

**Intelligent Home Lighting Systems**

*A project report submitted to*

**MANIPAL ACADEMY OF HIGHER EDUCATION**

*For Partial Fulfilment of the Requirement for the Award of the Degree of*

**Bachelor of Technology**

*In*

**Information Technology**

*by*

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*Under the guidance of*

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**DECLARATION**

I hereby declare that this project work entitled **Intelligent Home Lighting System** is original and has been carried out by me in the Department of Information and Communication Technology of Manipal Institute of Technology, Manipal, under the guidance of **Dr. Sameena Pathan**, Assistant Professor, Department of Information andCommunication Technology, M. I. T., Manipal. No part of this work has been submitted for the award of a degree or diploma either to this University or to any other Universities.

Place: Manipal

Date: 14-11-2023

**CERTIFICATE**

This is to certify that this project entitled Intelligent Home Lighting Systems is a mini project work at Embedded system and IoT lab done by Jangam Karthik – 210911388, Daksh Sripada–210911408, Manan Garg- 210911394 at Manipal Institute of Technology, Manipal, independently under my guidance and supervision in Information Technology.

Dr. Sameena Pathan

Assistant Professor

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MIT

**ACKNOWLEDGEMENTS**

We extend our sincere gratitude to Dr. Sameena Pathan, our project guide, for her invaluable support and guidance. Thank you.

**ABSTRACT**

This project focuses on addressing the prevalent issue of inefficient electricity utilization in home lighting systems, with the objective of improving energy efficiency, reducing costs, and minimizing environmental impact. By developing an innovative intelligent lighting solution, we aim to optimize electricity consumption based on specific lighting requirements throughout the day. Unlike traditional lighting systems that operate in binary states, our solution incorporates automation and variable intensity control to ensure optimal lighting levels while minimizing energy usage. The implementation involves the integration of embedded systems, sensor technology, and intelligent algorithms to achieve a balance between adequate illumination and energy conservation. Through comprehensive experimentation and analysis, we demonstrate the effectiveness of our proposed solution in achieving enhanced energy efficiency and significant cost savings in home lighting. This project contributes to the field of sustainable technology by offering a practical approach to improving energy efficiency and promoting responsible energy consumption in residential environments.

**INTRODUCTION**

Inefficient electricity use for home lighting purposes is a significant issue that affects both the environment and household energy bills. Many households use outdated, inefficient lighting systems that consume too much electricity, resulting in unnecessary energy costs and greenhouse gas emissions. There being only two states of lighting (‘on’ and ‘off’ states), more electricity is being utilized even though in most cases except at night, only a little power is required for lighting, as lower intensity of the light would suffice. Therefore, there is a need to develop a solution that improves the energy efficiency of home lighting with automation while also reducing energy costs and environmental impacts.

**LITERATURE SURVEY**

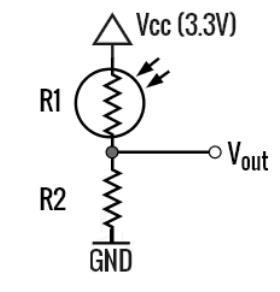
1. Smith, J., Johnson, A., & Brown, K. [1] wrote a paper which provides an overview of sensor-based lighting control systems and their applications in improving energy efficiency in buildings. It discusses various types of sensors used for occupancy detection, daylight harvesting, and task tuning, and their integration with lighting systems.
2. Y.R & Patel [2] explores intelligent lighting control systems for energy efficiency, including the use of sensors. It covers different sensor technologies, such as motion sensors, occupancy sensors, and ambient light sensors, and their role in achieving energy savings in lighting systems.
3. Kumar A. & Soni S. [3] focuses on the application of occupancy sensors in smart lighting control systems for energy conservation. It discusses various occupancy detection techniques, sensor placement strategies, and their impact on energy savings. The review also highlights challenges and future research directions in this field.
4. Lee E. & Joshi Y [4] explore daylight harvesting techniques and sensor technologies used in smart lighting control systems. It covers different types of sensors, such as photosensors and spectrally selective sensors, and their integration with lighting systems for maximizing energy savings through efficient utilization of natural daylight.
5. Zhang Y.[5] focuses on wireless sensor networks (WSNs) for intelligent lighting control applications. It discusses the use of WSNs in monitoring and controlling lighting systems based on occupancy, daylight availability, and user preferences. The review also addresses the challenges and future prospects of WSNs in smart lighting automation.
6. Wang Y [6] provides a comprehensive analysis of lighting control systems utilizing occupancy sensors. It presents an overview of sensor technologies, sensor placement strategies, and control algorithms used in smart lighting systems. The study also evaluates the energy-saving potential and user satisfaction associated with occupancy-based lighting control.

**METHODOLOGY**

1. Gather the Components: Collect the required components for the project, including a LDR (Light Dependent Resistor), wires for connections (2\* female to female and male to female jumper wires), and an LPC1768 Kit.
2. Understand LDR Specifications: Review the specifications provided for the LDR, including maximum power dissipation, voltage at 0 lux, peak wavelength, resistance at different lux levels, and dark resistance. These specifications will be used to understand the limits of the sensor’s capabilities.
3. Write the embedded C code: Use the following GPIO specifications to use the LDR with the kit. Refer to the given GPIO configurations:
   1. **[CND D]** Pin 1 → P1.31/AD0.5 (*In Function 3*): Used to read the analog voltage generated by the LDR circuit, A0 output pin of the sensor is connected to this.
   2. **[CNA B]** Pin 1 → P1.23 (*In Function 2*): Used to connect the in-built LED to show the response to the light intensity picked up by the LDR, using PWM function.
   3. **[Power Supply]** → VCC of 3.3 V to connect to the LDR and GND to R1 (as

shown in circuit diagram).

1. Connect the Circuit: Physically connect the components according to the circuit diagram. Ensure proper placement of the LDR, and wiring connections based on the designed circuit.



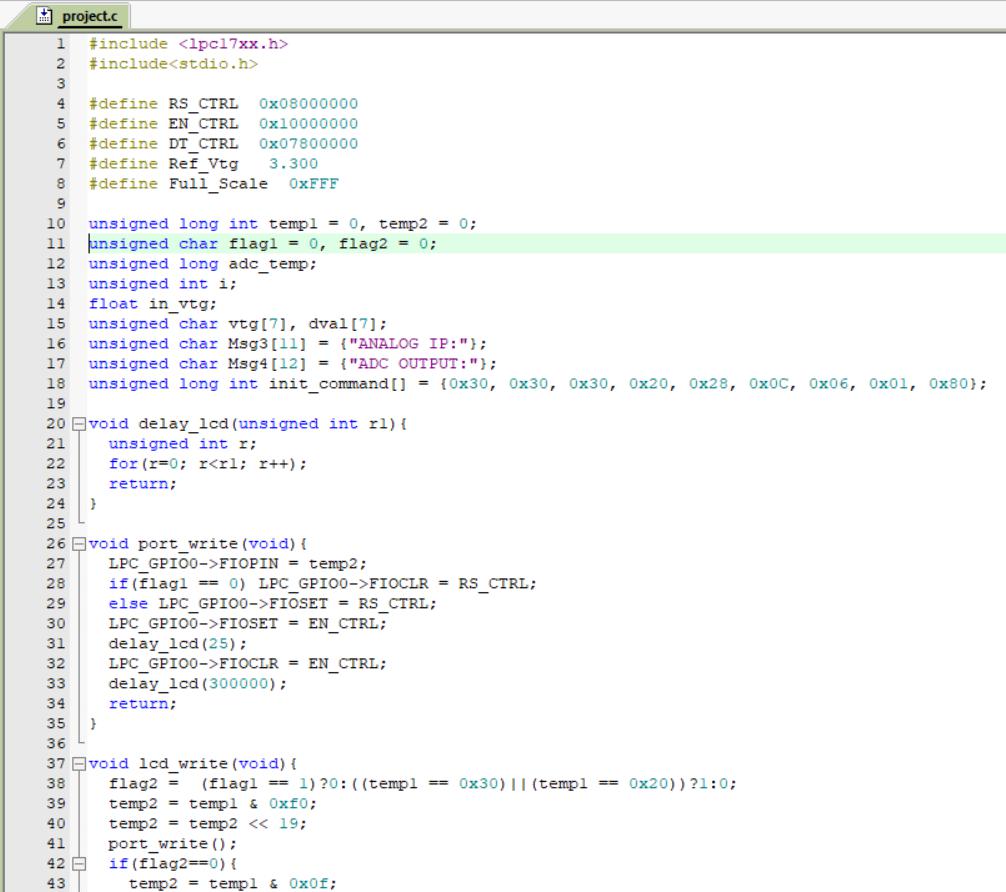
1. Program the Microcontroller: Use the LPC1768 Kit to program the microcontroller or embedded system. Utilize the GPIO pins mentioned in the specifications to read the analog voltage generated by the LDR circuit and control the in-built LED to display the response to the detected light intensity.
2. Implement Light Intensity Control: Develop the necessary software logic to control the lighting intensity based on the analog voltage readings from the LDR. Define appropriate thresholds and actions to adjust the light output accordingly.
3. Test and Calibration: Conduct thorough testing of the intelligent lighting system. Verify its functionality, including the accurate reading of analog voltage, proper response of the in-built

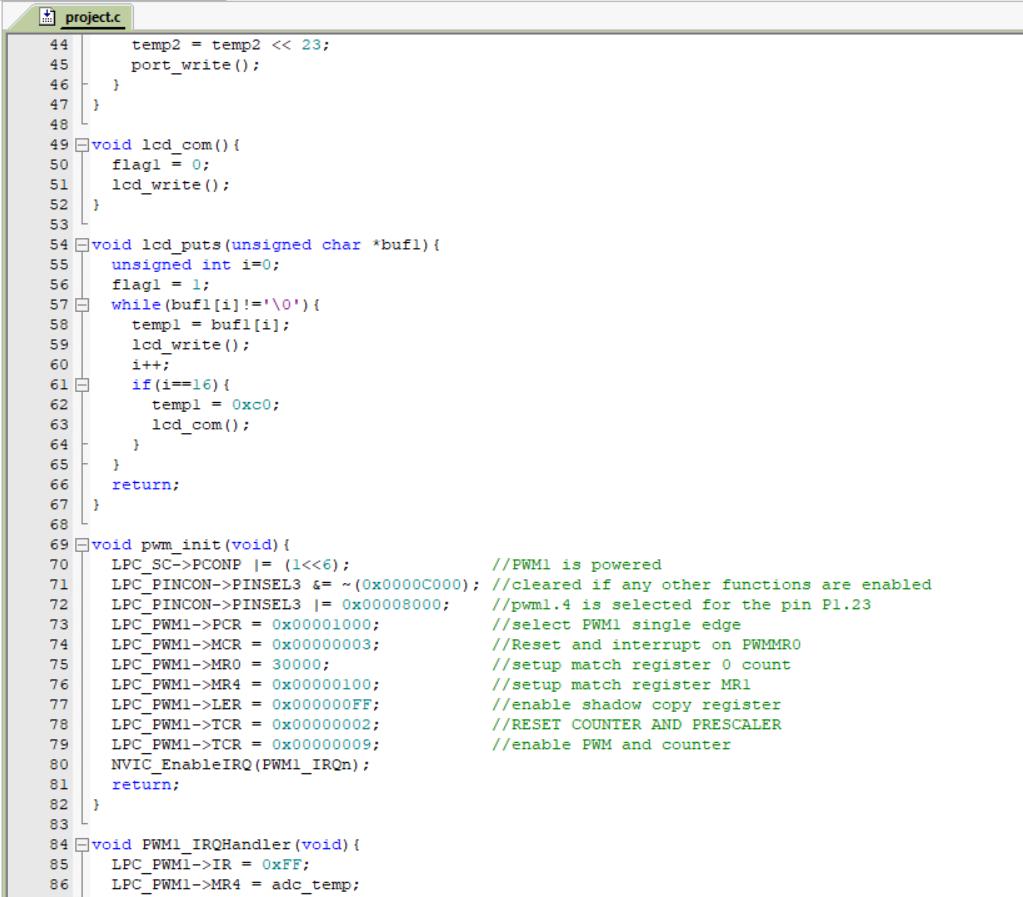
LED, and correct adjustment of light intensity based on detected light levels. Calibrate the system as needed to ensure optimal performance.

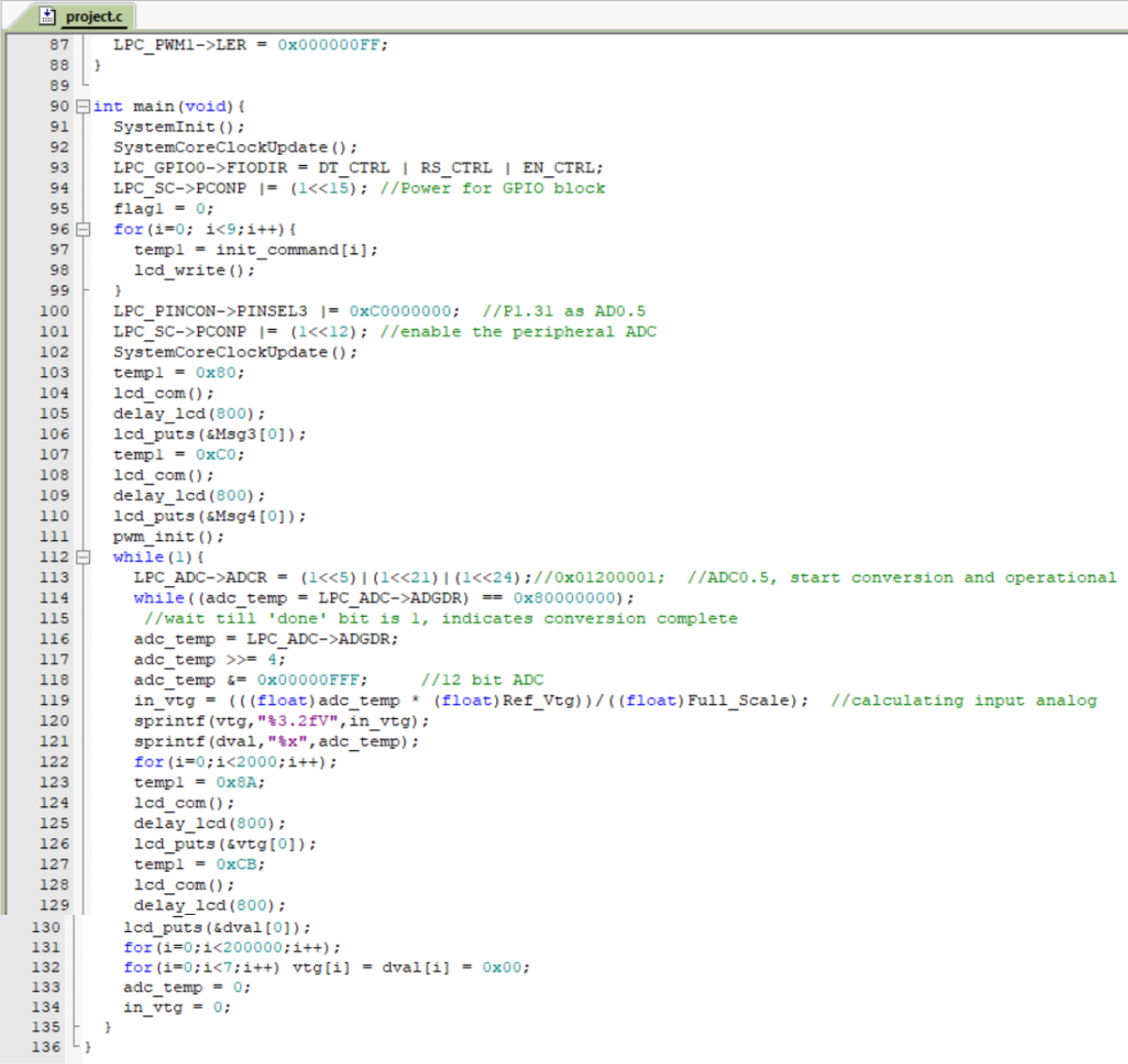
1. Document the Project: Prepare a detailed documentation of the project, including the circuit diagram, component specifications, methodology, and any modifications made during the implementation. Include any challenges faced and their corresponding solutions.

By following this methodology, you can successfully implement the intelligent lighting system using the LPC1768 Kit, LDR, and external resistor, enabling energy-efficient and automated control of home lighting.

**EMBEDDED C CODE**

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**RESULT**

As a light source was brought nearer to the LDR, the ADC voltage dropped to 0.7V, indicating to the kit that a light source was nearby, after which, the LED was turned off. When the light source was taken far back from the sensor, the ADC voltage jumped to 2.26V and thus, the LED turned back on.

The essential idea of this project was to automate the lighting system of a house, by measuring the lighting needs based on time of day (evening or night) through the use of a photo sensor and setting the intensity of the lights in the house.

By connecting the photo sensor to the LPC1768 kit, it will first start detecting the

intensity of the incident light. The intensity will be read as input and then cause the internal LED of the kit to be in “off” state (meaning it’s day time and the sky is clear) and if below, the LED light will be “on”.

Hence, not only will the lighting be energy efficient, it will also be automated, making the electricity bill and greenhouse gas emissions smaller, and the world a better place.

**REFERENCES**

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