A

MINI PROJECT REPORT

ON

FloodLight Control

Submitted by

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For

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1. BRIEF INTRODUCTION :

This project presents a floodlight dimmer circuit designed to regulate the brightness of a floodlight efficiently. The system utilizes a power MOSFET voltage control circuit, which adjusts the voltage supplied to the floodlight, allowing smooth dimming functionality. This approach helps in optimizing power consumption and extending the lifespan of the lighting system. The circuit operates using an AC power supply, which is converted into DC through a rectifier circuit. A microcontroller-based triggering circuit precisely controls the SCR, enabling dynamic voltage adjustment based on user input or predefined conditions. By modulating the power delivered to the floodlight, the system ensures optimal illumination levels while conserving energy.

2. LITERATURE REVIEW :

In view of current research area various journals are referred for up-to-date technical content some of them are discussed in brief as follows:

1.'Neeraj Khera', 'Prateekshya Biswal', and 'Chintalapudi Likhith' introduced an intelligent microcontroller-based digital AC dimmer designed for precise control of ambient light intensity. This system replaces conventional AC dimmers by employing a digitally isolated forward phase-controlled TRIAC system, offering improved flexibility and remote operation. Unlike traditional dimmers that rely on manually adjusted variable resistors or capacitors in the TRIAC gate firing circuit, this design leverages capacitive touch sensing for on-site control and Bluetooth communication for remote control. On-site dimming is achieved by varying the AC input voltage proportionally to the time duration that the user's finger remains on the capacitive touch sensor. Remote dimming functionality is enabled through a Bluetooth transceiver interfaced with the microcontroller, which communicates with an Android-based smartphone application for pairing and data transmission. The AC load connected to the dimmer is electrically isolated via a transformer to ensure safety and enhance performance. This innovative design offers a more adaptable and user-friendly lighting control solution, improving convenience in both residential and commercial environments. The integration of digital control and wireless communication demonstrates significant advancements in modern lighting systems, aligning with smart home technologies and enhancing energy efficiency.

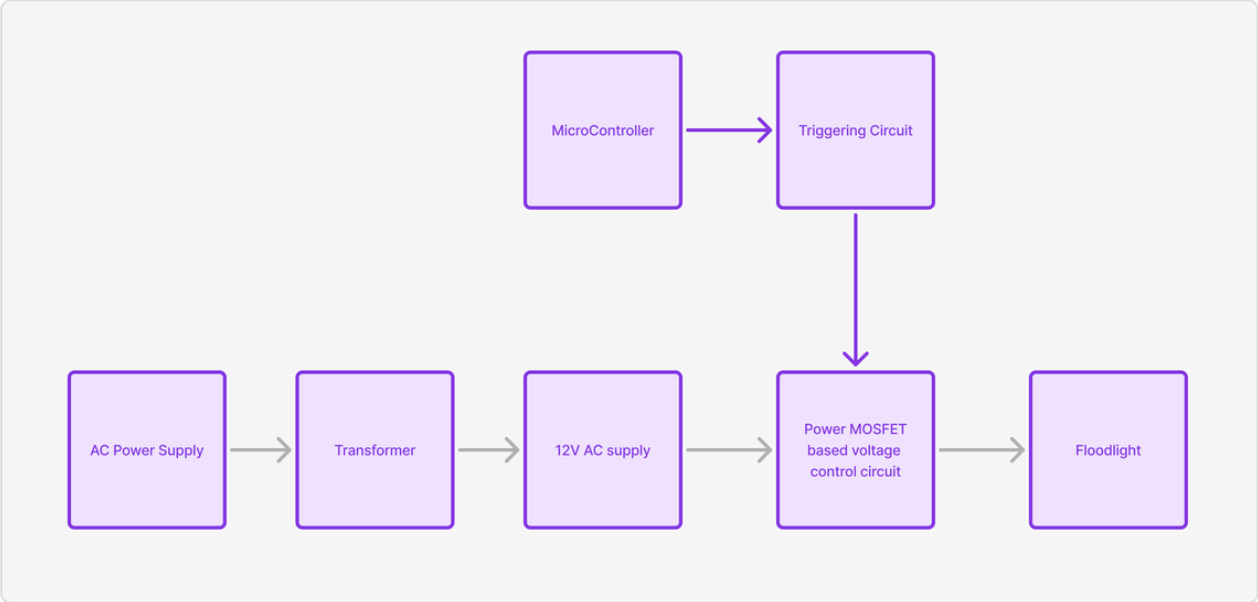
2. F. G. Rayer (T. Eng., CEO, Assoc. IERE)

the full-wave dimmer circuit presents an improved method for controlling the brightness of lamps or similar AC-powered loads. Unlike half-wave dimmer circuits, which limit conduction to one direction of the AC cycle, this design enables current flow during both half-cycles. As a result, the full-wave dimmer offers a wider control range, allowing adjustments from near-maximum brightness down to complete dimming. The circuit employs a single SCR in combination with four inexpensive diodes configured as a bridge rectifier. This configuration ensures current consistently flows in the same direction through the SCR, simplifying the design while enhancing efficiency. Recommended components include four 1N4004 diodes and a 400V 1A SCR, which effectively handle loads up to 100W with a sufficient safety margin. For larger loads, components with higher ratings can be substituted as needed. Despite its improved performance, the full-wave dimmer requires minimal additional space compared to a half-wave design. To ensure user safety, careful assembly and proper insulation are essential to mitigate potential shock hazards. This circuit provides an efficient and cost-effective solution for applications demanding precise and adjustable light control.

3. PROBLEM STATEMENT :

To design an effective microcontroller based AC Dimmer for Flood-Light Intensity control.

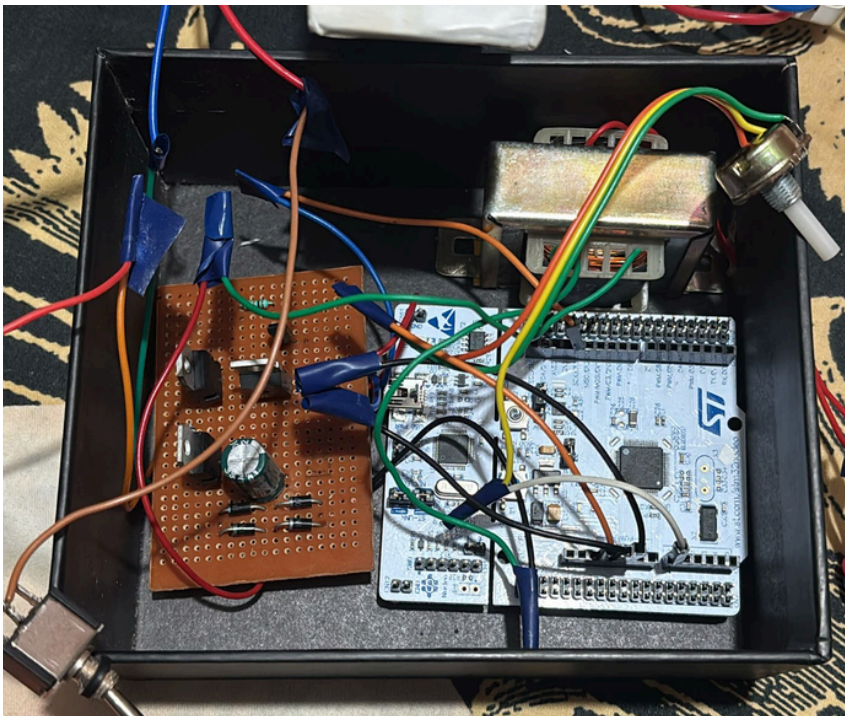
4. BLOCK DIAGRAM :

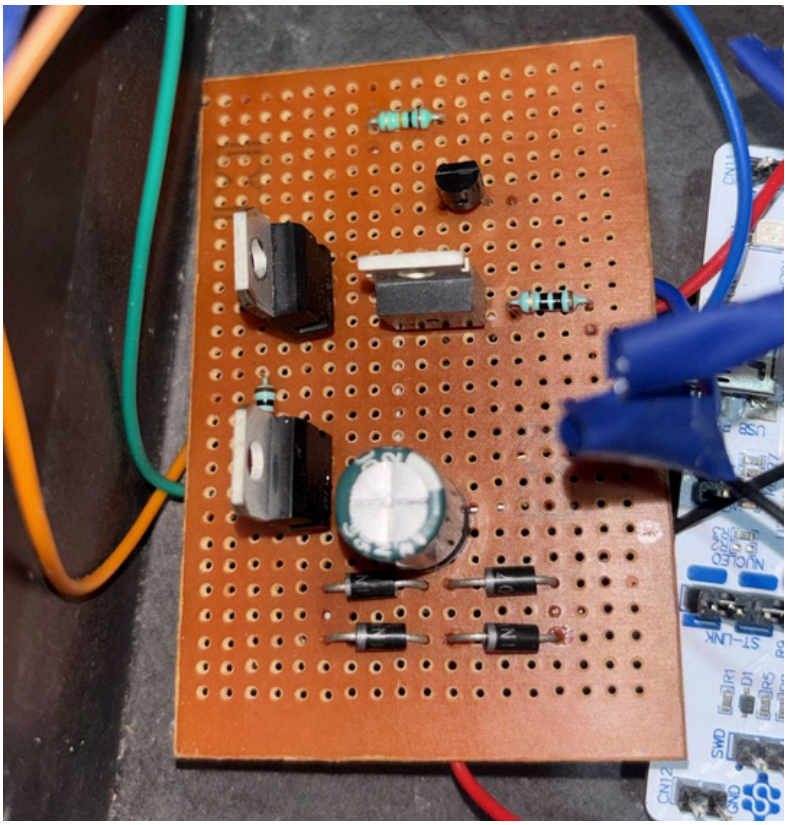


5. WORKING :

The Power MOSFET-based floodlight intensity controller is designed to regulate the brightness of 12V LED strips using a power MOSFET and PWM (Pulse Width Modulation) control. The system operates by receiving a PWM signal from a microcontroller which adjusts the duty cycle to control the output voltage applied to the LED strips. A logic-level N-channel MOSFET (IRLZ44N) acts as a switch, allowing precise control over the LED brightness while ensuring efficient power handling. The 12V DC power supply provides the necessary voltage for the LED strips, with the MOSFET's gate connected to a PWM pin of the microcontroller through a current-limiting resistor. A pull-down resistor ensures that the MOSFET remains off when no signal is applied, preventing unintended activation. By varying the PWM duty cycle, the system can smoothly adjust the floodlight intensity, making it suitable for energy-efficient lighting applications.

- **set-up**





6. COMPONENTS REQUIRED :

Sr.No.	Component Name	Quantity
1	STM-32 Microcontroller	1
2	Power-MOSFET	2
3	Transformer	1
4	Zener Diode	1
5	LED strips	3
6	Resistors,Capacitors	-
7	Wires, Breadboard	-

7. ADVANTAGES & DISADVANTAGES :

Advantages :

- Precise Control
- Energy Efficiency
- Cost-Effective
- Reduced Maintenance
- Flexibility

Disadvantages :

- Complex Circuit Design
- EMI Noise
- Limited Dimming Range
- Technological Literacy
- Heat Dissipation
- Technical Issues
- Harmonics

8. APPLICATIONS :

- Outdoor Stadium Lighting
- Theatrical and Stage Lighting
- Industrial Lighting
- Street Lighting
- Emergency Lighting
- Aviation and Marine Lighting

9. ESTIMATED BUDGET

Sr.No.	Component Name	Quantity	Approximate Price
1	STM-32 Microcontroller	1	1200
2	Power-MOSFET	1	50
3	Transformer	1	200
4	7805,7812 voltage regulators	1	50
5	LED strips	1	200
6	Resistors,Capacitors	2	100
7	BJT	1	50
	TOTAL		1850

10. TIME PLAN FOR IMPLEMENTATION OF MINI PROJECT:

The tentative Gantt chart shall be as follows:

Major Tasks/Duration	1-2	3-4	5-6	7-8	9-10	11-12
Project Planning and Research						
Component Procurement						
System Design						
Coding and Software Development						
Circuit Assembly						
Debugging and Refinement						
Final Demonstration						
Project Submission and Future Improvements						

11. REFERENCES:

1. https://ieeexplore.ieee.org/abstract/document/8665457

2.TRIAC-Based Drill Speed Controller: Efficient Power Control Solution
F. G. Rayer (T. Eng., CEO, Assoc. IERE) detailed a practical TRIAC-based circuit designed for controlling the speed of electric drills, motorized devices, and filament lamps.