Light Intensity Measurement using LDR Sensor and Arduino

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1. Introduction

This project measures the surrounding light intensity using an LDR (Light Dependent Resistor) sensor and displays the reading via Serial Monitor. Additionally, it controls the brightness of an LED based on the measured light levels.

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2. Key Components

- Arduino Uno (or compatible board)
- LDR (Light Dependent Resistor)
- 10kΩ Resistor (for voltage divider with LDR)
- LED
- 220Ω Resistor (for LED current limiting)
- Breadboard and jumper wires
- USB cable for Arduino programming

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3. Working Principle

1. **LDR Sensing:**
   The LDR changes its resistance depending on the light intensity falling on it. Brighter light lowers resistance; darkness increases it.
2. **Voltage Divider:**
   The LDR is connected with a fixed resistor (10kΩ) to form a voltage divider. The varying voltage is fed into Arduino's analog input A0.
3. **Analog Read:**
   Arduino reads the analog voltage from A0 using analogRead(), giving a value between 0 (dark) and 1023 (bright).
4. **Serial Output:**
   The measured value is printed to the Serial Monitor for observation.

5. **LED Brightness Control:**
   The light intensity value is mapped (scaled) to a PWM output (0-255) and used to adjust the brightness of an LED connected to pin 9.

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4. Circuit Overview

- **LDR + 10kΩ Resistor:** One side of LDR to 5V, one side to A0 and to a 10kΩ resistor to GND.
- **LED Connection:** Positive leg (anode) of LED to pin 9 through a 220Ω resistor, negative leg (cathode) to GND.
- **Arduino Connections:**
    - A0: Sensor voltage input
    - Pin 9: PWM output for LED control

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5. Code

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/*Light Intensity Measurement using LDR sensor and Arduino*/


int sensorValue = 0;

void setup()

{

  pinMode(A0, INPUT);

  Serial.begin(9600);

  pinMode(9, OUTPUT);

}
```

```
void loop()
{
 sensorValue = analogRead(A0);
 Serial.println(sensorValue);
 analogWrite(9, map(sensorValue, 0, 1023, 0, 255));
 delay(100);
}
```

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6. Code Explanation

- **Global Variable:**
- int sensorValue = 0;

Initializes a variable to store the analog sensor reading.

- **Setup Function:**
- void setup()
- {
- pinMode(A0, INPUT);
- Serial.begin(9600);
- pinMode(9, OUTPUT);
- }
    - pinMode(A0, INPUT); → Sets pin A0 as an input to read analog signals from the LDR.
    - Serial.begin(9600); → Starts serial communication at 9600 baud rate.
    - pinMode(9, OUTPUT); → Sets pin 9 as output to control the LED.
- **Loop Function:**
- void loop()

- {
- sensorValue = analogRead(A0);
- Serial.println(sensorValue);
- analogWrite(9, map(sensorValue, 0, 1023, 0, 255));
- delay(100);
- }
    - sensorValue = analogRead(A0); → Reads the light intensity as an analog value (0-1023).
    - Serial.println(sensorValue); → Sends the value to Serial Monitor for viewing.
    - analogWrite(9, map(sensorValue, 0, 1023, 0, 255)); → Maps the sensor reading to 0-255 range and outputs PWM signal to pin 9, adjusting LED brightness.
    - delay(100); → Small delay of 100 milliseconds between readings.

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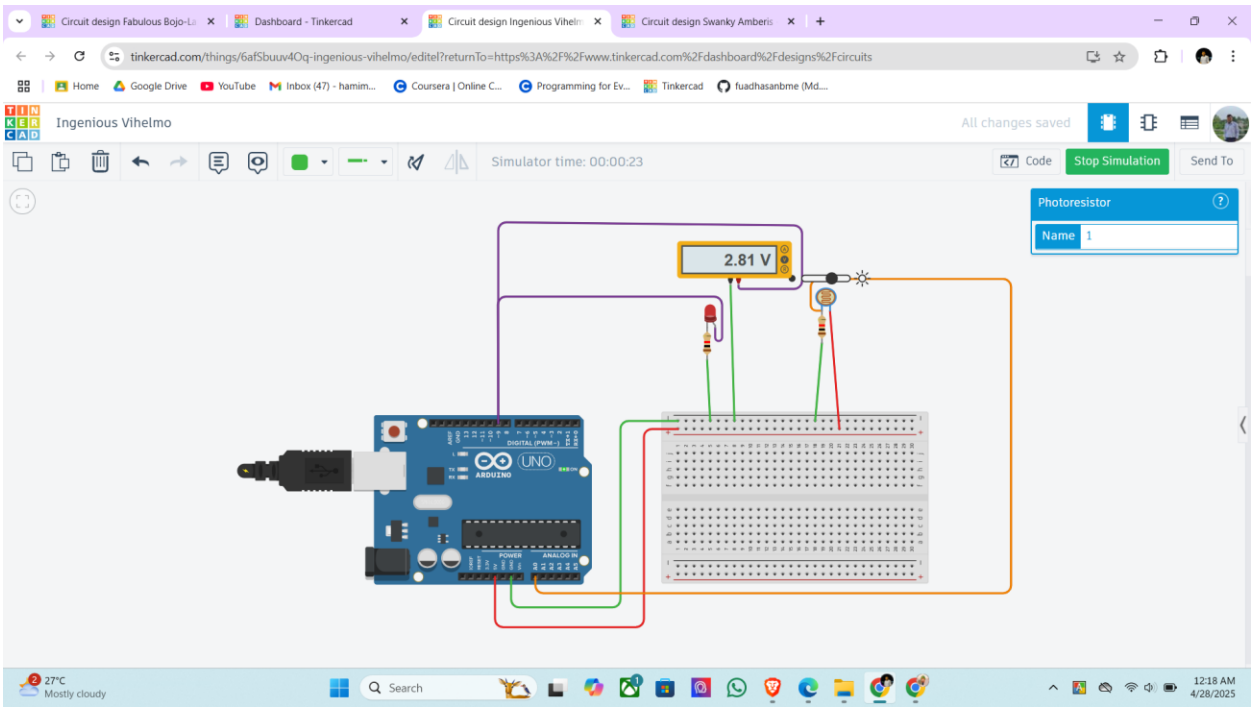
7. Conclusion

This project demonstrates how an Arduino can sense environmental light changes and control an output (like LED brightness) accordingly. It is a simple yet powerful example of analog sensing, data reading, and PWM output.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