PROJECT BASEC LEARNING

Academic Year	**:**	**2023-24**
Name of course	**:**	**BMT202 Microcontrollers and Interfacing**
Name of Faculty	**:**	**Lakshmy G B**
Innovative Teaching	**:**	**Micro- project**

Course Outcome

Design simple microcontroller-based system for various applications.

Describe an overview of Arduino board including program structure and interfaces.

Aim

Design Arduino-based project

Objectives

Students will

Gain practical experience with microcontrollers, including design and build electronic circuits, interfacing and programming.

Develop skills in writing and debugging code for embedded systems.

Enhance their ability to solve problems related to real-world applications.

Practice documenting their work and presenting their findings effectively.

Improve effective project management skills.

Evaluation

Each group consist of minimum of 10 members

Total Marks : 50

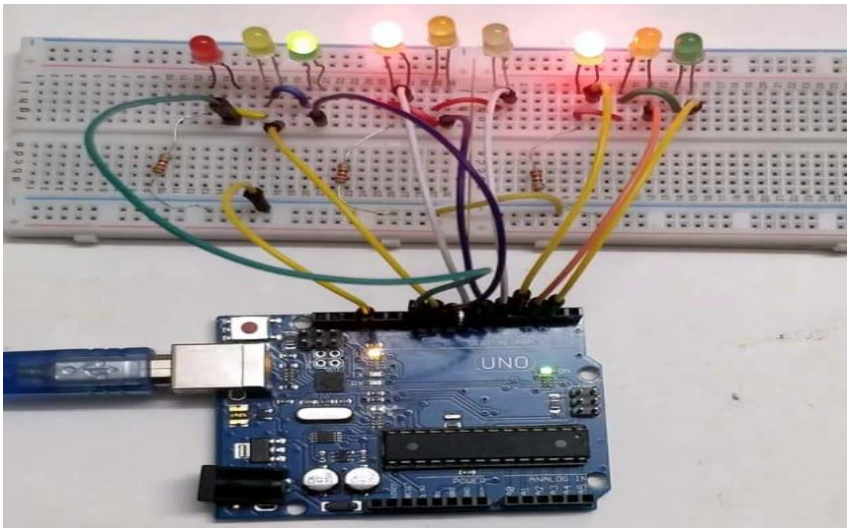
Rubrics for evaluation

Design	:	20
Product development	:	10
Planning of project work and team structure	:	10
Project Report	:	5
Working with team	:	5

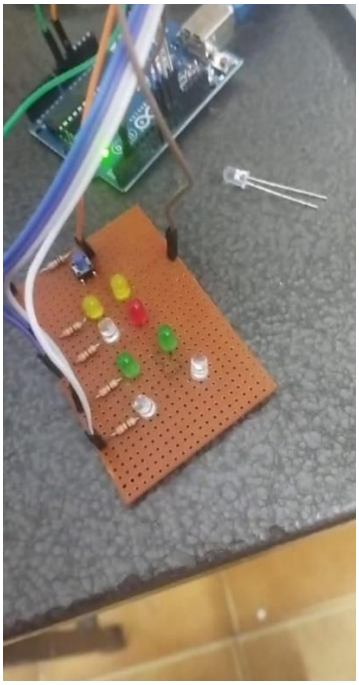
Details of microprojects

Sl. N o	Groups	Roll Number	Name of the projects	Cost of the Project	Marks
1	I	TKI22BM001 to TKI22BM010	Traffic light system using Arduino	800	50
2	II	TKI22BM011 to TKI22BM020	Flicker Fusion: An Arduino-Based Fancy Light Controller	900	50
3	III	TKI22BM021 to TKI22BM030	An Arduino Based Ultrasonic Radar Controller	1000	50
4	IV	TKI22BM031 to TKI22BM040	Soil Moisture detection using Arduino	1000	50
5	V	TKI22BM041 to TKI22BM050	Implementation Of 8-Bit Binary Counter Using Arduino	600	50
6	VI	TKI22BM051 to TKI22BM062	Health Monitoring System	500	50

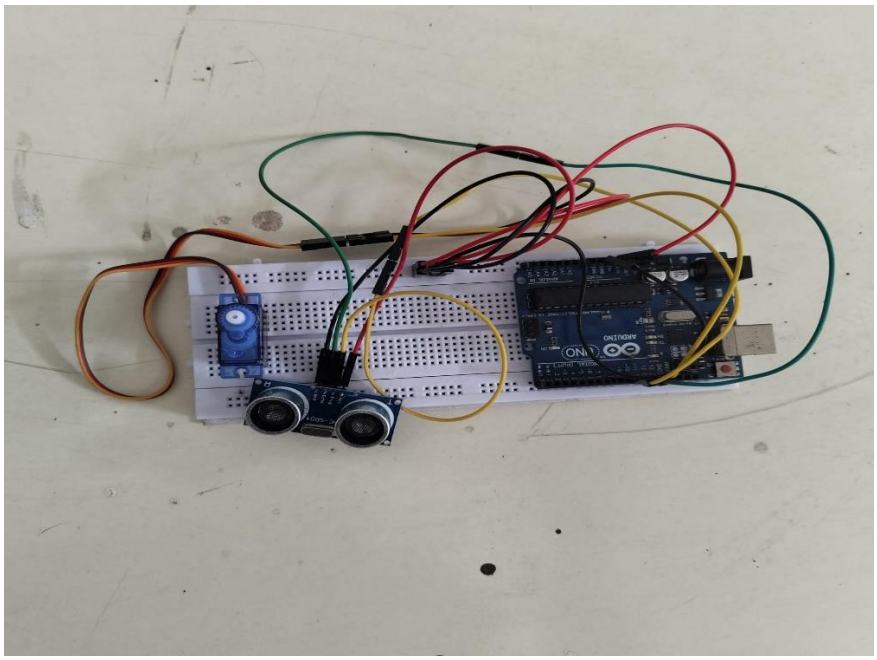
Group I - Traffic light system using Arduino



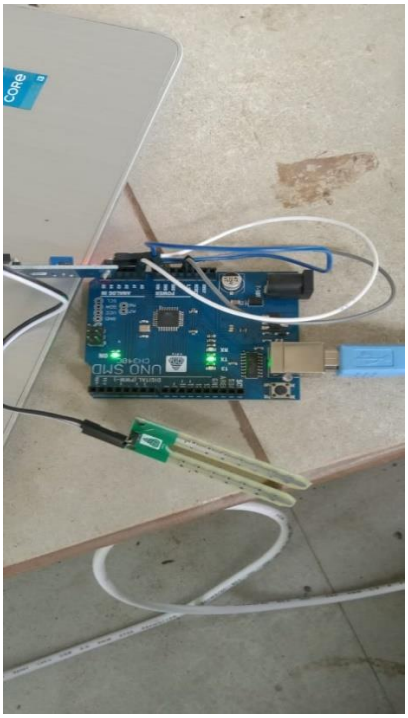
Group II - Flicker Fusion: An Arduino-Based Fancy Light Controller



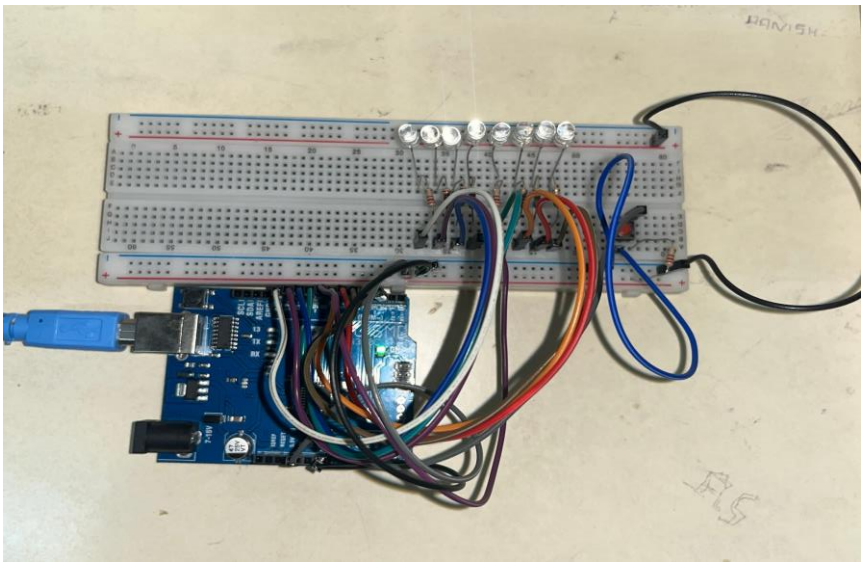
Group III - An Arduino Based Ultrasonic Radar Controller

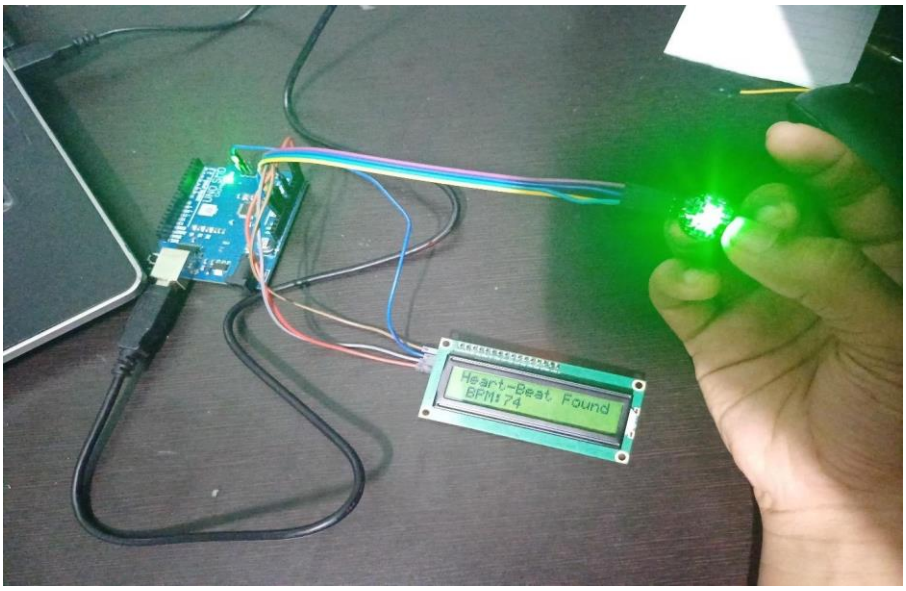


Group IV - Soil Moisture detection using Arduino



Group V - Implementation Of 8-Bit Binary Counter Using Arduino




Heart-Beat Found
BPM: 74

FLICKER FUSION: ANARDUINO-BASEDFANCY LIGHT CONTROLLER

PROJECT REPORT SUBMITED BY

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DEPARTMENT OF BIOMEDICAL ENGINEERING

TKM INSTITUTE OF TECHNOLOGYKARUVELIL, KOLLAM

MAY 2024

DECLERATION

We, the students, hereby declare that this project report titled “Arduino-based fancy light controller” under the guidance of and the work is submitted to Ms. Lakshmy G B.

The fancy lights controller described here is built around the Arduino (an open-source single board microcontroller) platform that can be purchased in pre- assembled hardware form. The circuit is nothing but a portable four-channel, multi-mode digital light controller, realized using very few external components.Four LEDs are made to glow in different sequences and patterns, controlled from the Arduino board.

We have worked on this project under the guidance of our faculty member andhave not plagiarized any content from any sources. We have duly acknowledged all the sources of information used in the report.

We declare that the project has been completed in accordance with the university's rules and regulations and that we have not violated any ethical standards during the completion of this project.

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ABSTRACT

This project demonstrates the design and implementation of a versatile lighting control system utilizing an Arduino board. The system enables users to control and customize various lighting effects, including fading, blinking, and color changing, through a user-friendly interface. The project incorporates sensors, LEDs, and programming to create a dynamic and interactive lighting experience.The report details the hardware and software components, circuit diagram, and coding used to develop the system. The Arduino-Based Fancy Lights Controllerproject showcases the potential of microcontroller-based technology in creating innovative and engaging lighting solutions.

Keywords: Arduino, Lighting Control, LEDs, Sensors, Microcontroller, Interactive Lighting.

ACKNOWLEDGEMENT

We are deeply grateful to the following individuals and organizations for their invaluable support, guidance, and encouragement throughout this project:

Ms. Lakshmy G B, our esteemed faculty member, for her expert guidance, insightful feedback, and unwavering support.

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APJ Abdul Kalam Technological University (KTU), for their guidelines, support, and opportunities for growth.

The authors and publishers of the references cited in this report, for theircontributions to our understanding of the subject matter and their commitment toadvancing knowledge.

We also acknowledge the collective efforts, dedication, and teamwork of ourgroup members, who have worked tirelessly to complete this project.

Date	:	24/05/24
Semester	:	III
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Department	:	Biomedical Engineeiing
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CONTENTS

INTRODUCTION

"Arduino Based Fancy Lights Controller" involves creating a multi-mode light controller using an Arduino Uno board. Thesystem is designed to control four LEDs in various sequences and patterns, withpotential for controlling high-voltage incandescent lamps using solid-state light switch modules. The project utilizes minimal components including LEDs, resistors, a microswitch, and a USB cable for connecting to a PC running the Arduino IDE. The detailed instructions cover circuit assembly, code uploading, and the use of the Arduino IDE for program development and debugging.

1.1 Overview of Project

Arduino is an open-source electronics platform based on easy-to-use hardware and software which intended for making interactive projects. The basic project involves an Arduino Uno controlling a series of LEDs with different lighting patterns. Typically, these projects use a microcontroller to switch LEDs on and off in predefined sequences. Key components include resistors to limit current and ensure the LEDs operate safely, as well as coding tomanage the light patterns. One common setup uses pins 9 through 13 for the LEDs, with a switch connected to pin 2 to change modes. This allows for multiplelighting modes such as steady on, flashing, and waving patterns (Instructables) (Smartech).

1.2 Aim

To create an accessible way to enter the world of microcontroller programming and to learn as a Arduino programming language, as it is a simplified version of the C++ programming language.

1.3 Motivation of the Project

Arduino programming language is an excellent way to begin learning microcontroller programming and creating fascinating projects and it is affordable and easy to use

1.4 Literature Review

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It consists of a microcontroller board and an integrated development environment (IDE). Popular boards include the Arduino Uno, Mega, and Nano.

Advantages:

- Energy-efficient
- Customizable lighting effects
- No need for manual intervention
- Can be expanded to control multiple LED strips

Applications:

- Home automation
- Party lighting
- Decorative lighting
- Ambient lighting

2. METHODOLOGY

To design and develop a smart lighting system using Arduino that can create a mesmerizing display of colours and patterns, and explore the creative potential ofprogrammable lighting.

Components Used:

- Arduino Uno Board
- LED strips (RGB)
- Breadboard
- Jumper wires
- Power source
- Switch or button (optional)

Hardware Description:

The project uses an Arduino Uno board as the brain of the system. The board is connected to an LED strip, which is used to display various lighting effects. TheLED strip is powered by an external power source. A switch or button can be added to turn the system on or off.

Software Description:

The Arduino IDE is used to program the board with a custom code that generatesvarious lighting effects, such as:

Color changing

Fading

Blinking

Pattern display

WORKING PRINCIPLE

Arduino-based fancy lights controllers operate on the principle of using a microcontroller to manage and control the state of LEDs (or other light sources)in a predefined or programmable manner. Here's a detailed explanation of the working principle:

1. Microcontroller (Arduino)

The heart of the system is the Arduino microcontroller, typically an Arduino Uno.The microcontroller is programmed using the Arduino Integrated Development Environment (IDE) to execute specific lighting patterns and sequences.

2. LED Control

LEDs are connected to the digital output pins of the Arduino. The microcontrollercontrols the LEDs by sending digital signals (HIGH or LOW) to these pins. Eachpin can be programmed to turn an LED on or off, or to create more complex effects like fading or blinking.

3. Coding and Programming

The behavior of the lights is defined by the code uploadedto the Arduino. This code specifies:

- Pin Configuration: Defines which pins control which LEDs.
- Patterns and Sequences: Defines the lighting patterns (e.g., blinking, fading, sequential lighting) using loops and timing functions.
- Mode Selection: If the project includes multiple modes, a button or switchcan be used to cycle through different lighting patterns. The code handles the input from the switch and changes the mode accordingly.

4. Power Supply

The Arduino board and LEDs are powered either by a USB connection to a computer or an external power supply. It’s crucial to ensure that the power supply is sufficient to handle all the connected LEDs, especially if high-powerLEDs or multiple LEDs are used.

5. Input Devices

For more interactive projects, various input devices such as buttons, switches, orsensors can be used. For example, a button might be used to switch between

The code uses the Arduino's built-in libraries to control the LED strip and createthe desired effects.

PROGRAM

```
int potPin = A7;
int potValue;
int baseTime = 20;
int interval;
int randomNumber;
void setup() {
pinMode(potPin, INPUT);
pinMode(2, OUTPUT);
pinMode(3, OUTPUT);
pinMode(4, OUTPUT);
pinMode(5, OUTPUT);
pinMode(6, OUTPUT);
pinMode(7, OUTPUT);
pinMode(8, OUTPUT);
pinMode(9, OUTPUT);
pinMode(10, OUTPUT);
pinMode(11, OUTPUT);
pinMode(12, OUTPUT);
pinMode(13, OUTPUT);
}
void loop() {
potvalue = analogRead(potPin);
```

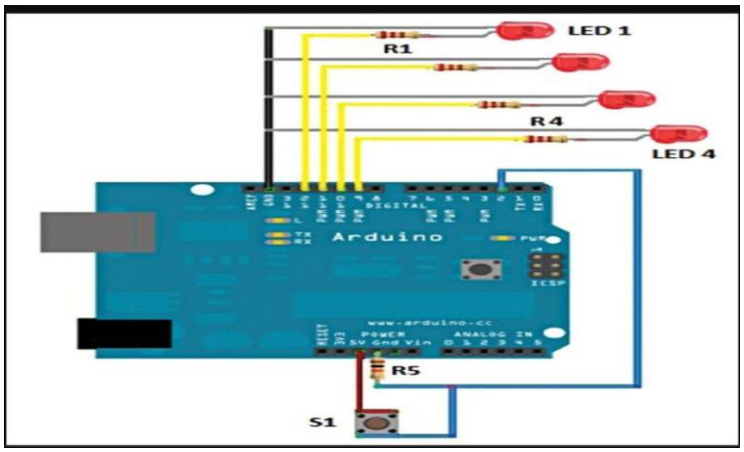
```
interval = baseTime + 3 * potValue;
randomNumber = random(2, 14);
digitalWrite(randomNumber, HIGH);
delay(interval);
for (int i = 2; i <= 13; i++) {
digitalWrite(i, LOW);
}
}
```

different lighting modes, or a sensor might detect ambient light and adjust thebrightness of the LEDs accordingly.

6. Advanced Features

Advanced projects might include:

- Sound Integration: Synchronizing lights with music using a microphoneor audio input.
- Remote Control: Using IR remote controls or Bluetooth modules tocontrol the lights wirelessly.
- Smart Automation: Integrating with home automation systems for smartcontrol of the lighting system.



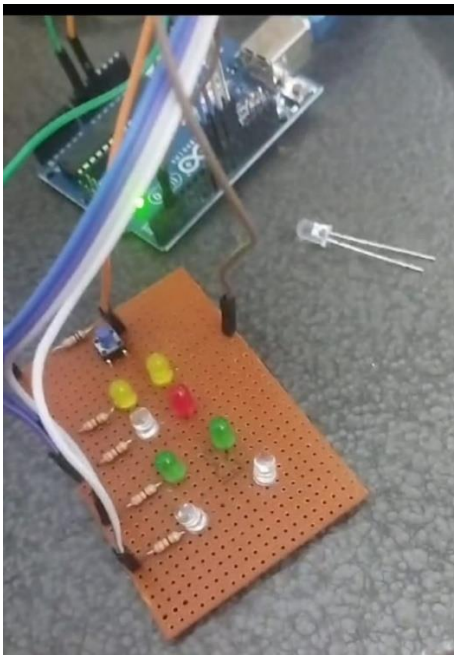
RESULT

- Precise control over RGB LEDs using digital output pins 9, 10, 11, and12.

- Generation of an extensive array of colors and dynamic lighting effects.
- Series resistors ensure safe operation of LEDs, preventing damage fromexcessive current.

- Programmability allows users to customize lighting patterns and effects.

Made a aurora light design using Arduino, and other parts. By utilizing Arduino's capabilities and combining it with other components, created a mesmerizing anddynamic lighting display that simulates the breathtaking beauty of the Aurora Borealis (Northern Lights).



CONCLUSION

The Arduino-based Fancy Lights Controller project is a creative and innovative way to explore the possibilities of programmable lighting. By using Arduino andLED strips, we can create a unique and captivating display of colors and patternsthat can add a touch of magic to any space.

Arduino-based fancy lights controllers are versatile and can be tailored to various applications from simple LED patterns to sophisticated smart home systems. Byintegrating sensors and additional modules, these projects can be expanded to include more interactive and automated features, making them a valuable learningexperience for both beginners and advanced users in electronics and programming. These projects not only highlight the capabilities of Arduino microcontrollers but also inspire creativity and innovation in the field of DIY electronics.

REFERENCE

Websites:

1. Electronics For You
2. Instructables
3. Arduino Project Hub
4. Circuit Digest

Books:

1. "Exploring Arduino: Tools and Techniques for Engineering Wizardry" byJeremy Blum
2. "Arduino Cookbook" by Michael Margolis
3. "Arduino Projects for Dummies" by Brock Craft
4. "Programming Arduino: Getting Started with Sketches" by Simon Monk

Online Communities:

1. Arduino Forum
2. Reddit - r/arduino