**ELEC1601 Week 3 Lab Report**

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**Introduction**

The purpose of this lab session was understanding the use of a photoresistor and a buzzer/speaker and how they can be used in a circuit. This was also our first graded Lab work so it tested our group collaboration and communication skills and how effective and efficient we can work as a team.

We have gone the further step and have taken the initiative to meet up privately outside of our labs to work on our assignment and our collaboration before our Lab class. We go through the description and external information and share it within the group through discord. We use the Tinkercad sharelink feature and codeshare to work together to solve the given problems. We were 90% done with our work and complete the rest during the Lab class. We also formulated a plan on how we distribute our Lab report work during Lab

**Materials**

The components used in this week’s Lab session were:-

1) Buzzer/Speaker:

A buzzer is a small 12mm round audio device that convers audio signals into sound signals. It is ether a magnetic or a piezo design. It is audible up to 2kHz and can generate several tones(frequencies) to make simple sounds.

It’s mostly known for being used in alarms but other applications include toys, pest deterrents etc.

2) Resistors:

Resistors come under passive electronic components and are extensively used in electronic circuits. The function of a resistor is to oppose the flow of current through it and the strength of this opposition is known as resistance and is measured in ohms. It is also used to adjust signal levels, to divide voltages etc. The resistance of a resistor can be fixed or varying depending on its application.

A resistor is by far one of the most notable and heavily applied component on the circuit board being used in more than just its intended primary purpose.

Varying the resistance can change the speed of motors and vary the loudness in amplifiers. However since it opposes the current, naturally it generates heat and this has been made practical in heating appliances like toasters.

3) Photoresistors : Photoresistors comes from the branch of resistors and has the same resultant effect as a regular resistor, but instead of varying the resistance through physical means, the amount of light it receives varies the resistance.

Photoresistors are used in streetlights to control when the light should switch on and off. When the sun rises in the morning, these lamps detect the light and in turn switch off the lights and vice versa, as it gets dark, the lights will switch on by varying its resistance depending on the light falling on the resistor.

**Connection**

**Task 1:**

**A picture containing text, electronics

Description automatically generated**

*Pseudocode*

1) Assign green to pin 9.

2)  Initialise green as an OUTPUT

3) Setting the communication speed with the computer to 9600ms

4)  Setting tone

5)  delay 1000ms

6)  Repeat from 4

1. The green wire connects pin 9 to the positive terminal of the buzzer with a resistor in the middle.
2. The green wire outputs electricity which powers the buzzer to make the sound. The resistor is 10 k ohms and is used as a safety measure.
3. A buzzer was used as it is a low energy-consuming component and can produce several musical notes.
4. The negative terminal of the resistor is connected to the ground of the circuit to release all the excess electricity safely.
5. Several tones are placed one after another with a delay of 1000ms which produces a melody.

*Limitations*

* The buzzer has a relatively small range of tones at just 3,300hz
* The sound generated is not very pleasing and can be annoying
* Lot of wasted space. The circuit can be smaller

*Successes*

* The code required to program this is very simple
* The circuit design is also very basic and easy to build

**Task 2:**

**Diagram, schematic

Description automatically generated**

*Pseudocode*

1)  Assign green to pin A0

2)  Initialise green as an INPUT

3)  Setting the communication speed with the computer to 9600ms

4)  Read LDR values from pin A-

5)  print LDR values in serial monitor

6)  delay by 5000ms

7) repeat from 4)

1. Red wire connected to the 5V pin which connects to the resistor and the Light dependent resistor. The result is that the voltage is split between the 2 resistors depending on the resistance of the resistor.
2. Communication speed between the computer and the board is set to 9600ms
3. To see the Serial values, the Arduino needs to read the LDR values through an input which we have assigned to pin A0
4. The value of the LDR is read and displayed in the serial monitor with a delay of 5s once a change in the LDR is made

*Limitations*

* They require a few milliseconds or more to respond fully to the changes in light intensity.
* They will take few seconds to return to their normal dark resistance once light is absent.
* Lot of wasted space. The circuit can be smaller

*Successes*

* The code required to program this is very simple
* The circuit design is also very basic and easy to build

*Unexpected results*

* The LDR was more responsive than we expected

**Task 3:**

Diagram

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*Pseudocode*

1)   LDR value read from pin A0

2)   LDR value stored as a variable

3) Setting the speed of communication with computer to be 9600ms

4)   Electricity supplied to buzzer from pin 9

5)   Value from pin A0 read

6)   frequency has been set to a variable dependent on the value at pin A0

7) delay of 5000ms

8) repeat from 5)

1. The circuit sends electricity from pin 9 to the positive terminal of the buzzer with the excess being sent to the ground.
2. Red wire connected to the 5V pin which connects to the resistor and the Light dependent resistor. The result is that the voltage is split between the 2 resistors depending on the resistance of the resistor.
3. A wire from the pair of resistors is sent to pin A0 which reads the values from the resistors
4. This value is displayed in the Serial monitor.
5. The frequency of the buzzer is set to change according to the value in pin A0. The bigger the value in A0 the smaller the frequency of the buzzer. As luminance increases, frequency decreases and vice-versa.
6. There is a delay of 5 seconds between the changes in the value at A0

*Limitations*

* The buzzer has a relatively small range of tones at just 3,300hz
* The sound generated is not very pleasing and can be annoying
* They require a few milliseconds or more to respond fully to the changes in light intensity.
* They will take few seconds to return to their normal dark resistance once light is absent.
* Lot of wasted space. The circuit can be smaller

*Successes*

* The code required to program this is very efficient and simple
* The circuit design is also very basic and easy to build

*Unexpected results*

* The buzzer responded well with the change in light intensity

**Relation to real-world electronics**

*Description:*

Photoresistors and buzzers are widely used components in a circuit and combining the two can create interesting gadgets.

Detecting intrusion into containers or rooms is an important security application. When shipping expensive cargo, it can be important to know when a shipping container has been opened, so that cases involving loss of product can be solved easier. A cheap photo-resistor could be used to log each time the container is opened, so it can be determined at what point in the process a container has been accessed and will help catch the perpetrator, or if a member of staff was being dishonest and claimed the container must have been robbed.

*Connections/Sensors:*

Diagram

Description automatically generated

*Pseudocode*

1. The photoresistor reads the value from pin A1
2. Setting communication speed to 9600ms
3. If light intensity at sensor >= 500:

Light up Red bulb to max brightness and play buzzer at max volume

1. If light intensity >= 200:

Light up Green bulb to max brightness

1. If light intensity = 0:

Light up Blue bulb max brightness

1. Delay for 100ms

*Risks and Difficulties*

There doesn’t seem much risk as there are only a small amount of components used in the circuit all being low-energy components. Coding the circuit is also not very difficult as it only consists of 3 if statements. Wiring the circuit might be tedious s there are several resistors and LED’s included in the build.

*Safety issues*

Since we are working with electrical components, it comes with a degree of hazard as electrical components can cause:

* Electrical shock
* Electrical fire
* Overheating of components resulting in burns

However to overcome these possible risks, the Arduino circuit operates at only 5 Volts and a low amount of current. Components have a very slim chance of catching fire even when dealt recklessly. Components are also unlikely to overheat even if short circuited.

To be absolutely safe, insulating parts with the most chance of overheating or insulating the entire circuit can be done