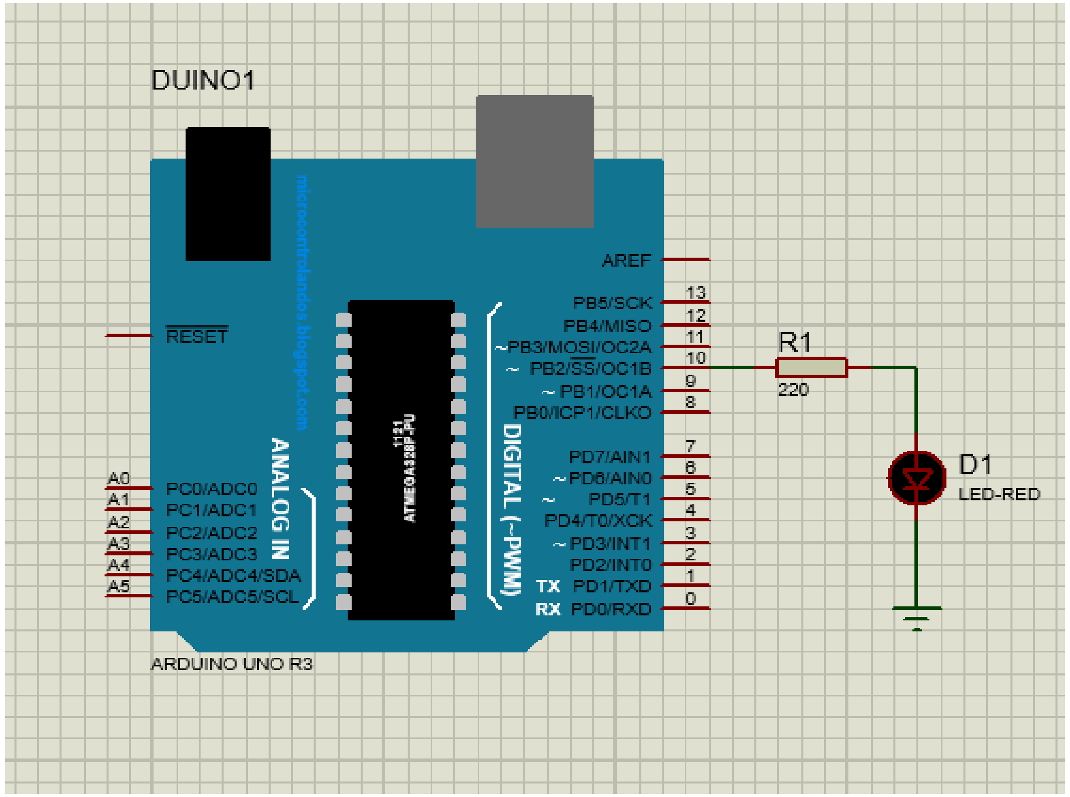
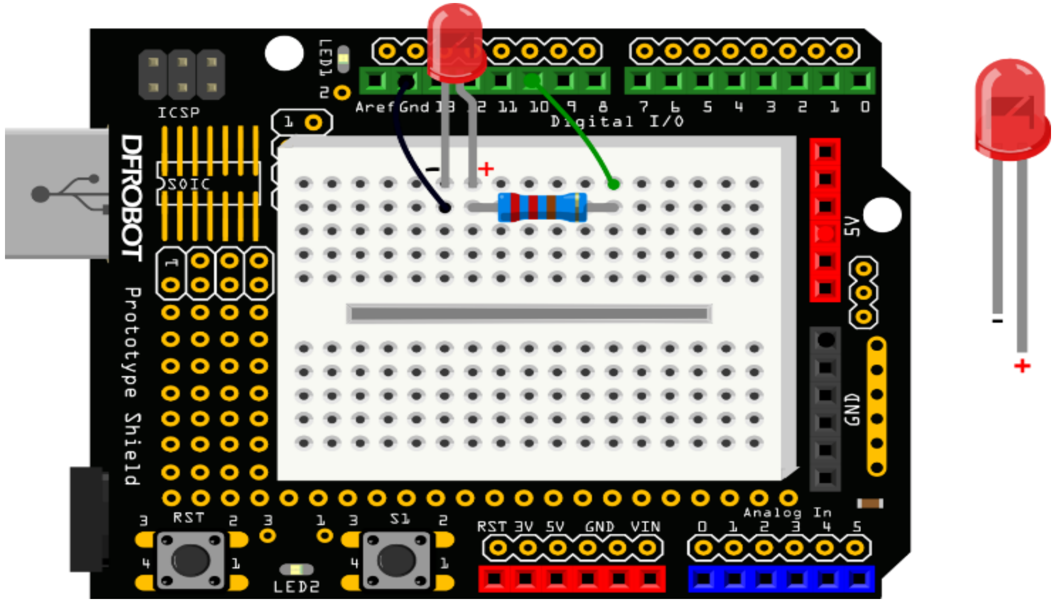
PARAKTIK PEMROGRAMAN EMBEDED SYSTEM

Purwantoro,S.Kom.,M.Kom

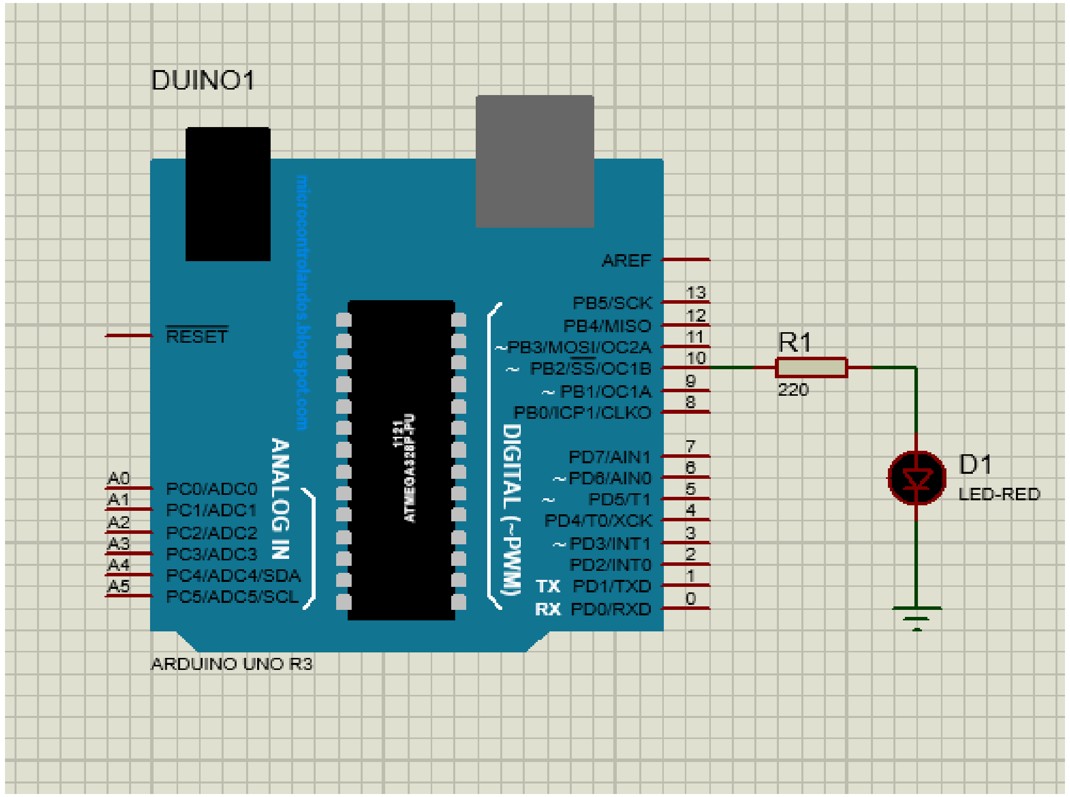
ARDUINO TUTORIAL 1: BLINKING A LED

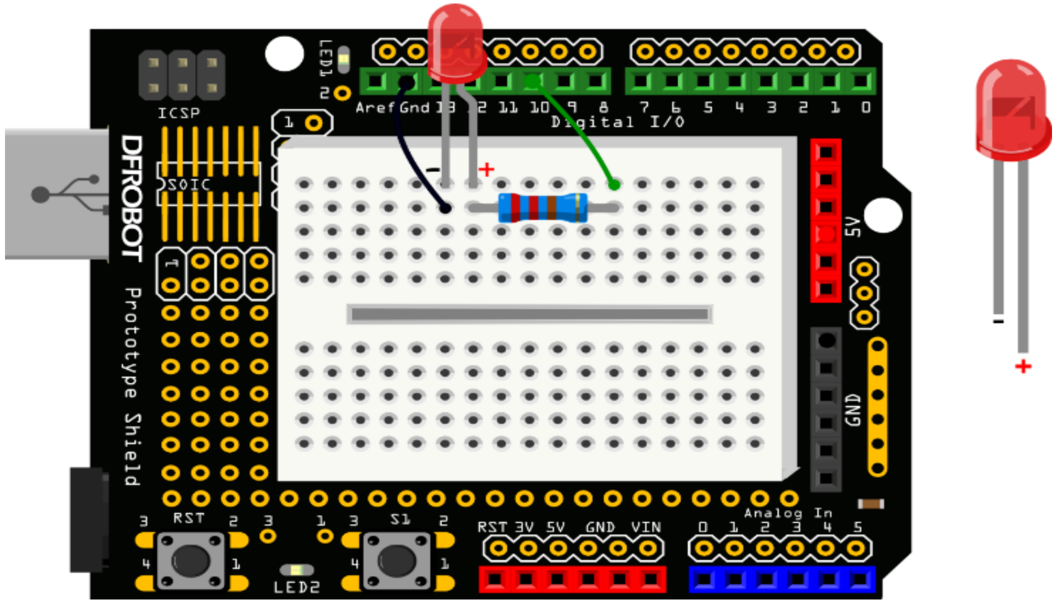




```
/*
 # Description:
 # Turns on an LED on for one second, then off for one second, repeatedly.
*/
int ledPin = 10;
void setup() {
        pinMode(ledPin, OUTPUT);
}
void loop() {
        digitalWrite(ledPin,HIGH);
        delay(1000);
        digitalWrite(ledPin,LOW);
        delay(1000);
}
```

ARDUINO TUTORIAL 2: SOS BEACON

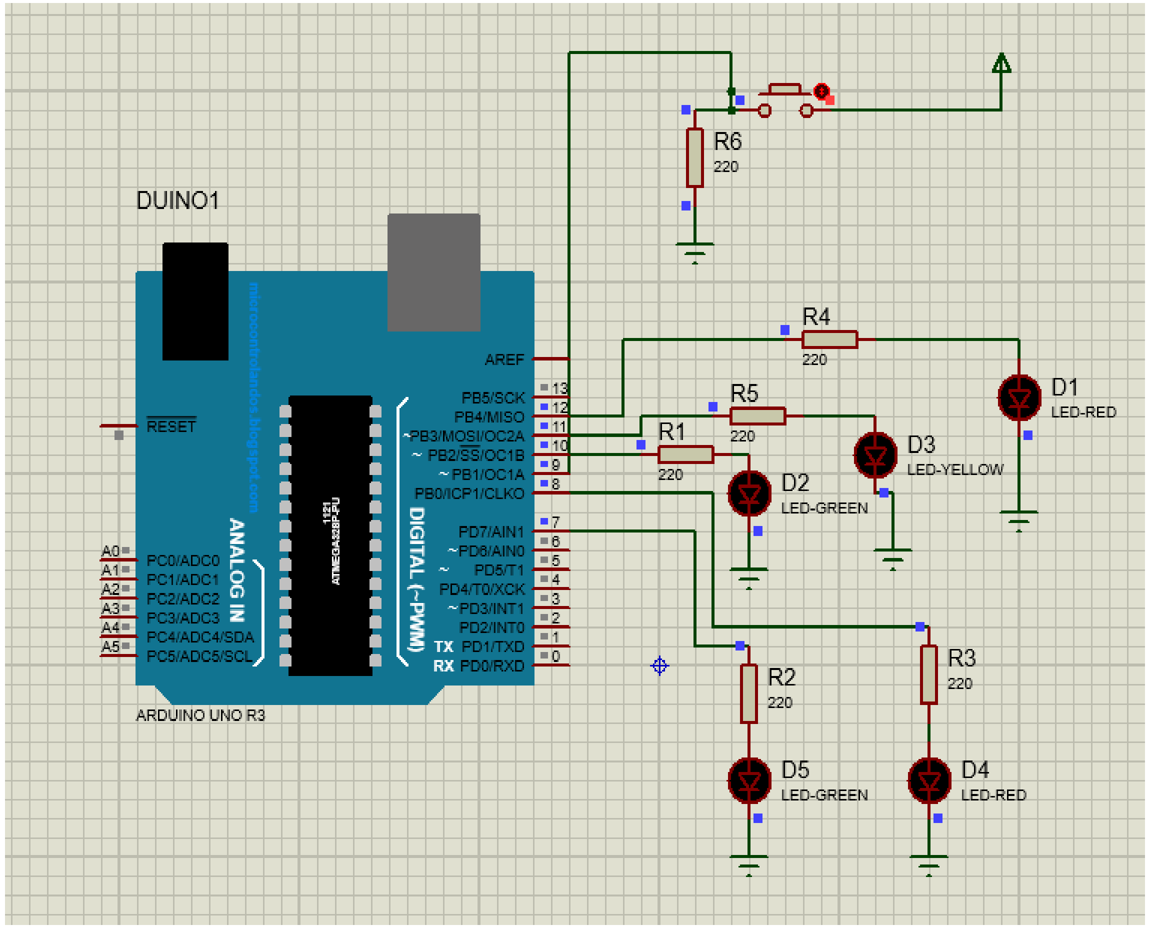


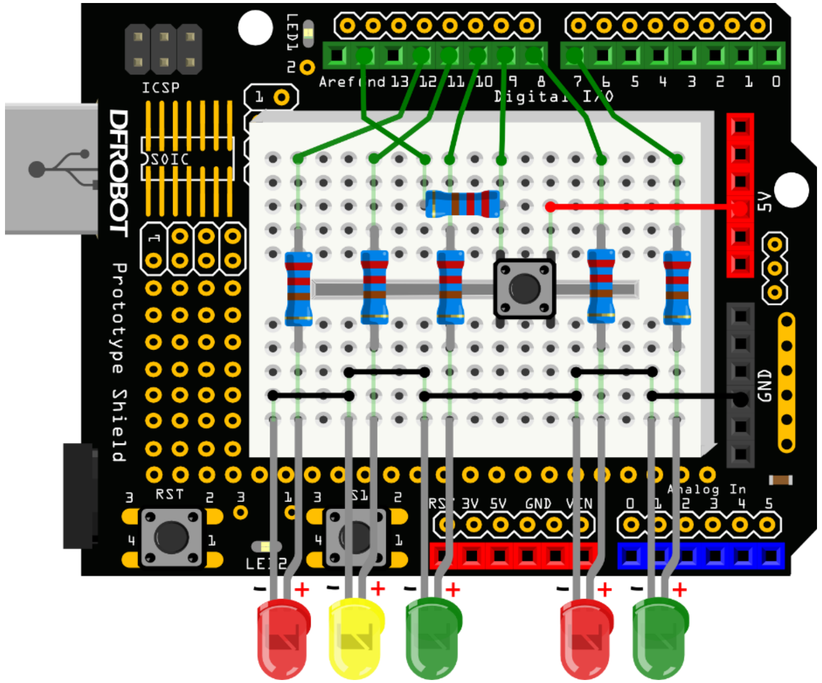


```
/*
 # Description:
  # Send SOS Beacon by led
 */
 int ledPin = 10;
 void setup() {
        pinMode(ledPin, OUTPUT);
 }
 void loop() {

      // S(...) three dot
       for(int x=0;x<3;x++){
        digitalWrite(ledPin,HIGH);
        delay(150);
        digitalWrite(ledPin,LOW);
        delay(100);
        }
        delay(100);
      // O(---) three dash
```

```
for(int x=0;x<3;x++){
       digitalWrite(ledPin,HIGH);
       delay(400);
       digitalWrite(ledPin,LOW);
       delay(100);
       }

       delay(100);

     //S(...) three dot
      for(int x=0;x<3;x++){
       digitalWrite(ledPin,HIGH);
       delay(150);
       digitalWrite(ledPin,LOW);
       delay(100);
       }

       delay(5000);
}
```

ARDUINO TUTORIAL 3: TRAFFIC LIGHT



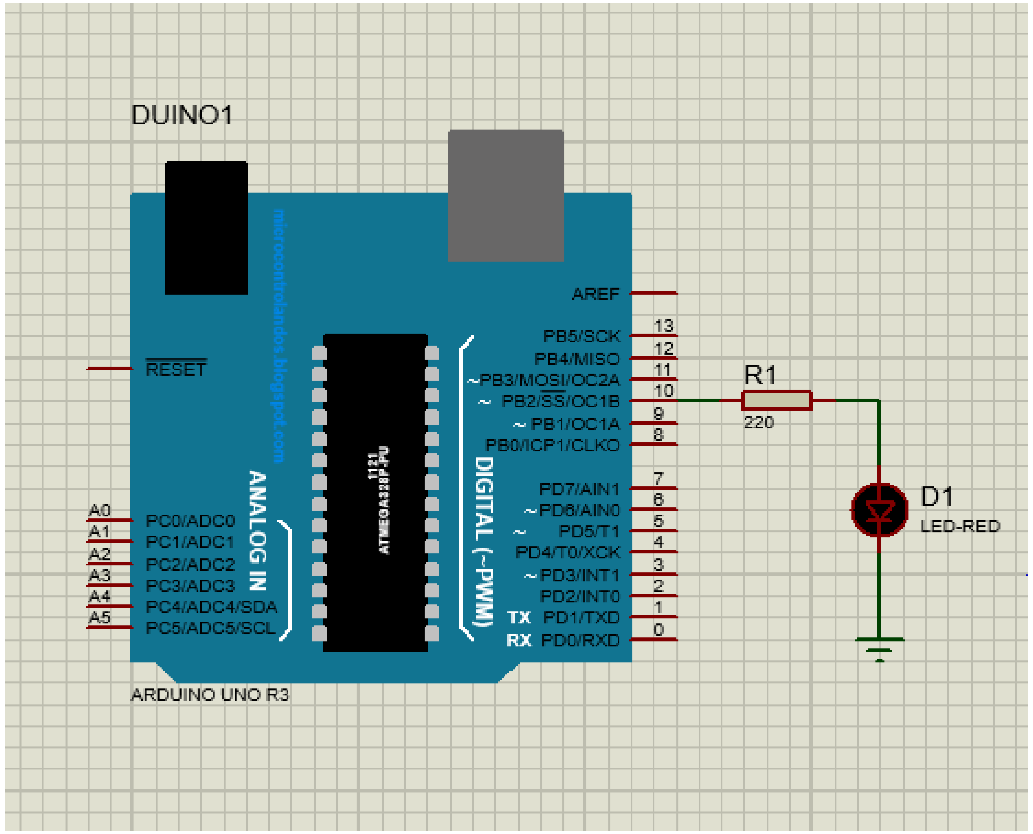


```
/*
  Traffic Light
  This code copied from the book Beginning-Arduino.
*/
int carRed = 12; //assign the car lights
int carYellow = 11;
int carGreen = 10;
int button = 9; //button pin
int pedRed = 8; //assign the pedestrian lights
int pedGreen = 7;
int crossTime =5000; //time for pedestrian to cross
unsigned long changeTime;//time since button pressed

void setup() {
   pinMode(carRed, OUTPUT);
   pinMode(carYellow, OUTPUT);
   pinMode(carGreen, OUTPUT);
   pinMode(pedRed, OUTPUT);
   pinMode(pedGreen, OUTPUT);
   pinMode(button, INPUT);
   digitalWrite(carGreen, HIGH); //turn on the green lights
   digitalWrite(pedRed, HIGH);
}
```

```
void loop() {
   int state = digitalRead(button);
      //check if button is pressed and it is over 5 seconds since last button press
      if(state == HIGH && (millis() - changeTime)> 5000){
           //call the function to change the lights
           changeLights();
      }
}
void changeLights() {
   digitalWrite(carGreen, LOW); //green off
   digitalWrite(carYellow, HIGH); //yellow on
   delay(2000); //wait 2 seconds

   digitalWrite(carYellow, LOW); //yellow off
   digitalWrite(carRed, HIGH); //red on
      delay(1000); //wait 1 second till its safe
   digitalWrite(pedRed, LOW); //ped red off
   digitalWrite(pedGreen, HIGH); //ped green on
   delay(crossTime); //wait for preset time period
```

```
   //flash the ped green
      for (int x=0; x<10; x++) {
         digitalWrite(pedGreen, HIGH);
      delay(250);
      digitalWrite(pedGreen, LOW);
      delay(250);
       }
      digitalWrite(pedRed, HIGH);
//turn ped red on
   delay(500);
   digitalWrite(carRed, LOW); //red off
   digitalWrite(carYellow, HIGH); //yellow on
   delay(1000);
   digitalWrite(carYellow, LOW); //yellow off
      digitalWrite(carGreen, HIGH);
   changeTime = millis(); //record the time since last change of lights
   //then return to the main program loop
}
```

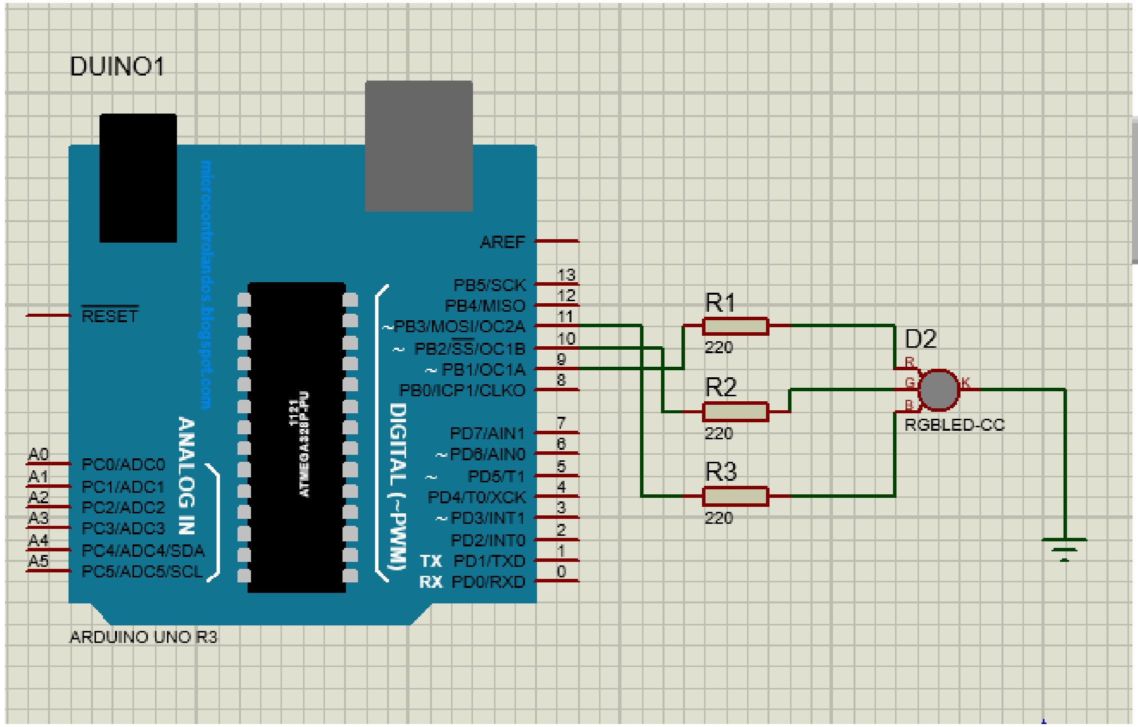
ARDUINO TUTORIAL 4: FADING LIGHT

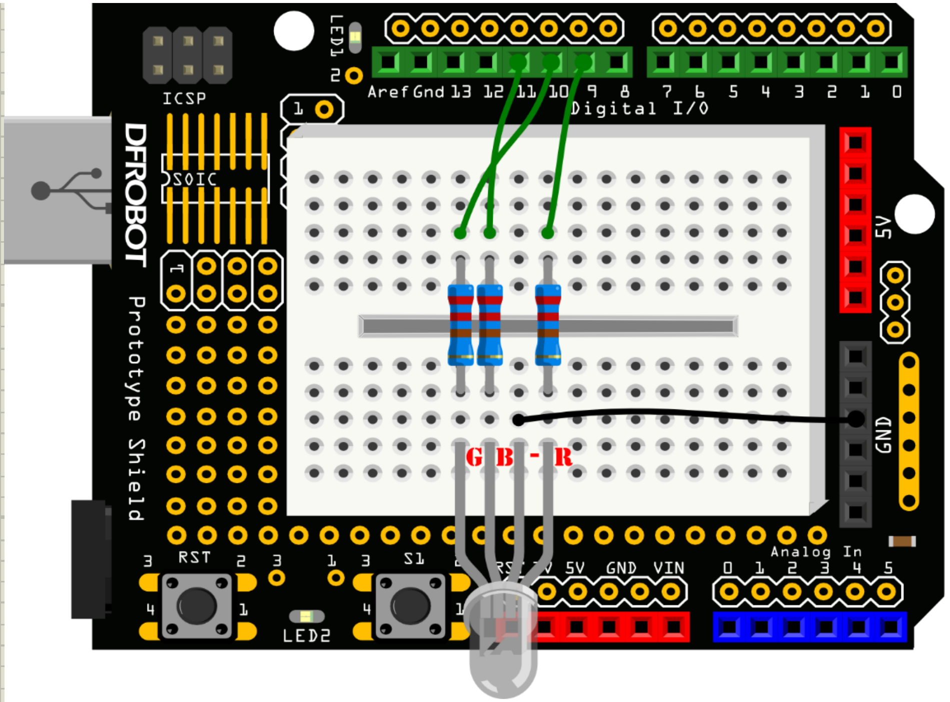


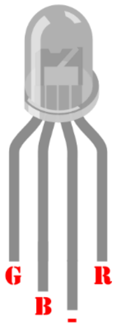
```
/*
  Fading Light
  This example shows how to fade an LED on pin 10 using the analogWrite() function.
*/
int ledPin = 10;      // the pin that the LED is attached to

void setup() {
    // declare pin 9 to be an output:
    pinMode(ledPin,OUTPUT);
    // initialize serial communication at 9600 bits per second:
    Serial.begin(9600);
}

void loop(){
    fadeOn(1000,5);
    fadeOff(1000,5);
}
```

```
void fadeOn(unsigned int time,int increament){
    //change the brightness by FOR statement
  for (byte value = 0 ; value < 255; value +=increament){
        // print out the value:
      Serial.println(value);
        // set the brightness of pin 10:
    analogWrite(ledPin, value);
    delay(time/(255/5));
    }
}

void fadeOff(unsigned int time,int decreament){
    //change the brightness by FOR statement
  for (byte value = 255; value >0; value-=decreament){
      Serial.println(value);
    analogWrite(ledPin, value);
    delay(time/(255/5));
  }
}
```

ARDUINO TUTORIAL 5: RGB LED

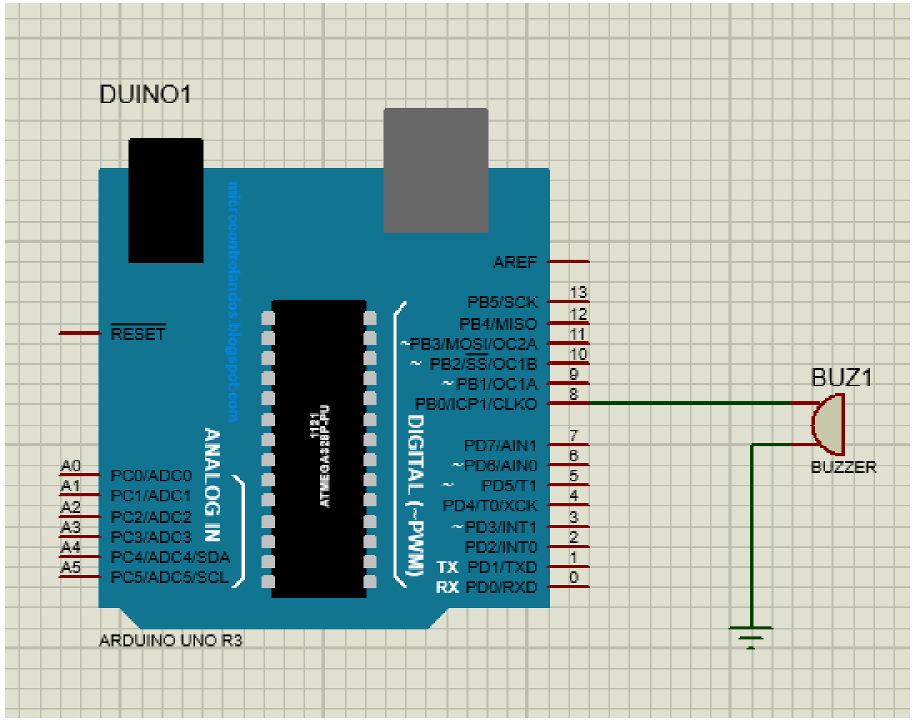


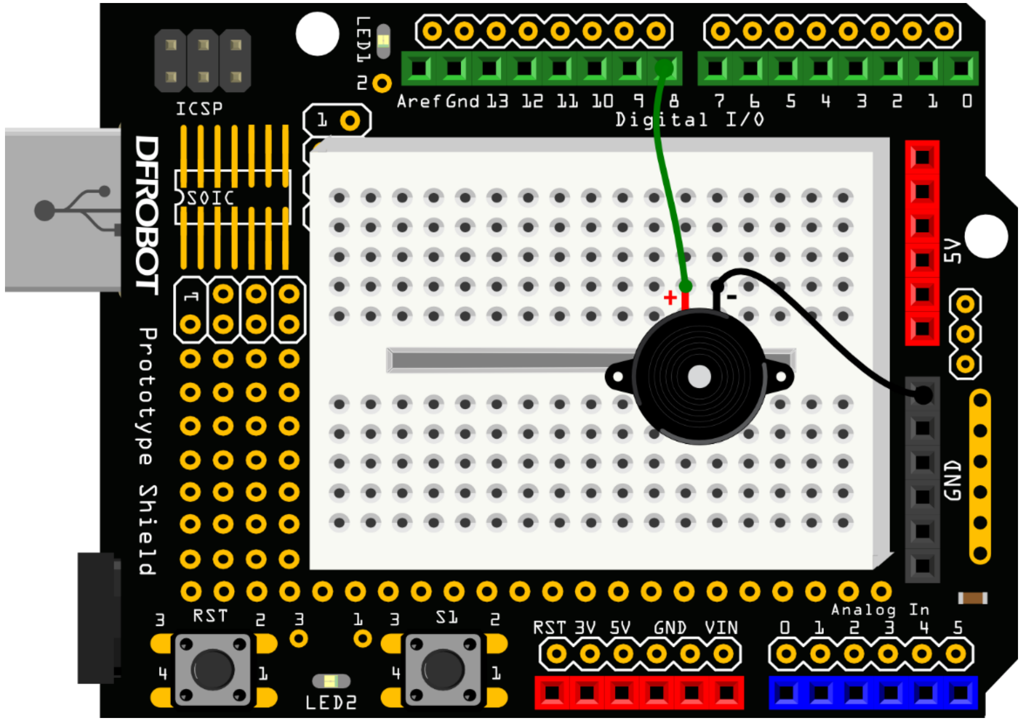




```
/*
  RGB LED
 */
int redPin = 9;   // the pin that the red LED is attached to
int greenPin = 10; // the pin that the green LED is attached to
int bluePin = 11;  // the pin that the blue LED is attached to

void setup(){
    pinMode(redPin, OUTPUT);
    pinMode(greenPin, OUTPUT);
    pinMode(bluePin, OUTPUT);

}
void loop(){
   // call the function to change the colors of LED randomly.
   colorRGB(random(0,255),random(0,255),random(0,255)); //R:0-255 G:0-255 B:0-255
   delay(1000);
}

void colorRGB(int red, int green, int blue){
    analogWrite(redPin,constrain(red,0,255));
    analogWrite(greenPin,constrain(green,0,255));
    analogWrite(bluePin,constrain(blue,0,255));
}
```

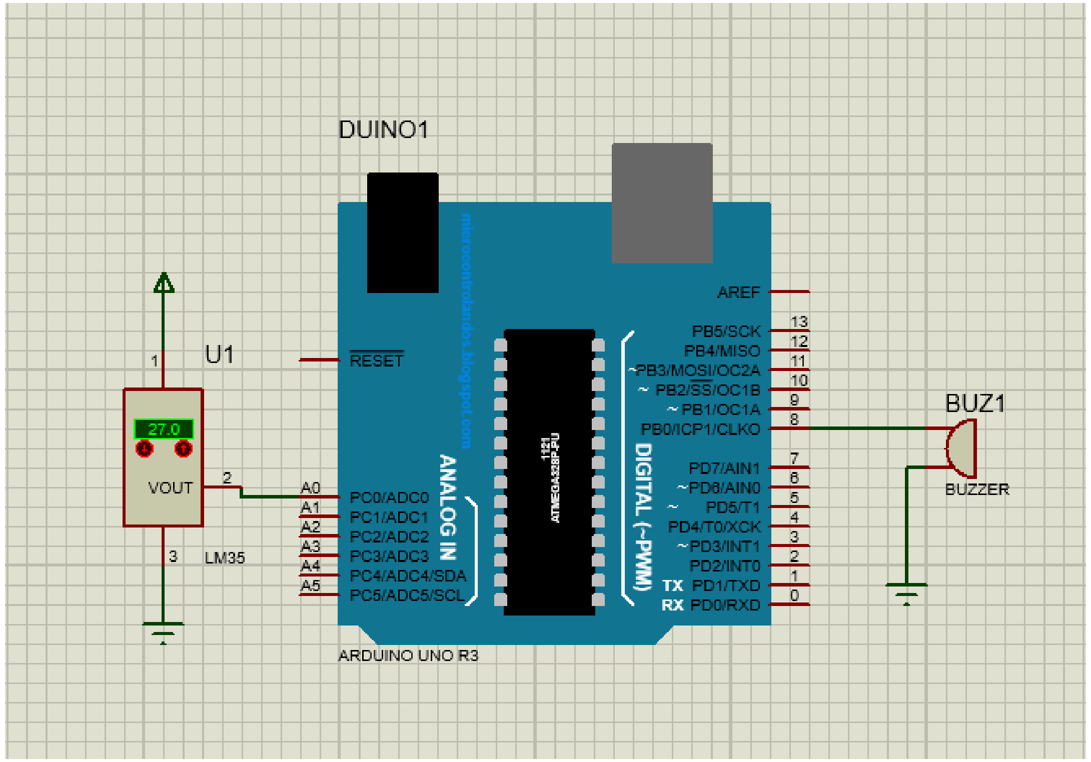
ARDUINO TUTORIAL 6: ALARM

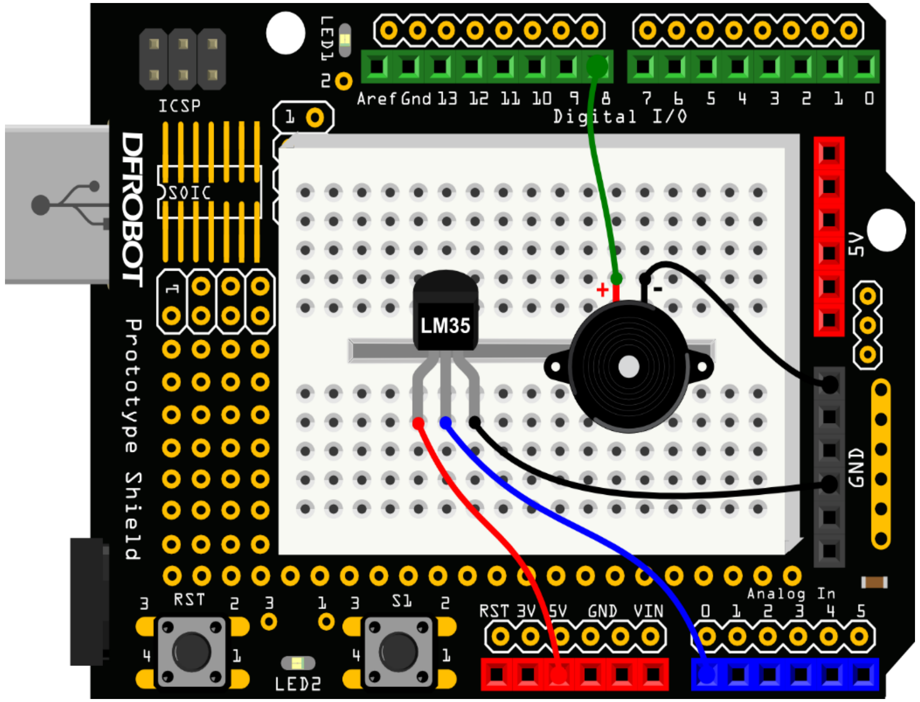




```
/*
  Alarm
*/
float sinVal;
int toneVal;

void setup(){
    pinMode(8, OUTPUT);
}

void loop(){
    for(int x=0; x<180; x++){
        // convert degrees to radians then obtain value
        sinVal = (sin(x*(3.1412/180)));
        // generate a frequency from the sin value
        toneVal = 2000+(int(sinVal*1000));
        tone(8, toneVal);
        delay(2);
    }
}
```

ARDUINO TUTORIAL 7: TEMPERATURE ALARM

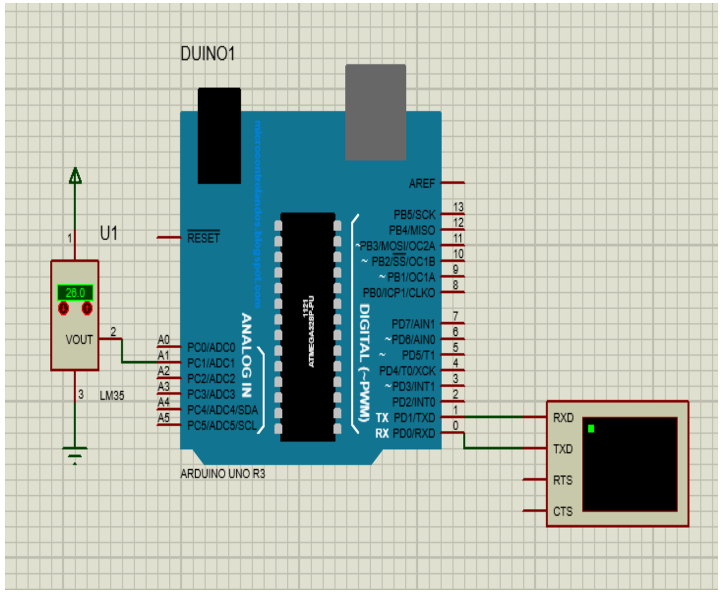




```
/*
  Temperature Alarm
*/
float sinVal;
int toneVal;
unsigned long tepTimer ;

void setup(){
    pinMode(8, OUTPUT);
    Serial.begin(9600);
}

void loop(){
    int val;
    double data;
    val=analogRead(0);
    data = (double) val * (5/10.24);
// convert the voltage to temperture
```

```
 if(data>27){        // If the temperture is over 27 degree, buzzer will alarm.
        for(int x=0; x<180; x++){
          sinVal = (sin(x*(3.1412/180)));
          toneVal = 2000+(int(sinVal*1000));
          tone(8, toneVal);
          delay(2);
     }
    } else {    // If the temperturn is below 27 degree, buzzer will not alarm
         noTone(8);
    }

   if(millis() - tepTimer > 500){
  // output the temperture value per 500ms
          tepTimer = millis();
          Serial.print("temperature: ");
          Serial.print(data);
          Serial.println("C");
      }
}
```

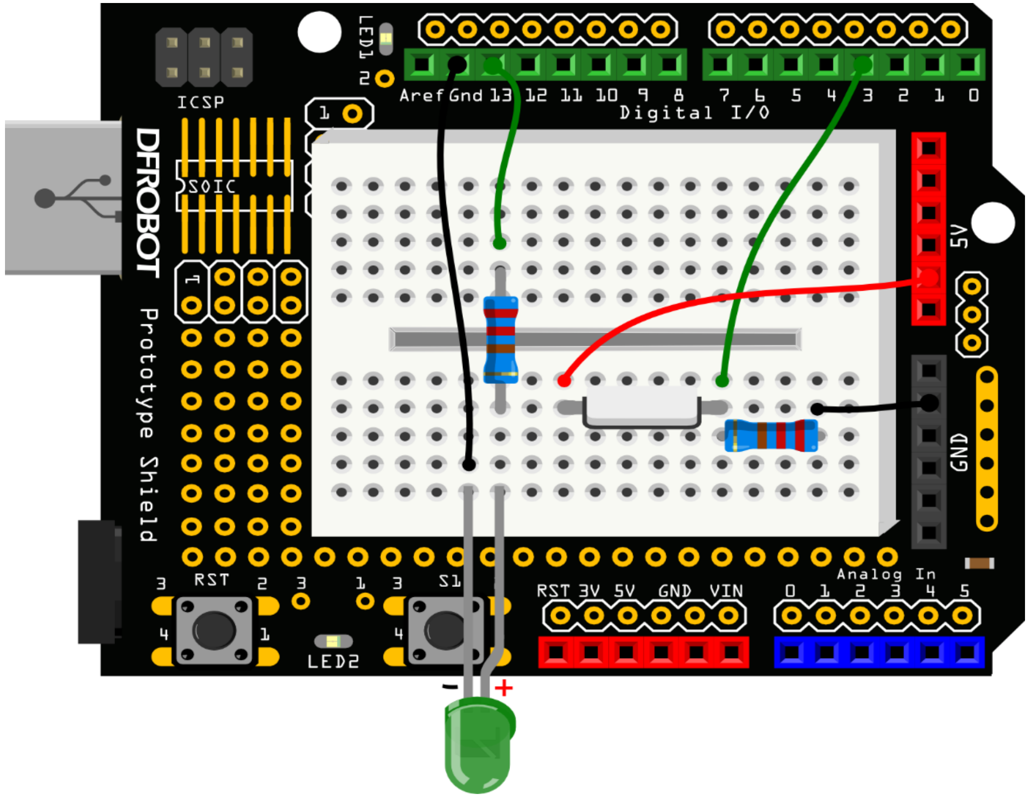
ARDUINO TUTORIAL 7A: TEMPERATURE



- Secara umum sensor LM35 merupakan perangat yang dpaat digunakan untuk mengukur panas atau dinginnya suatu objek. LM35 merupakan sensor suhu IC presisi dengan output sebanding dengan suhu dalam satuan derajat derajat celcius (oC)[1].Sensor LM35 dapat mengukur suhu dalam range -50 oC sampai 150 oC ,sedangkan untuk tengangan LM35 dapat disuplai dengan tegangan +4V hingga 30V.Adapun tegangan output dari sensor ini adalah 10mV untuk 1 oC. Perhatikan persamaan berikut :
-
- Misalnya tegangan keluaran dari LM35 adalah 1000mV artinya suhu yang terukur adalalah 100 oC. Tegangan dari sensor tersebut yang nantinya akan dibaca melalui ADC atau analog to digital Converter.
- Pemrograman LM35 dengan Arduino
- Untuk mendapatkan pembacaan suhu yang akurat dari LM35 saya menyaranka anda untuk menbaca datasheetnya disini. Dari datasheet tersebut kita mengetahui bwahwa LM35 mempunyai tegangan output sebesar 10mV, dengan demikian kita dapat menhitung nilai tegangan analog tersebut melalui ADC. Arduino menggunakan ADC 10 bite yaitu 1024 dengan tegangan referensi vcc sebesar 5 V.Dengan demikian kita mendapat persamaan berikut [2]:
-

```
float tempC;
int Lm35 =1;
void setup() {
Serial.begin(9600);
}
void loop() {
tempC=analogRead(Lm35);
tempC=(tempC/1024.0)*5000;
tempC=tempC/10;
Serial.print("Temp =");
Serial.print(tempC);
Serial.println(" Celcius");
delay(500);

}
```

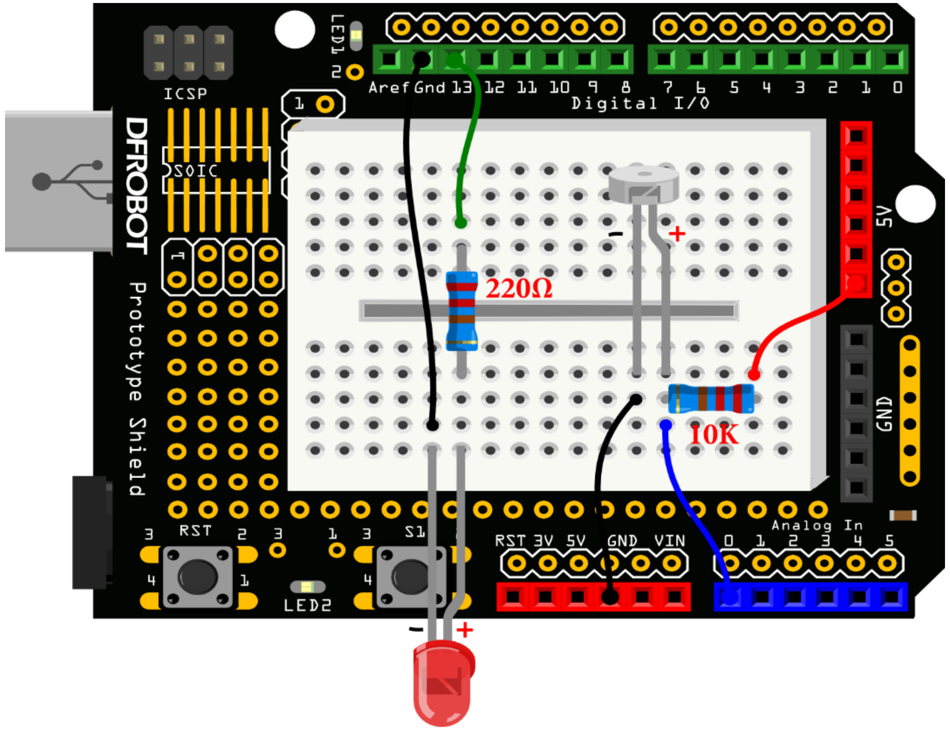
ARDUINO TUTORIAL 8: DETECTING VIBRATION



```
/*
  Detecting vibration
*/

int SensorLED = 13;      //LED PIN
int SensorINPUT = 3;     //Connect the sensor to digital Pin 3 which is Interrupts 1
unsigned char state = 0;

void setup() {
  pinMode(SensorLED, OUTPUT);
  pinMode(SensorINPUT, INPUT);

  // Trigger the blink function when the falling edge is detected
  attachInterrupt(1, blink, RISING);
}
```

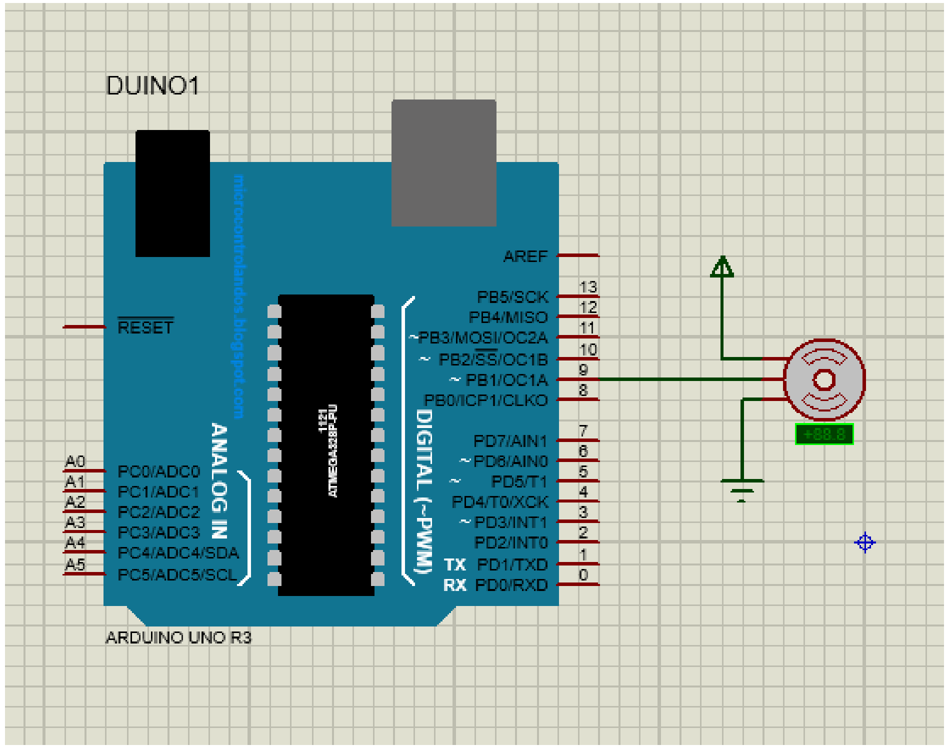
```
 void loop(){
     if(state!=0){
       state = 0;
       digitalWrite(SensorLED,HIGH);
       delay(500);
     }
     else
       digitalWrite(SensorLED,LOW);
}

void blink(){            //Interrupts function
   state++;
}
```

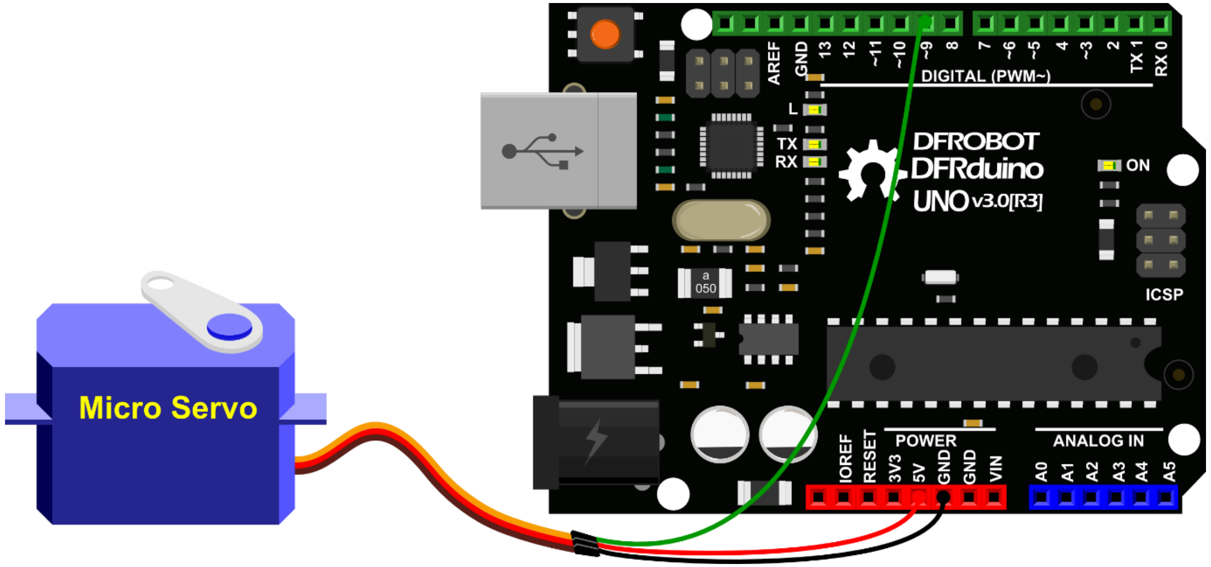
ARDUINO TUTORIAL 9: AMBIENT LIGHT CONTROLLED LED



```
/*
 Ambient Light controlled LED
*/
int LED = 13;                //Led pin
int val = 0;

void setup(){
   pinMode(LED,OUTPUT);
   Serial.begin(9600);
}

void loop(){
   val = analogRead(0);       // read voltage value
   Serial.println(val);
   if(val<1000){              // if the value is less than 1000,  LED turns off
      digitalWrite(LED,LOW);
   }else{                     // if the value is more than 1000,  LED turns on
      digitalWrite(LED,HIGH);
   }
   delay(10);
}
```

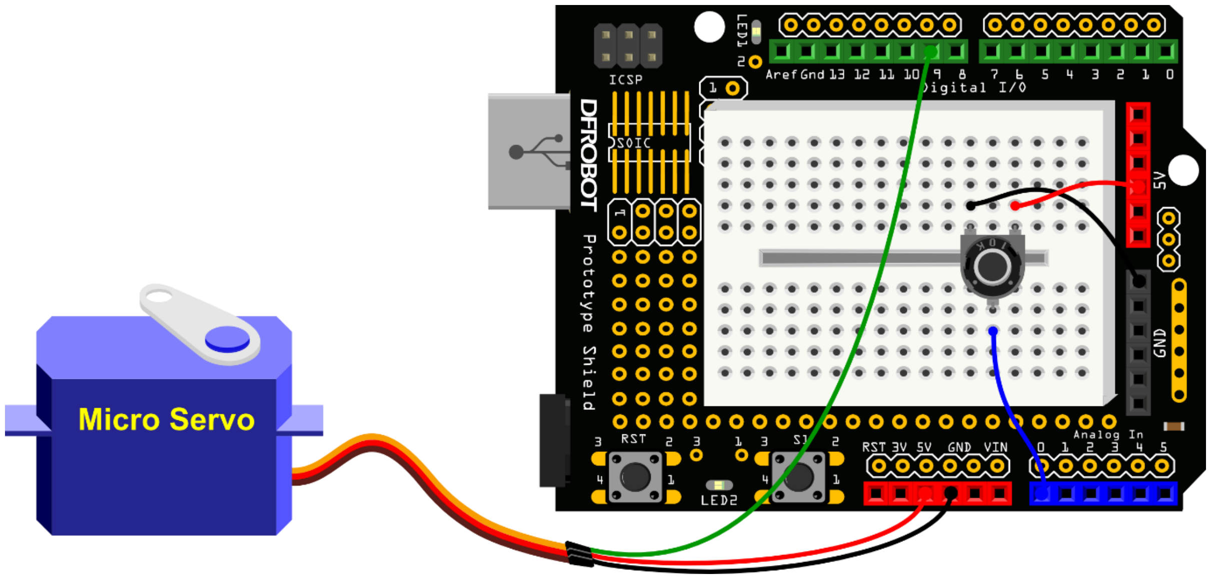
ARDUINO TUTORIAL 10: MOVING A SERVO





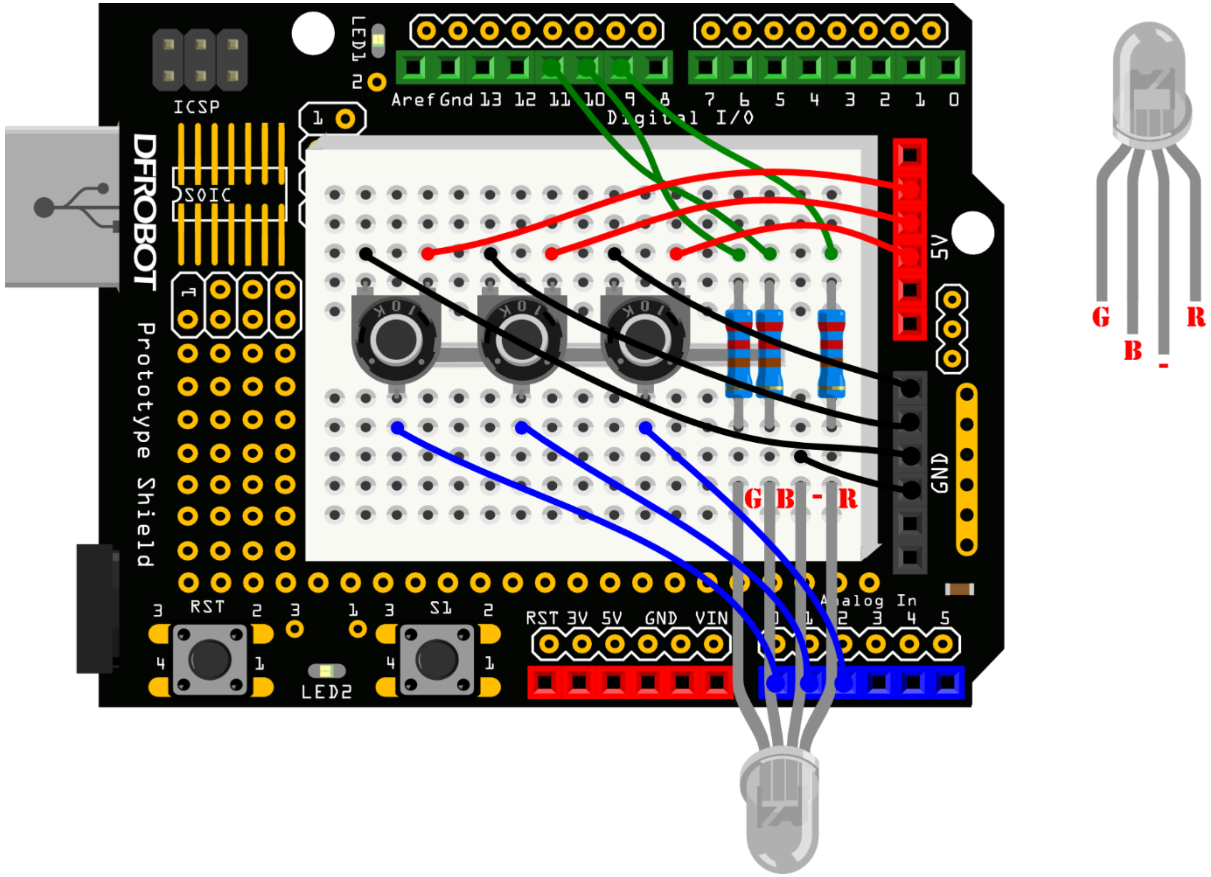
```
// Moving a Servo
// by BARRAGAN <http://barraganstudio.com>
// This example code is in the public domain.

#include <Servo.h>
Servo myservo;      // create servo object to control a servo
           // a maximum of eight servo objects can be created
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
  }
}
```

ARDUINO TUTORIAL 11: INTERACT WITH SERVO



```
/*
  Interact with Servo
  Controlling a servo position using a potentiometer (variable resistor)
  by Michal Rinott <http://people.interaction-ivrea.it/m.rinott>
*/
#include <Servo.h>
Servo myservo;            // create servo object to control a servo

int potpin = 0;           // analog pin used to connect the potentiometer
int val;                  // variable to read the value from the analog pin

void setup() {
  myservo.attach(9);      // attaches the servo on pin 9 to the servo object
}

void loop() {
  val = analogRead(potpin);        // reads the value of the potentiometer (value between 0 and 1023)
  val = map(val, 0, 1023, 0, 179);  // scale it to use it with the servo (value between 0 and 180)
  myservo.write(val);              // sets the servo position according to the scaled value
  delay(15);                       // waits for the servo to get there
}
```

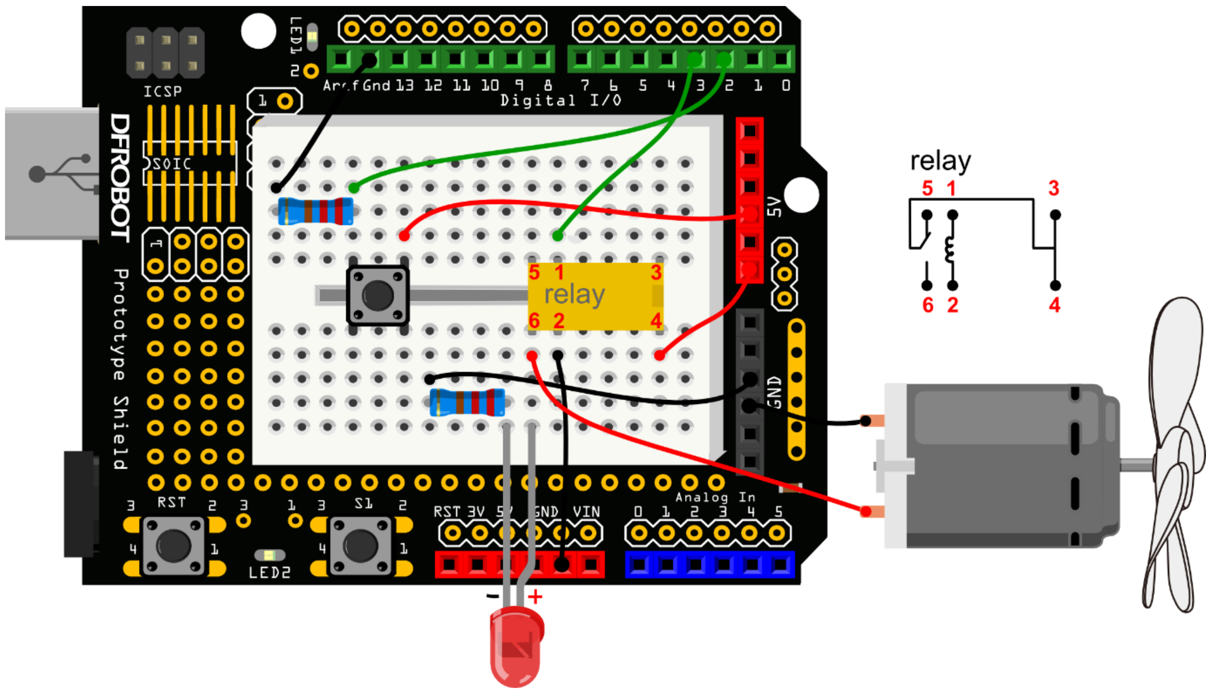
ARDUINO TUTORIAL 12: RGB LIGHT DIMMER



```
/*
  RGB Light Dimmer
*/
int redPin = 9;           // R – digital 9
int greenPin = 10;        // G – digital 10
int bluePin = 11;         // B – digital 11
int potRedPin = 0;        // potentiometer 1 – analog 0
int potGreenPin = 1;      // potentiometer 2 – analog 1
int potBluePin = 2;       // potentiometer 3 – analog 2


void setup(){
  pinMode(redPin,OUTPUT);
  pinMode(greenPin,OUTPUT);
  pinMode(bluePin,OUTPUT);
  Serial.begin(9600);
}
```

```
void loop(){
  int potRed = analogRead(potRedPin);
  int potGreen = analogRead(potGreenPin);
  int potBlue = analogRead(potBluePin);

  int val1 = map(potRed,0,1023,0,255);
  int val2 = map(potGreen,0,1023,0,255);
  int val3 = map(potBlue,0,1023,0,255);

  Serial.print("Red:");
  Serial.print(val1);
  Serial.print("Green:");
  Serial.print(val2);
  Serial.print("Blue:");
  Serial.println(val3);

  colorRGB(val1,val2,val3);
}

void colorRGB(int red, int green, int blue){
  analogWrite(redPin,constrain(red,0,255));
  analogWrite(greenPin,constrain(green,0,255));
  analogWrite(bluePin,constrain(blue,0,255));
}
```

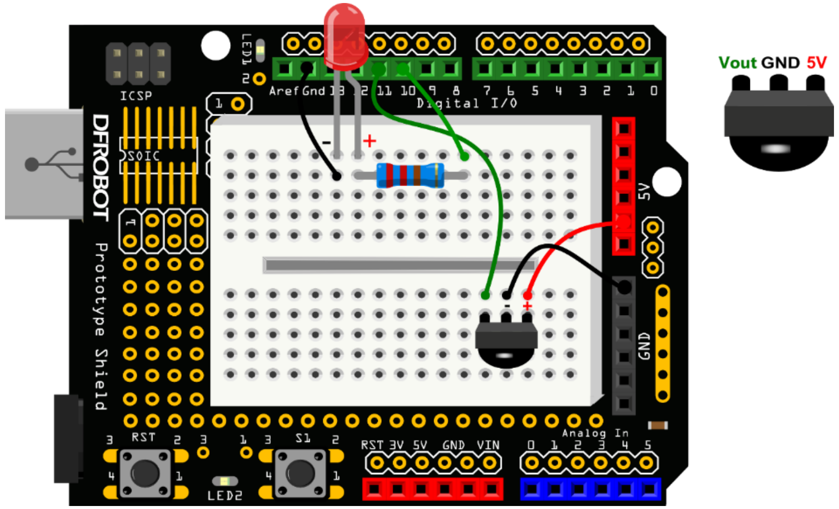
ARDUINO TUTORIAL 13: MOTOR FAN



```
/*
  Motor Fan
*/


int buttonPin = 2;               // button pin -- Digital 2
int relayPin = 3;                // relay pin -- Digital 3
int relayState = HIGH;
int buttonState;
int lastButtonState = LOW;
long lastDebounceTime = 0;
long debounceDelay = 50;


void setup() {
  pinMode(buttonPin, INPUT);
  pinMode(relayPin, OUTPUT);


  digitalWrite(relayPin, relayState);
}
```

```
void loop() {
  // read the state of the switch into a local variable:
  int reading = digitalRead(buttonPin);

  // check to see if you just pressed the button
  // (i.e. the input went from LOW to HIGH),  and you've waited
  // long enough since the last press to ignore any noise:

  // If the switch changed, due to noise or pressing:
  if (reading != lastButtonState) {
    lastDebounceTime = millis();
  }

  if ((millis() - lastDebounceTime) > debounceDelay) {
    // whatever the reading is at, it's been there for longer
    // than the debounce delay, so take it as the actual current state:

    // if the button state has changed:
    if (reading != buttonState) {
      buttonState = reading;

      // only toggle the Relay if the new button state is HIGH
      if (buttonState == HIGH) {
        relayState = !relayState;
      }
    }
  }

  // set the relay:
  digitalWrite(relayPin, relayState);

  // save the reading.  Next time through the loop,
  // it'll be the lastButtonState:
  lastButtonState = reading;
}
```

ARDUINO TUTORIAL 14: INFRARED CONTROLLED LIGHT

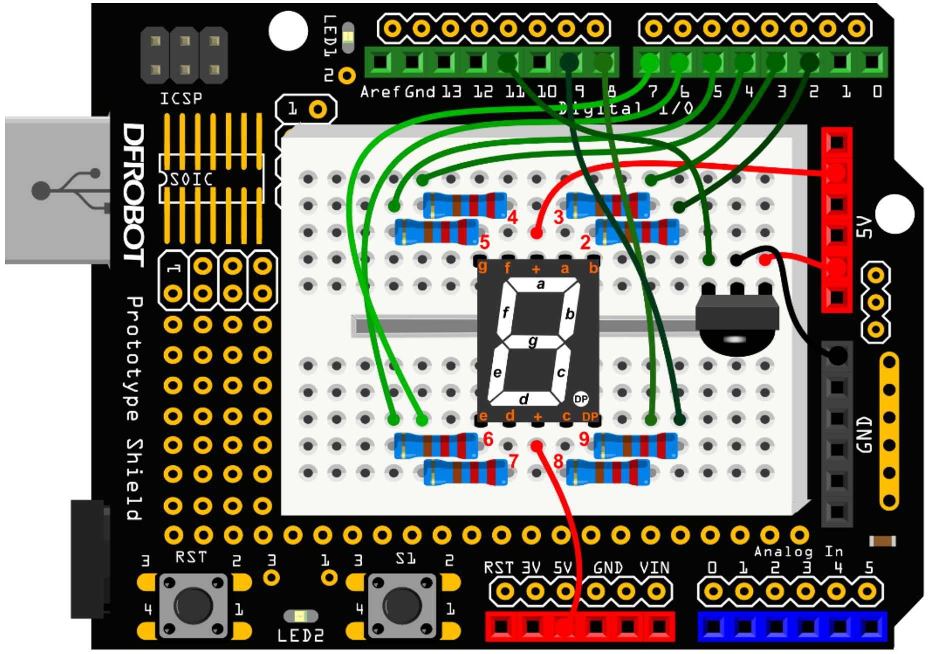


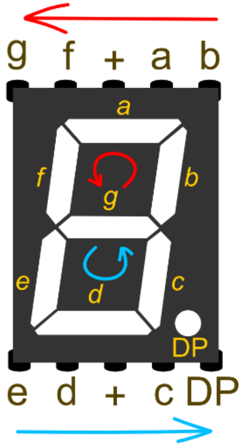
VOL +
FUNC/
STOP
VOL -
EQ
ST/
REPT
0
1
2
3
4
5
6
7
8
9

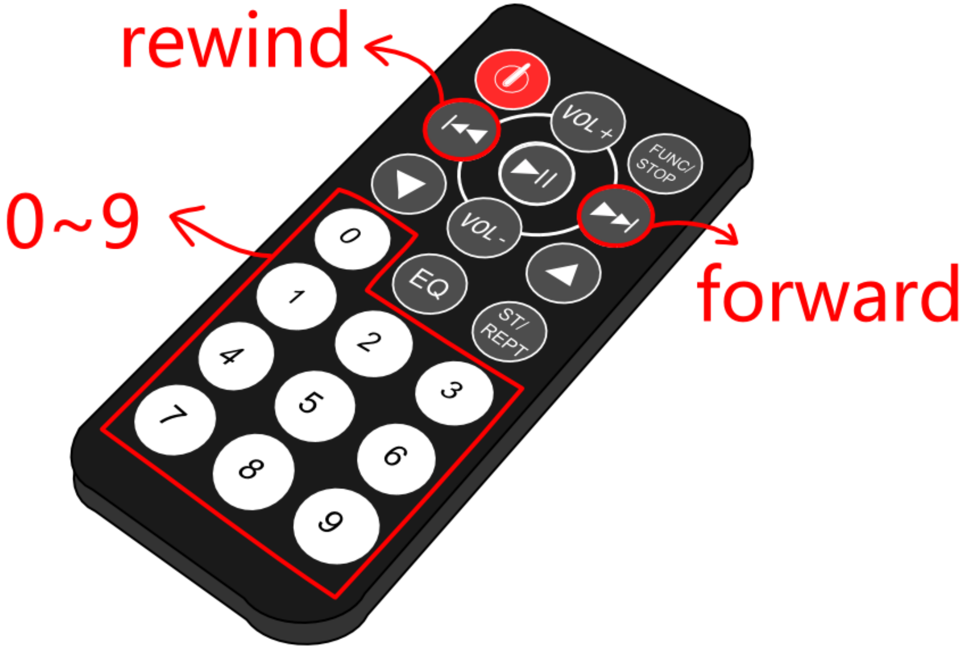
```
/*
    Infrared controlled Light
*/
#include <IRremote.h>
int RECV_PIN = 11;
int ledPin = 10;
boolean ledState = LOW;
IRrecv irrecv(RECV_PIN);
decode_results results;

void setup(){
  Serial.begin(9600);
  irrecv.enableIRIn();
  pinMode(ledPin,OUTPUT);
}
```

```
void loop() {
  if (irrecv.decode(&results)) {
      Serial.println(results.value, HEX);

      if(results.value == 0xFD00FF){
              ledState = !ledState;
              digitalWrite(ledPin,ledState);
          }
   irrecv.resume();
   }
}
```

ARDUINO TUTORIAL 15: INFRARED CONTROLLED LED MATRIX







```
  #include <IRremote.h>
int RECV_PIN = 11;
IRrecv irrecv(RECV_PIN);
decode_results results;
int currentNumber = 0;


long codes[12]=              // this array is used to store infrared codes
{
  0xFD30CF,0xFD08F7,            // 0 ,1
  0xFD8877,0xFD48B7,            // 2 ,3
  0xFD28D7,0xFDA857,            // 4 ,5
  0xFD6897,0xFD18E7,            // 6 ,7
  0xFD9867,0xFD58A7,            // 8 ,9
  0xFD20DF,0xFD609F,            // advance, move back
};
```

```
int number[10][8] =          //the array is used to store the number 0~9
{
  {0,0,0,1,0,0,0,1},//0
  {0,1,1,1,1,1,0,1},//1
  {0,0,1,0,0,0,1,1},//2
  {0,0,1,0,1,0,0,1},//3
  {0,1,0,0,1,1,0,1},//4
  {1,0,0,0,1,0,0,1},//5
  {1,0,0,0,0,0,0,1},//6
  {0,0,1,1,1,1,0,1},//7
  {0,0,0,0,0,0,0,1},//8
  {0,0,0,0,1,1,0,1} //9
};
void numberShow(int i) { //this function is used to display numbers
  for(int pin = 2; pin <= 9 ; pin++){
     digitalWrite(pin, number[i][pin - 2]);
  }
}
v Serial.begin(9600);
  irrecv.enableIRIn();

  for(int pin = 2 ; pin <= 9 ; pin++){
     pinMode(pin, OUTPUToid setup(){
);
     digitalWrite(pin, HIGH);
  }
```

```
void loop() {
  if (irrecv.decode(&results)) {
    for(int i = 0; i <= 11; i++){

       if(results.value == codes[i]&& i <= 9){
           numberShow(i); // display number 0~9 on the digital control
           currentNumber = i;
           Serial.println(i);
           break;
       }

       else if(results.value == codes[10]&& currentNumber != 0){
           currentNumber--;
           numberShow(currentNumber);
           Serial.println(currentNumber);
           break;
       }

       //
       else if(results.value == codes[11]&& currentNumber != 9){
           currentNumber++;
           numberShow(currentNumber);
           Serial.println(currentNumber);
           break;
       }
   }

   Serial.println(results.value, HEX);
   irrecv.resume();
  }
}
```