Light Intensity Measurement

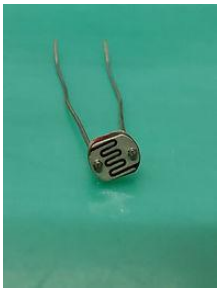
Project Overview:

- The project demonstrates **Light Intensity Measurement** using **TinkerCAD** simulation.
- The key components used: **Arduino, Breadboard, Photoresistor (LDR), LED, Resistors, and Multimeter**.

KEY COMPONENTS IS LDR:

LDR: (Light-Dependent Resistor)

- **LDR (Photoresistor)** operates on the principle of **photoconductivity**.
- It has a **semiconductor layer** that measures **light intensity**.
- When **light falls on the semiconductor**, electrons gain energy and move, forming **electron-hole pairs**, which **reduces resistance** and increases **output voltage**.



LDR Circuit:

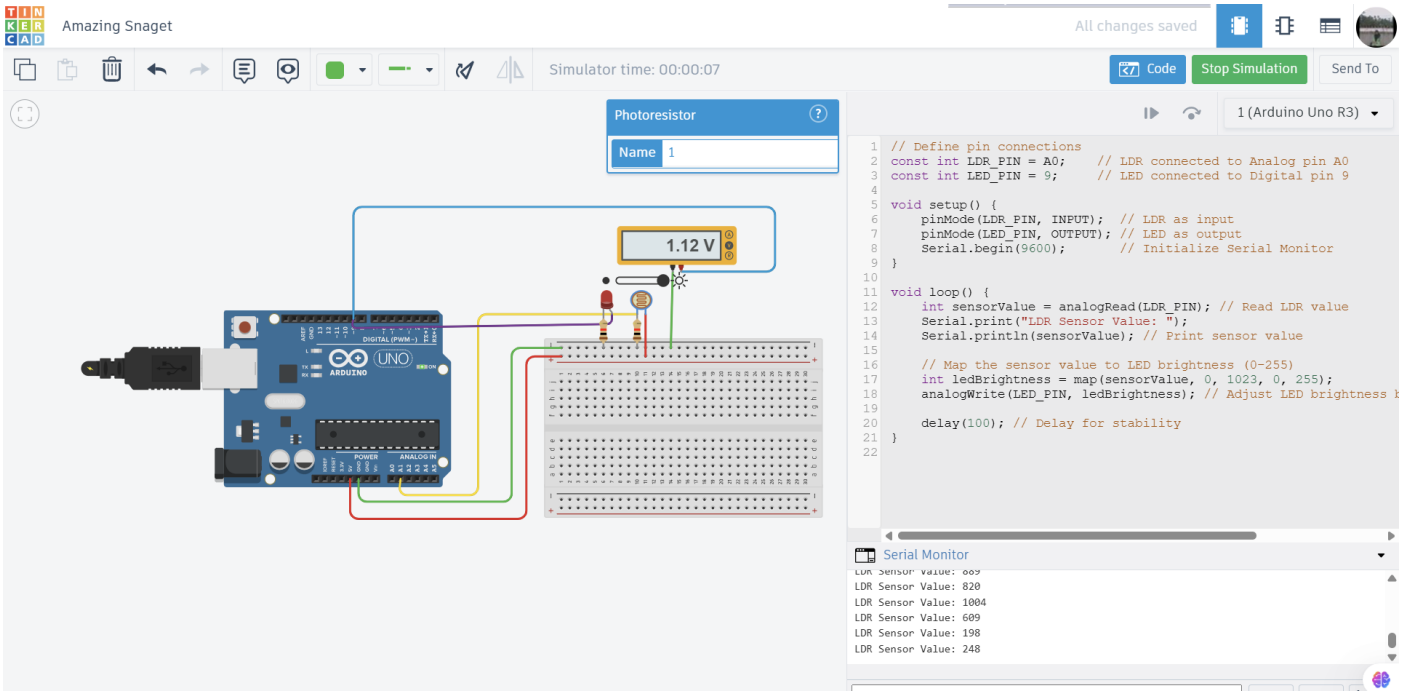
- Uses an **LDR and a resistor** in a **voltage divider** configuration.
- As **light intensity changes**, the **voltage at the junction** of the LDR and resistor varies.
- This varying voltage can be used to **control electronic components**.

Circuit Setup:

1. **Arduino and Breadboard** are placed in the workspace.
2. **LDR (Photoresistor)** is connected with a **resistor** to prevent burning out.
3. **LED** is connected with a **resistor** to avoid damage.
4. **Multimeter** is used to measure the voltage across the LED.
5. **Power (5V) and Ground (GND) connections** are made with proper wire colors for clarity.
6. **LDR Output is connected to A0 (Analog Input)** on Arduino.
7. **LED is connected to Digital Pin 9** on Arduino.
8. **Multimeter probes** are placed across **LED terminals** to measure voltage.

Working Principle of LDR:

- **Photoconductivity**: When light falls on LDR, its resistance **decreases**, allowing more current to flow.
- **Higher light intensity → More electrons excited → Lower resistance → Higher voltage output**.



Code:

```
// Define pin connections
const int LDR_PIN = A0;    // LDR connected to Analog pin A0
const int LED_PIN = 9;     // LED connected to Digital pin 9
void setup() {
  pinMode(LDR_PIN, INPUT);  // LDR as input
  pinMode(LED_PIN, OUTPUT); // LED as output
  Serial.begin(9600);       // Initialize Serial Monitor}
void loop() {
  int sensorValue = analogRead(LDR_PIN); // Read LDR value
  Serial.print("LDR Sensor Value: ");
  Serial.println(sensorValue); // Print sensor value
  // Map the sensor value to LED brightness (0-255)
  int ledBrightness = map(sensorValue, 0, 1023, 0, 255);
  analogWrite(LED_PIN, ledBrightness); // Adjust LED brightness based on light intensity
  delay(100); // Delay for stability}
```

Code Explanation:

- **A0 is set as an input (LDR)** and **Pin 9 as an output (LED & Multimeter)**.
- **Sensor value is read using analogRead(A0)** and printed to the Serial Monitor.
- **LED brightness & voltage increase** with increasing light intensity.
- **Code runs in a loop with a 100ms delay** to continuously monitor changes.

Simulation & Output:

- Initially, **low sensor values & LED brightness** are observed.
- As **light intensity increases**,
    - **Sensor values, LED brightness, and voltage increase**.
    - The **multimeter shows rising voltage levels**.

Conclusion:

- The project successfully demonstrates how **light intensity is measured** using an **LDR, Arduino, and Multimeter**.
- LED brightness and voltage increase **proportionally** with **light intensity**.