



MAINCRAFTS
TECHNOLOGY

- TASK – 1 :

- 1 . Smart temperature monitor
- 2 . Smart lighting system
- 3 . MOTION detection alarm

INTRODUCTION TO EMBEDDED SYSTEMS...

- An Embedded System is a special-purpose computer system designed to perform a specific task or set of tasks.
- It is embedded inside a larger system, unlike a general-purpose computer (like a PC or laptop).
- Embedded systems are the brains behind most smart devices today.
- They are specialized, efficient, and widely used in modern technology, from home appliances to industrial machines.

INTRODUCTION TO EMBEDDED SYSTEMS

CHARACTERISTICS OF EMBEDDED SYSTEMS

- ✓ ☐ Dedicated function
(only one task)
- ✓ ☐ Real-time operation
(fast response)
- ✓ ☐ Small size & low power consumption
- ✓ ☐ High reliability
- ✓ ☐ Cost-effective
- ✓ ☐ Embedded in other devices

COMPONENTS OF EMBEDDED SYSTEMS (mainly)

- Microcontroller/Microprocessor
- Memory (RAM, ROM/FLASH)
- Input devices (Sensor: light, pressure, etc...)
- Output devices (LED, LCD, Motors, etc ..)
- Communication interfaces (UART, SPI, I2C, etc ..)

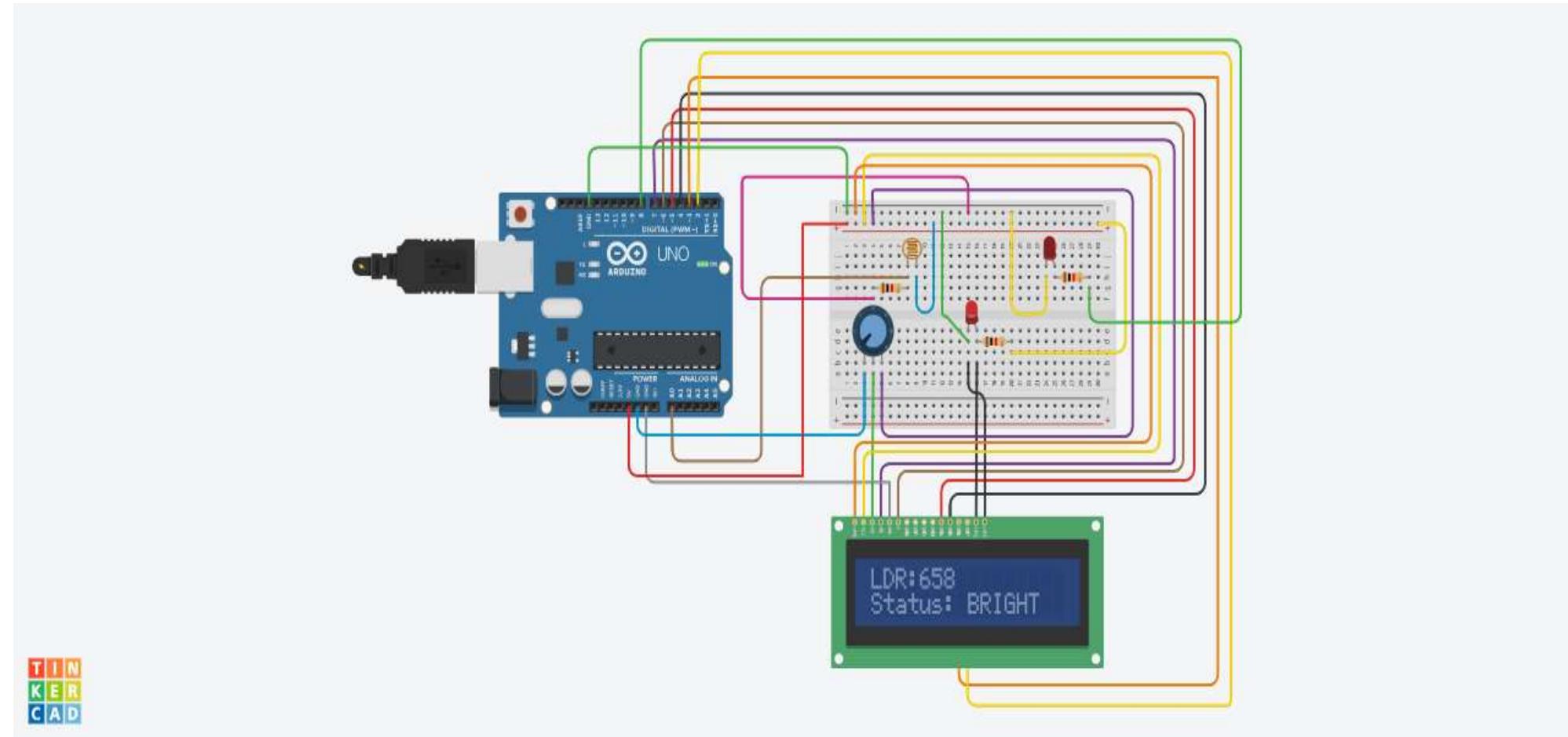
SMART LIGHTING SYSTEM

LED turns ON/OFF based on sensor input



TASK-1: SMART LIGHTING SYSTEM (CIRCUIT DIAGRAM)

- ✓ Component List (Simplified)
- ✓ Arduino Uno
- ✓ LDR sensor
- ✓ LED
- ✓ 220Ω resistor
- ✓ $10k\Omega$ resistor
- ✓ Breadboard + wires
- ✓ Power supply (5V)
- ✓ LCD Display



TASK-1: SMART LIGHTING SYSTEM (EXPLANATION)

1. Sensor Detects the Environment

- The system uses a sensor such as **LDR, PIR, or IR**.
- The sensor continuously measures the surrounding conditions:
 - **LDR** → detects light intensity (dark or bright)
 - **PIR** → detects human motion
 - **IR** → detects obstacle or object presence

2. Sensor Sends Signal to Microcontroller

- The sensor converts the physical input into an electrical signal.
- This signal is sent to the microcontroller (Arduino/ESP32).
- Example:
 - **LDR** gives an analog voltage value depending on light intensity.
 - **PIR** gives a digital HIGH/LOW signal

3. Microcontroller Processes the Signal

- The microcontroller reads the sensor output continuously.
- It compares the sensor value with a **pre-defined threshold**.
- Example logic:
 - If light intensity is **low**, the system considers it **night time**.
 - If motion is detected, the system considers someone is present.

4. LED Turns ON/OFF Based on Condition

- When the sensor output crosses the threshold:
 - The microcontroller sends a signal to the LED pin.
 - LED turns **ON** (HIGH).
- When the condition is not met:
 - LED remains **OFF** (LOW).

TASK-1: SMART LIGHTING SYSTEM(APPLICATIONS)

- Automatic street lights
- Home lighting automation
- Security lights (motion-based)
- Office building lighting control
- Garden/pathway lights
- Parking lot lights
- Solar-powered lighting systems

SOURCE CODE WITH COMMENTS

sketch_jan19d.ino

```
1 #include <LiquidCrystal.h>           // Include the LiquidCrystal library to control the LCD display
2 LiquidCrystal lcd(7, 6, 5, 4, 3, 2); // Initialize LCD with pin connections LCD pins: RS, EN, D4, D5, D6, D7
3 int ldrPin = A0;                   // LDR sensor is connected to analog pin A0
4 int ledPin = 9;                   // LED is connected to digital pin 9 (PWM pin)
5 int ldrValue;                    // Variable to store LDR analog value
6 void setup()
7 {
8     pinMode(ledPin, OUTPUT);      // Set LED pin as output to control the LED
9     lcd.begin(16, 2);            // Initialize the LCD with 16 columns and 2 rows
10    lcd.print("Object Detect"); // Display "Object Detect" on LCD
11    delay(2000);                // Wait for 2 seconds so user can read the message
12    lcd.clear();                // Clear the LCD screen
13 }
14 void loop(){
15     ldrValue = analogRead(ldrPin); // Read analog value from LDR (0 to 1023)
16     lcd.setCursor(0, 0);         // Set cursor to first row, first column
17     lcd.print("LDR:");          // Display text "LDR:"
18     lcd.print(ldrValue);        // Display the current LDR value
19     lcd.print(" ");
20     lcd.setCursor(0, 1);         // Set cursor to second row, first column
21     if (ldrValue < 500){        // If LDR value is less than 500 (light blocked)
22         digitalWrite(ledPin, HIGH); // Turn ON the LED
23         lcd.print("Status: DARK"); // Display message "DARK"
24     }
25     else{                      // If LDR value is greater than or equal to 500
26         digitalWrite(ledPin, LOW); // Turn OFF the LED
27         lcd.print("Status: BRIGHT"); // Display message "BRIGHT"
28     }
29     delay(500);                // Wait for 0.5 seconds before next reading
30 }
```

THANK YOU