IBM ASSIGNMENT -1

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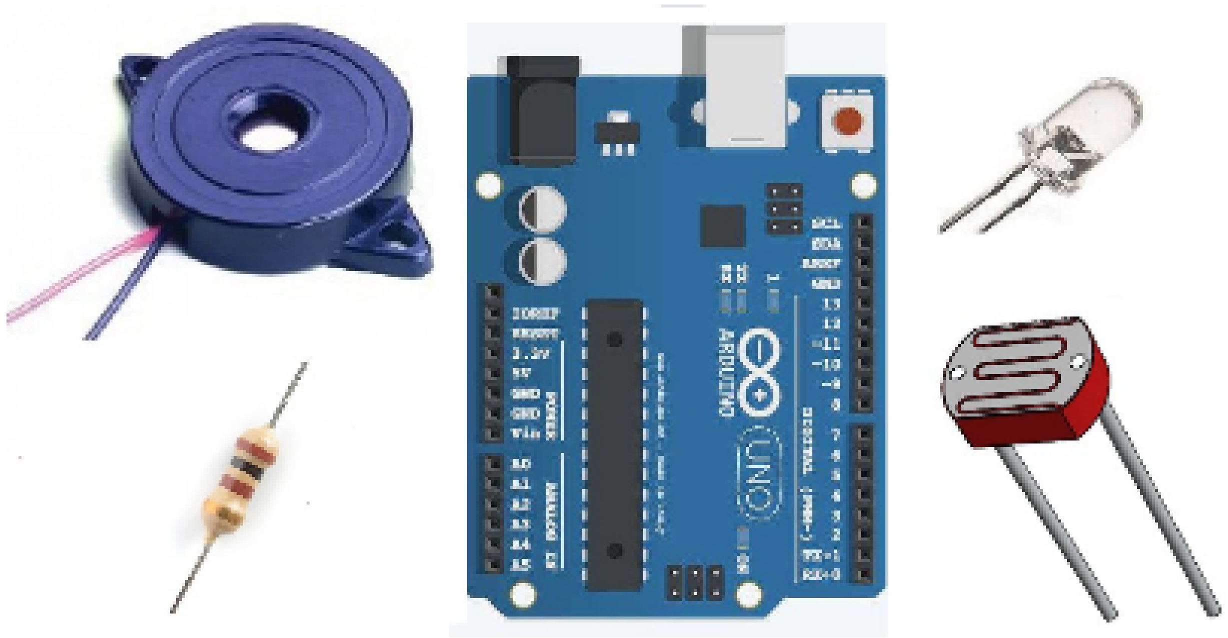
To Create Signs with Smart Connectivity for Better Road Safety with Peizo alarm,Resistor,Relay,Photoresistor,Bulb with below functionalities:Build a python code,Assume u get temperature and humidity values.

This is a simple tutorial on arduino, ldr(light dependent resistor)/photoresistor sensor and piezo buzzer. Piezo buzzer output sound level will variate by arduino depending on the intensity of light thrown on ldr/light sensor. An led will also fade by arduino depending on the intensity of light thrown on photoresistor. The diy project is same like basic electronics project which we design in our electronics class “Light sensor” using passive components(Resistors, Transistors, LDR, Led, Buzzer). The difference is, in our diy project we are going to use a dedicated microcontroller(Arduino uno) for controlling buzzer sound level and led fadeness depending on the ldr light sensor value.

Buzzer Arduino led and LDR



Buzzer Arduino led and LDR

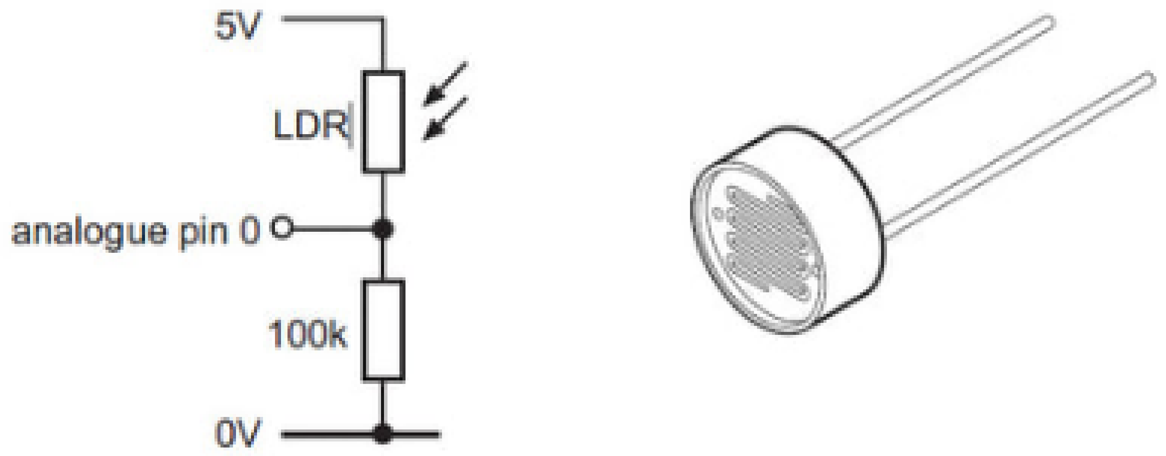
Piezo buzzer

Piezo buzzer is a small electronic component. It outputs a tone when voltage is supplied across its power pins. Normally piezo buzzer operates on 5 volts, but 12 volt versions are also available. The tone/sound produced by piezo buzzer depends on the power supplied to it. If power is low the output tone will be low and if power is high the pitch of tone/sound will be high. A 5 volt rated piezo buzzer can output a tone at 3 volt. The output tone pitch increase if we increase the voltage from 3 and the maximum tone we will get is at 5 volts. Piezo buzzer have two pins. Vcc to which we supply +ve voltage and Gnd which we connect to out power source ground.

LDR(Light dependent resistor)/Photoresistor

LDR is a special resistor. LDR resistance varies when light is thrown on it Its resistance increases and decreases depending on the intensity of light thrown on it. Normally it has high resistance and when it is exposed to light its resistance decreases. This unique feature of LDR makes us to use it in automatic street light on/off circuits. It is used as autonomous light switch. Light intensity and brightness can be controlled using LDR.

In our project we are also going to measure the intensity of light with ldr(light dependent resistor). Now how we are going to measure it? See the diagram on below.



LDR Arduino measuring intensity of light

A voltage divider circuit is shown above. Recall LDR is a resistor. when their is no light on ldr very little amount of current will flow through the circuit. 100 k resistor will be on 0 potential. Their will be no voltage across the 100 k resistor. Now when a light source is brought near the LDR. Its resistance will start decreasing and current starts flowing through the circuit. Voltage starts appearing across the 100 k resistor. The more the intensity of light thrown on ldr the more voltage appears on the 100 k resistor. When the amount of light thrown on the ldr sensor increases the threshold value the ldr resistance becomes almost to 0.

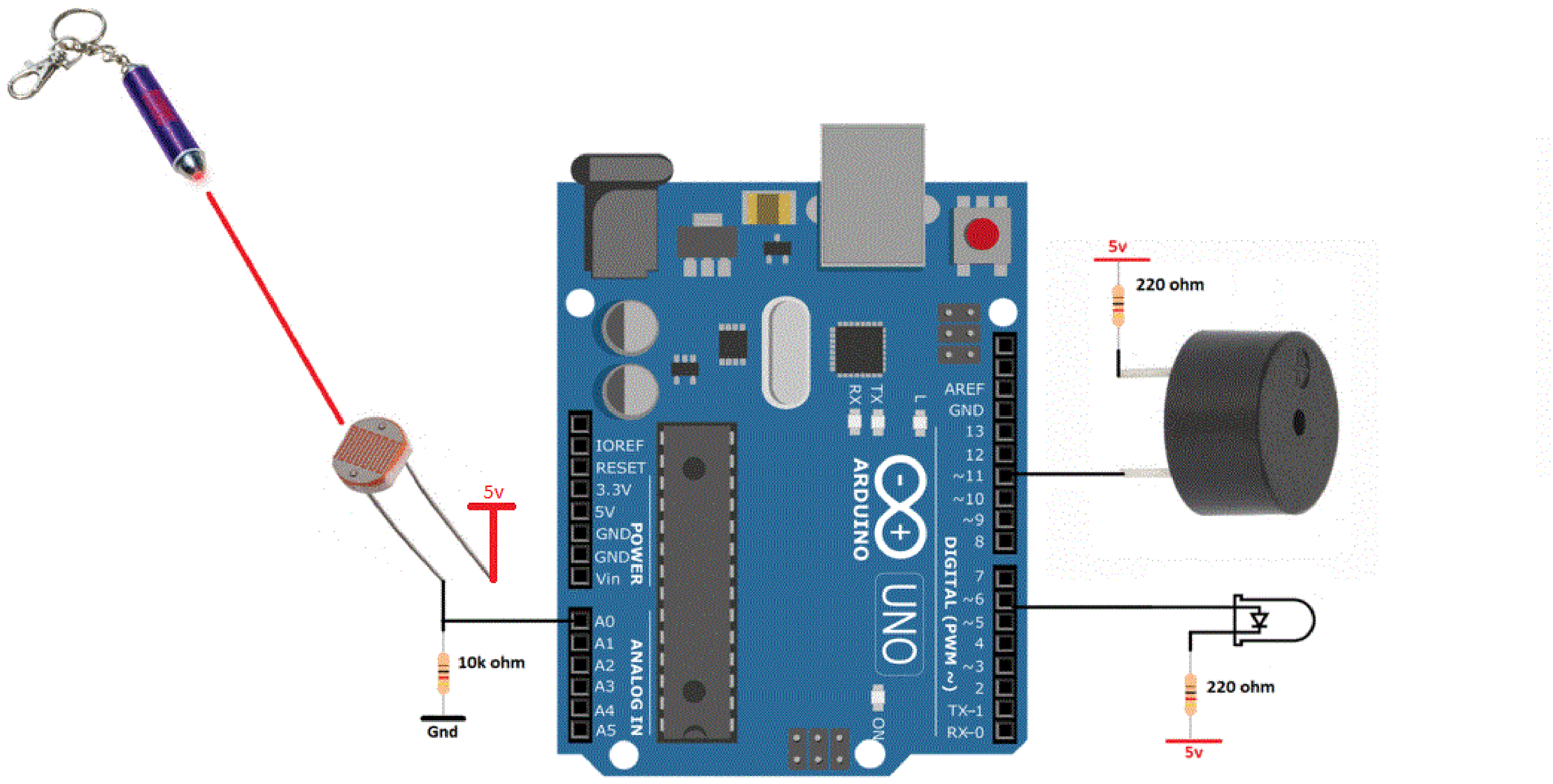
The voltage appearing across the 100 k resistor is read by the analog pins of arduino and translated for further use(controlling buzzer arduino and led fade mechanism).

Project Circuit diagram

Arduino two digital pins and one analog pin is used in the project. Two digital pins of arduino are carefully selected. I choose the arduino digital pins(~11 and ~6) which can output a pwm signal. I hope you people know about the PWM(Pulse width modulation) technique. If not then just for this tutorial take it(pwm) as a way to output a variable signal on digital pins. From variable signal i mean output voltage between 0-5 volt. It can be 0.5, 1, 1.2, 3.5, 4.1 volts any voltage between 0-5 volts.

Arduino buzzer one leg is connected to arduino pin#11 and the other is pulled high. Led positive leg is connected to arduino pin#6 and the other end is pulled high. 5 volts supplied to buzzer and led can be from the arduino 5v pin. 220 ohm resistor in series with the buzzer and led is used for current limiting purpose.

LDR and 10 k resistor voltage divider circuit middle point is connected to analog channel 0 of arduino uno. Ldr input 5 volts can also be supplied with the arduino 5 volt output rail. Circuit diagram of the project is given below.



Arduino buzzer alarm with light dependent resistor(LDR)/photoresistor

Coming to the code portion of the project. Code is written in arduino ide and its free for every one. You can use and modify it according to your needs. In the code first i defined the variables for analog channel 0 of arduino as sensor, buzzer arduino pin(arduino pin#11) as Buz and led arduino pin(arduinp pin#6) as Led. In the setup function i declared the Buz and Led pins as output. Since they are outputting voltage or Pwm(pulse width modulated) signal for buzzer and led fadness.

In setup function arduino serial port is also initialized at 9600 baud rate. Arduino serial port is initialized to see the voltage measurement by analog channel 0 to which LDR output is connected. Serial.begin(9600) statement is initialing the arduino serial port.

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/***************************************************
```

```
 * Written By:   Usman Ali Butt                 *
 * Dated     :   11 August 2018                 *
 * Property off: www.microcontroller-project.com  *
 ********************************************/


int sensor=A0;  //Analog channel 0 of arduino.
int Buz= 11;    //Arduino buzzer interface pin
int Led= 6;     //Arduino Led interface pin

void setup()
{
Serial.begin(9600);    //Begin Serial monitor of arduino ide
pinMode(Buz, OUTPUT);  //Arduino buzzer pin as output
pinMode(Led, OUTPUT);  //Arduino Led pin as output
}

void loop()
{
//Read Intensity of light thrown on LDR and
//store the measured value in variable senValue
int senValue=analogRead(sensor);
delay(10);                      //Time for ADC to stable
Serial.println(senValue);       //Print the read value on arduino serial monitor
//If the voltage at 10 k resitor is 1.51 volts or senValue is greter than 310. Then
//enter in the if statement.
// {(read value on analog cahnnel/Max analog channel value)*Total voltage}
//(310/1024)*5 = 1.51
if(senValue>310){
    //same Output voltage to buzzer which apperas as input on A0 channel of arduino
    analogWrite(Buz, senValue/4);
    //Same Output voltage to Led which apperas as input on A0 channel of arduino
    analogWrite(Led, senValue/4);
}
else
{
  //Do nothing
}


}//End Loop
```

In the loop function first i am reading the LDR intensity light value. The statement int senValue=analogRead(sensor) is reading the LDR output voltage across 10 k resistor. The read value is stored in senValue variable.

Arduino is a 5 volt tolerant device. Its gpio pins can output 5 volt TTL signal. Similarly its gpio pins can be exposed to 5 v TTL signal as input. Higher than 5 v may destroy the gpio pin. So your input voltage to arduino pins must remain between 0-5 volts. I supplied 5 volt to LDR keeping in mind the above constraint.

Arduino analog channel can also read max 5 volts. Arduino ADC(Analog to digital channel) is 10 bit wide or its resolution is 10 bit. Means it can output value up to 1024. 1024 represents 5 volts. 512 represents 2.5 volts and vise versa.

So if voltage across the 10 k resistor is 2 volts than the analog channel 0 of arduino will read it and provide us an integer value of 410. [(410/1024)*5v = 2v].

The same above strategy is applied in the code. When the voltage across 10 k resistor increases 1.5 volts(ADC value 310) then the buzzer and led are activated and are driven with the same voltage that appears across the 10 k resistor. The if statement in the code is checking 1.5 volts or 310 integer value by ADC. Buzzer and LED will operate only on the voltages greater than 1.5 volts.

Unlike arduino ADC the arduino pwm provides 8 bit resolution. So in analogWrite(*, senValue/4) function in code i am dividing the senValue by 4 to bring the senValue in 8 bit resolution 0-255. I hope it makes sense to you.