CIRCUITS AND SYSTEMS SOCIETY SUMMER BREAK PROJECT REPORT

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1 BLINKING LED LIGHTS

Abstract

This project demonstrates how to control a series of 10 LEDs using an Arduino UNO. The LEDs are connected to digital pins 2 through 11 and light up sequentially to create a visual effect. This is a beginner-friendly example of using arrays and loops in Arduino programming.

Objective

To create a simple LED light chaser using an Arduino UNO and ten LEDs connected through digital I/O pins.

Components Required

- Arduino UNO R3
- Breadboard
- 10 LEDs (various colors)
- 10 Resistors (220 330 Ω)
- Jumper wires
- USB Cable

Circuit Diagram

Arduino Code

```
int ledPins[] = {2, 3, 4, 5, 6, 7, 8, 9, 10, 11};
```

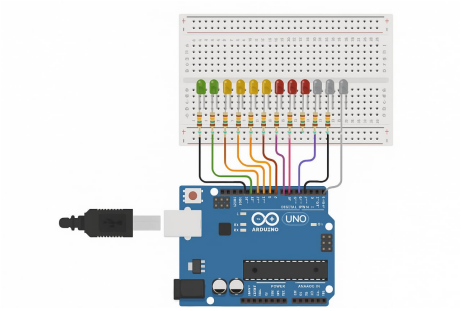

Figure: LED sequence connected to pins

```
int numLeds = 10;

void setup() {
  for (int i = 0; i < numLeds; i++) {
    pinMode(ledPins[i], OUTPUT);
  }
}

void loop() {
  for (int i = 0; i < numLeds; i++) {
    digitalWrite(ledPins[i], HIGH);
    delay(200);
  }

  for (int i = 0; i < numLeds; i++) {
    digitalWrite(ledPins[i], LOW);
  }

  delay(500);
}
```

Working Principle

The Arduino lights up each LED in sequence from left to right by writing `HIGH` to each pin with a short delay. After all the lights are turned on, they are all turned off together, followed by a pause. This cycle repeats indefinitely.

Applications

- LED chasers for visual effects
- Status indicators or bar graphs

- Educational demonstrations for digital outputs and loops

Conclusion

The project successfully demonstrates the use of loops and arrays to control multiple outputs on an Arduino board. It serves as a great learning step toward more complex LED control systems like binary counters or LED matrices.

2 SMART IRRIGATION SYSTEM

Abstract

This project demonstrates a cost-effective automated irrigation system using an Arduino UNO and a soil moisture sensor. It activates a water pump based on real-time soil moisture levels, with the aim of minimizing water waste and human effort in plant care.

Introduction

Manual irrigation often leads to overwatering, underwatering, and inefficiencies in time. The proposed smart system addresses these issues through automation, ensuring optimal water usage and healthier plants.

System Overview

Objective: Automatically irrigate plants when soil moisture falls below a threshold.
Key Features:

- Real-time soil moisture sensing
- Automatic pump control via relay
- LED indicators for moisture status

Hardware and Software

Components:

- Arduino UNO R3
- Soil Moisture Sensor
- DC Water Pump with Relay

fig:placeholder

- LEDs, Resistors, Breadboard, Jumper Wires

Tools: Arduino IDE (coding), TinkerCAD (simulation)

Working Principle

1. The sensor detects the soil moisture level.
2. Arduino reads the sensor value via analog pin A0.
3. If moisture ¡ 100, pump turns ON; otherwise, OFF.
4. Red/Green LEDs indicate status.

Circuit Diagram

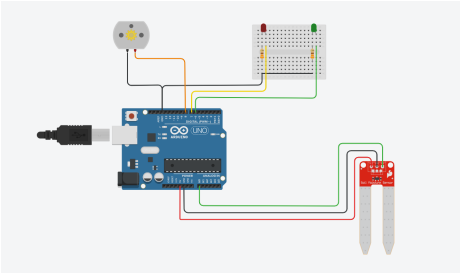

Figure: Circuit diagram of the smart irrigation system

Code Snippet

```
void setup() {
  pinMode(A0, INPUT);
  pinMode(6, OUTPUT); // Pump
  pinMode(7, OUTPUT); // Green LED
  pinMode(8, OUTPUT); // Red LED
}
void loop() {
  int moisture = analogRead(A0);
  if (moisture < 100) {
    digitalWrite(6, HIGH); digitalWrite(8, HIGH); digitalWrite(7, LOW);
  } else {
    digitalWrite(6, LOW); digitalWrite(8, LOW); digitalWrite(7, HIGH);
  }
}
```

Conclusion

The system efficiently automates irrigation according to soil conditions, reducing water waste and labor. Its simplicity and scalability make it ideal for home gardens and remote areas.

3 OBSTACLE AVOIDING BOT

Introduction

Overview: This project presents an autonomous obstacle avoiding robot using Arduino UNO, ultrasonic sensor, and dual DC motors. The robot uses distance sensing to detect obstacles and navigate safely.

Objective: To design a robot that avoids collisions by detecting objects in its path and responding automatically.

Components Used

Hardware:

- Arduino UNO R3
- HC-SR04 Ultrasonic Sensor
- L293D Motor Driver IC
- 2x DC Geared Motors with Wheels
- Breadboard, Jumper Wires, Power Supply

Software:

- Arduino IDE
- TinkerCAD for simulation

Circuit Diagram

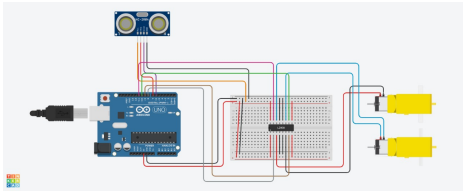

Figure: Wiring of Ultrasonic Sensor, L293D Motor Driver, and Arduino

Code

```
long readUltrasonicDistance(int triggerPin, int echoPin) {
  pinMode(triggerPin, OUTPUT);
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2);
  digitalWrite(triggerPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(triggerPin, LOW);
  pinMode(echoPin, INPUT);
  return pulseIn(echoPin, HIGH);
}

void setup() {
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
}

void loop() {
  if (0.01723 * readUltrasonicDistance(7, 6) < 50) {
    digitalWrite(8, LOW);
    digitalWrite(9, LOW);
    digitalWrite(10, LOW);
    digitalWrite(11, LOW);
  } else {
    digitalWrite(8, HIGH);
    digitalWrite(9, LOW);
    digitalWrite(10, HIGH);
    digitalWrite(11, LOW);
  }
  delay(10);
}
```

Working Principle

- The ultrasonic sensor sends sound pulses and measures reflection time.
- The Arduino calculates the distance to obstacles.
- If an object is detected within 50 cm, the robot stops.
- If the path is clear, motors move the robot forward.
- The loop ensures continuous obstacle detection and response.

Conclusion

This obstacle avoiding robot demonstrates a practical approach to automated movement using Arduino and ultrasonic sensing. It serves as a foundation for more complex autonomous systems and showcases core concepts in robotics and embedded systems.