Ambient Lighting Using LDR And Transistors

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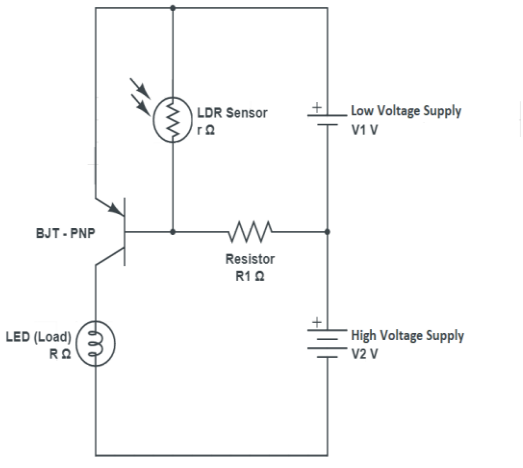
Abstract- *Lighting around us is one of the most important factors of our daily life. And there are many problems related to light which we need to solve. Few of them are Insufficient lighting, glare, Improper contrast, Poorly distributed light, Flicker. Poor lighting can be a safety hazard in outdoors as misjudgment of the position, shape or speed of an object can lead to incidents and injury. It can also affect the quality of work, specifically in situations where precision is required, and overall productivity. Even there are many biological side effects of poor lighting as too much or too little light strains eyes and may cause eye discomfort (burning, etc.) and headaches. Our mental health, mood etc. also depends upon the lighting condition around us.*

Hence in order to overcome this problem and serve the amount of light as per need we would need a smart lighting source around us, which will automatically adjust its output luminosity depending upon the time, environment lighting conditions and most importantly the convenience. With Adaptive Lighting not only we solve the above mentioned problem but we also conserve the energy as it will automatically reduce the power consumption when there is no need.

Keywords- Adaptive Lighting with LDR and Transistor, Energy Conservation, lighting wellbeing

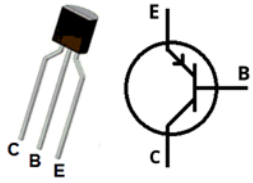
I. CIRCUIT DIAGRAM



II. COMPONENTS AND IT'S USAGE

Bipolar Junction Transistor (PNP):-

We are using Bipolar Junction Transistor (PNP) in Common Base Configuration. Emitter and Base are connected across Low Voltage Supply and Emitter and Collector are connected across High Voltage Supply. It is acting as an amplifier.



Low Voltage Source:-

Low Voltage DC Source is connected across the base and emitter of the transistor. It is used to provide base current to the transistor.

High Voltage Source:-

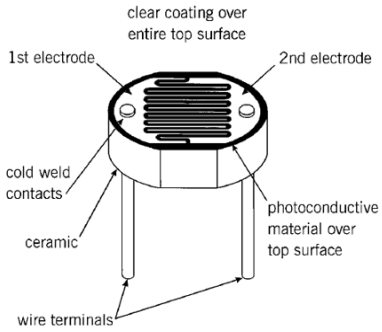
High Voltage DC Source is used to power the LED Bulb (Load) used in the circuit.

Resistor (R1):-

It is connected to avoid excessive flow of current through the common base

Light Dependent Resistor:-

It is used to measure the intensity of light in the environment. It is used as an Input Device. LDR is connected in parallel with the Emitter and base of the transistor to directly affect the base current depending upon the presence of light in its surrounding.



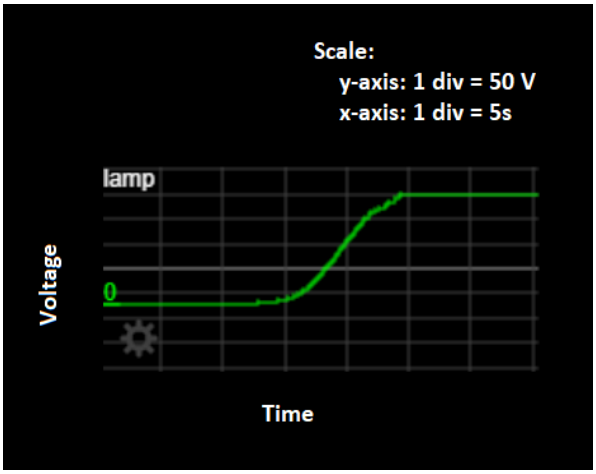
LED Bulb:

It is used to emit the required luminosity to the environment. It is used as an Output Device.

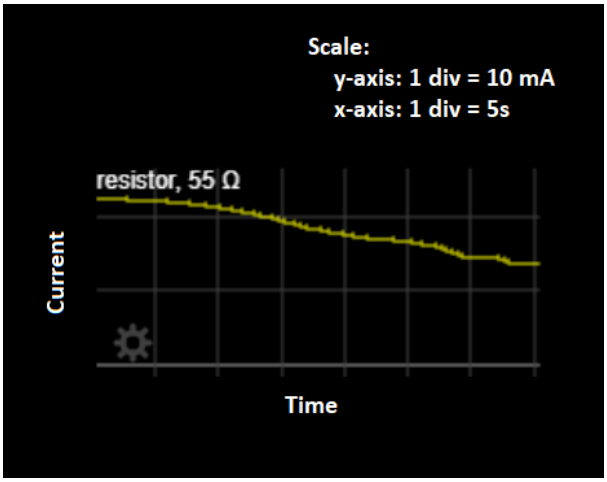
III. WORKING PRINCIPLE

Case 1: Light Intensity in the Environment is increasing

1. As the intensity of Light in the environment increases the resistance of the LDR decreases
2. Due to the decrease in the Resistance of the LDR, current through it increases. And hence the base current of the transistor decreases.
3. As the transistor is acting as an amplifier, due to the decrease in base current the Collector current will also decrease.
4. Due to the decrease in current the voltage drops across the Load attached in series also decreases.
5. As a result the output intensity of the bulb also decreases.



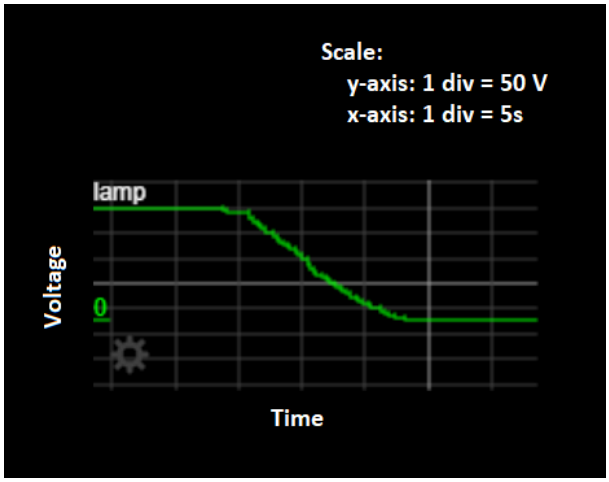
Voltage vs Time across Lamp



Current vs Time in LDR Sensor

Case 2: Light Intensity in the Environment is decreasing

1. As the intensity of Light in the environment decreases the resistance of the LDR increases
2. Due to the increase in the Resistance of the LDR, current through it decreases. And hence the base current of the transistor increases.
3. As the transistor is acting as an amplifier, due to the increase in base current the Collector current will also increase.
4. Due to the increase in current the voltage drops across the Load attached in series also increases.
5. As a result the output intensity of the bulb also Increases.



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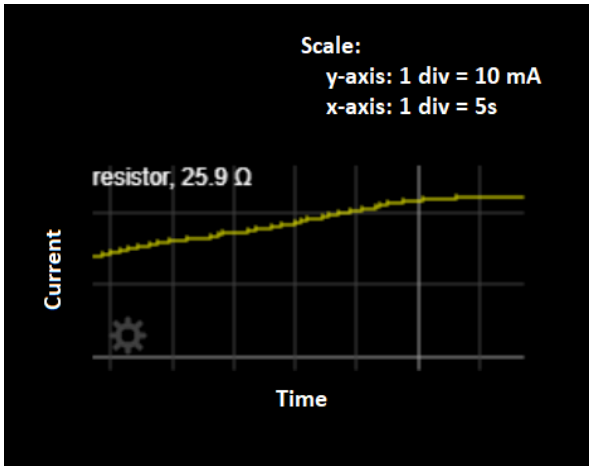

Current vs Time in LDR Sensor

IV. CONCLUSION

As the Intensity of light in the surrounding increases gradually the output voltage across the LED decreases and hence the luminosity of the bulb decreases and when the Intensity of light in the surrounding decreases gradually the output voltage across the LED increases and hence the luminosity of the bulb increases.

REFERENCES

[1] Circuit Diagram Builder Tool: https://www.circuitlab.com/
[2] Problems with Lighting: https://www.ccohs.ca/oshanswers/ergonomics/lighting_survey.html
[3] Simulation Tool: https://www.falstad.com/circuit/