Pin Connection
2	7 (A)
3	6 (B)
4	4 (C)
5	2 (D)
6	1 (E)
7	9 (F)
8	10 (G)
9	5 (DP)

7-segment (code)

```
/* SevenSegment */
void setup() {
    pinMode(2, OUTPUT);
    pinMode(3, OUTPUT);
    ...
    pinMode(9, OUTPUT);
}
void loop() {
    // write '7'
    digitalWrite(2, 1);
    digitalWrite(3, 1);
    digitalWrite(4, 1);
    digitalWrite(5, 0);
    digitalWrite(6, 0);
    digitalWrite(7, 0);
    digitalWrite(8, 0);
    delay(1000);
    // write '6'
    digitalWrite(2, 1);
    digitalWrite(3, 0);
    digitalWrite(4, 1);
    digitalWrite(5, 1);
    digitalWrite(6, 1);
    digitalWrite(7, 1);
    digitalWrite(8, 1);
    delay(1000);
}
```