AUTOMATIC ROOM LIGHT CONTROLLER USING ARUDINO

A MINI PROJECT REPORT

Submitted by

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ABSTRACT

Automatic Room Light Controller using IR Sensor and LDR with Visitor Count is designed to automatically control the lighting of a room based on the human presence and ambient light levels. It uses a combination of sensors and a microcontroller to control the lights in the room. The IR Sensors and LDR sensors are used in this system.

The microcontroller named arduino collect information provided by the IR sensor and LDR in order to turn on or off the lights in the room. When the system detects the presence of people in the room and the ambient light levels are low, the microcontroller will turn on the lights to provide adequate illumination. If no one is present in the room, the microcontroller will turn off the lights to conserve energy. Additionally, if the ambient light levels are high, the microcontroller will reduce the brightness of the lights to save energy. The visitor count is implemented using an Infrared (IR) sensor. It is placed at the entrance of the room and counts the number of people entered and left the room. The microcontroller calculates the total number of people in the room and adjust the lighting accordingly.

The Automatic Room Light Controller using IR Sensor and LDR with Visitor Count is an efficient and cost-effective way to save energy and reduce carbon footprint in indoor spaces. It is easy to install and can be implemented in any room with a simple wiring system. Overall, this system provides a comfortable and sustainable environment for the occupants of the room while promoting energy conservation.

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LIST OF ABBREVIATIONS

B/S	Browse/Server
GSM	Global System for Mobile communication
I2C	Inter Integrated Controller
IDE	Integrated Drive Electronics
IoT	Internet of Things
IR	Infrared
LDR	Light Dependent Resistor LED
LED	Light Emitting Diode
USB	Universal Serial Bus
WSN	Wireless Sensor Network

CHAPTER 1

INTRODUCTION

Lots of people in this world are without electricity and modern lighting. This problem is more severe in rural areas or in cities. The rural electrification varies widely from country to country. Our country India frequently suffers from unreliable and intermittent electricity supply. In some places, people get electricity only few hours of the day only. Without electricity, it becomes challenging for adults towards concentrating on their professional work or study. Rural communities of course need a reliable and sustainable solution for lighting towards providing a brighter future. The country has made significant progress towards the augmentation of its power infrastructure. Moreover, poor quality of power supply and frequent power cuts and shortages impose a heavy burden on India's growing trade and industry.

So current scenario insists towards highly efficient and effective usage of any form of power in educational institutions like Colleges and Universities where we use power for our teaching in class room or labs. It is common practice that most of us leave the class rooms or labs with Air conditioner, Fans and lighting on even if no students or faculty members present. In some cases, we see only few students sitting in one corner of the class room or lab and entire fan, light and air conditioner going. All these amounts to unnecessary wastage of power contributing to country energy resource.

Energy conservation has become a critical issue in today's world due to the increasing demand for electricity and the limited availability of resources. In this context, the Automatic Room Light Controller using IR Sensor and LDR with Visitor Count is a project that aims to conserve energy by automating the process of controlling room lighting based on human presence and ambient light levels.

The system is designed to provide a comfortable and sustainable environment for the occupants of a room while promoting energy conservation.

1.1. BACKGROUND AND PROBLEM STATEMENT

The demand for electricity has been increasing rapidly in recent years due to the growth of the population and the increased use of electronic devices. This has resulted in a significant strain on the power supply infrastructure and limited availability of resources. In this context, energy conservation has become a critical issue, and there is a need to reduce the energy consumption in buildings. One of the main sources of energy consumption in buildings is lighting. Many rooms are often lit unnecessarily, leading to a waste of energy. Traditional lighting systems do not have the ability to adjust the brightness of the lights based on human presence and ambient light levels, resulting in unnecessary energy consumption. The Automatic Room Light Controller using IR Sensor and LDR with Visitor Count aims to address this issue by automating the process of controlling room lighting based on human presence and ambient light levels.

1.2. SCOPE OF THE PROJECT

The scope of the automatic room light controller using LDR sensors and IR sensors using Arduino can be applied to a wide range of buildings, including residential buildings, offices, schools, hospitals, and other public spaces. This project has the potential to reduce energy consumption and associated costs while improving the overall energy efficiency of the building. Additionally, this project can help to reduce the carbon footprint of buildings by minimizing energy waste and promoting sustainability.

The scope of this project also extends to the customization of the system to meet specific needs of different users. For example, the system can be customized to adjust the sensitivity of the sensors based on the size and layout of the room, as well as the preferences of the occupants. The system can also be customized to

integrate with other smart home technologies, such as voice assistants or mobile apps, for more convenient control and monitoring.

1.3. SOCIAL CONCERN

One social concern to consider with this project is energy conservation. While automating the lights in a room can be convenient and save energy by turning off the lights when they are not needed, it is important to also consider the impact of the materials used in this project.

Another social concern to consider is the accessibility of this technology. While automating room lights may be a helpful feature for some individuals, it is important to consider those who may not have access to this technology due to financial or technological barriers. Additionally, some individuals may prefer the control of manually turning on and off their lights and may not want to rely on automated systems. Therefore, it is important to consider the potential impacts of this technology on different groups of people and ensure that it does not create any unintended barriers or exclusions.

1.4. OBJECTIVES OF THE PROJECT

The objective of the automatic room light controller using LDR and IR sensors with an LCD display for people count is to create a smart, energyefficient, and convenient solution for controlling the lights in a room while also providing useful information about the occupancy of the room.

CHAPTER 2

REVIEW OF LITERATURE

2.1. LITERATURE SURVEY

This Chapter describe about the various devices already developed by other researchers,

Rajasekaran. R et. al (2009) designed and developed an automatic room light controller with visitor counter using PIR sensor and LDR. This system can detect the presence of a person and automatically turn on the lights while also counting the number of visitors. This paper describes the system architecture, the hardware and software components, and the testing and validation of the system.

Hossam S. Hassanein et. al (2013) proposed Smart Lighting System Based on Wireless Sensor Networks and Internet of Things and they analyzed the characteristics and disadvantages of smart home systems, and introduces a system based on B/S (Browse/Server) module to control household devices remotely. It provides a more flexible and convenient control, and is beneficial for the popularity and promotion of smart home systems.

M. M. Islam et. al (2014) proposed Automatic Light Control System using PIR Sensor and Arduino Uno. The project aimed to implement the PIR sensor, Arduino UNO and 2 channel relay Module to automatically turn on the lights in the classroom at the STMIK Hang Tuah Pekanbaru campus. The hardware used is an Arduino Uno microcontroller, PIR motion sensor, 2 channel relay module, and 1.5V flashlight. The software used is Arduino IDE with the C programming language. The test results show that the PIR sensor can detect the movement of people entering or leaving a room.

A. T. Abbas et al. (2014) presented Intelligent Street Lighting System using PIR Sensor and GSM Technology, they used PIR sensors and GSM technology to control street lights based on the presence of vehicles and ambient light levels. Their system is designed to improve energy efficiency and reduce maintenance costs by turning off lights when no presence is detected and adjusting light levels based on ambient light. This paper provides a detailed description of the system architecture, the design and implementation of the PIR sensor and GSM module, and the programming of the microcontroller. This paper also includes experimental results to demonstrate the effectiveness of the proposed system.

A. O. Akinlabi et al. (2015) designed and implementated Smart Home System Using PIR Sensor and GSM Module, they created a smart home which is the automation and control of electronic appliances and light energy systems found in the home. It was implemented using IoT and Rapid Application Development methodology. This system consists of three subsystems namely, Remote System, Simulated System and Cloud System. The Remote System consists of an alert system to notify the user of an event, a messaging service to send and receive data messages, a notifier for visual alert, a messaging service to notify other systems for changes, and triggers to enable automated action.

Vijay Kulkarni et. al (2016) proposed a smart lighting system uses the concept of green, low-carbon, energy-saving and environmental protection to change people's lifestyle and bring about high-quality life. This paper designs a smart lighting control system based on Bluetooth and Android. When the system is in automatic mode, the pyroelectric infrared sensor can be used to detect whether anyone is passing by to control the LED light on or off. The LED light can be also controlled by the Android app through Bluetooth communication when the system is in manual mode. The testing results show that the system is energy-saving, efficient and easy-to-use, and it can be widely used in various lighting scenes.

D. Kandarakis et. al (2016) presented a smart lighting system that uses PIR sensors to detect presence and LDR sensors to adjust the intensity of light according to the ambient light levels. This system is designed to improve energy efficiency by turning off lights when no presence is detected and adjusting light levels based on ambient light to minimize energy consumption. The paper provides a detailed description of the system architecture, the design and implementation of the PIR and LDR sensors, and the programming of the microcontroller. This paper also includes experimental results to demonstrate the effectiveness of the proposed system.

Sherine M. Abd El-kader et. al (2016) proposed a smart lighting system based on wireless sensor networks (WSNs) and Internet of Things (IoT) technology. This system uses a combination of WSN nodes, gateways, and cloudbased IoT services to provide intelligent control of the lighting system. The experimental results show that the proposed system is effective in reducing energy consumption while providing adequate lighting levels. The paper also discusses the potential of the system to be extended for use in smart cities and other applications.

N. Shanthi et. al (2016) discussed the design and implementation of an Energy Saver for Automatic Room Light Controller with Visitor Counter. Her project uses a microcontroller to reduce human efforts and conserve resources. It can be built upon for household usage, hotels, schools, hospitals, industrial purpose or businesses, and should be encouraged and put into large scale manufacturing due to its various advantages. The concept of an automatic room light controller counter can be built upon not just for household usage but for such settings as hotels, schools, hospitals, industrial purpose or businesses.

Jatinder Kumar et. al (2017) presented the design and implementation of an automatic light control system for home environment using PIR sensor. Their

paper discusses the working principle of PIR sensor and its use in detecting human presence. The system architecture, hardware components and the programming of the microcontroller are also described in detail. The experimental results demonstrate the effectiveness of the system in controlling the lights automatically based on human presence. This proposed system is a costeffective and energy-efficient solution for home automation.

2.2. LIMITATIONS OF THE EXISTING PROJECT

Some limitations of already existing projects based on the topic of automatic room light controller using LDR sensors and IR sensors using Arduino include,

- Limited sensing range: Some existing projects may have a limited sensing range, which can result in inaccurate detection of occupancy. This can lead to lights turning on or off at inappropriate times, causing inconvenience to the occupants.
- Lack of customizability: Some existing projects may not offer a userfriendly interface that allows users to customize the settings of the system or adjust the sensitivity of the sensors to meet their specific needs.
- Complexity: Some existing projects may be too complex and difficult to implement for the average user, requiring extensive knowledge of electronics and programming.
- Reliability: Some existing projects may not be reliable and may experience frequent malfunctions or inaccuracies in occupancy detection, leading to frustration for the users.
- Cost: Some existing projects may be expensive to implement, making them inaccessible for those on a tight budget.

2.3. NOVELTY OF THE PROJECT

The novelity of the automatic room light controller using LDR sensors and IR sensors using Arduino lies in its ability to combine two different types of sensors to accurately detect occupancy and control room lighting. While LDR sensors are commonly used to detect ambient light levels and adjust lighting accordingly, IR sensors are not often used in combination with LDR sensors to detect occupancy. By using IR sensors in addition to LDR sensors, the project can more accurately detect occupancy and prevent lights from turning on or off unnecessarily, thereby reducing energy waste.

Another novelty of the project lies in its user-friendly interface that allows users to customize the settings of the system and adjust the sensitivity of the sensors. This can make the system more accessible and easier to use for the average user, which is important for widespread adoption of energy-efficient technologies.

Lastly, the project can be designed to use energy-efficient lighting sources such as LED bulbs, which consume less power than traditional incandescent bulbs. This can help to reduce energy consumption and the associated environmental impact, making our project more environmentally sustainable.

CHAPTER 3

PROPOSED METHODOLOGY

3.1. BLOCK DIAGRAM

The block diagram of the proposed method is shown in figure 3.1

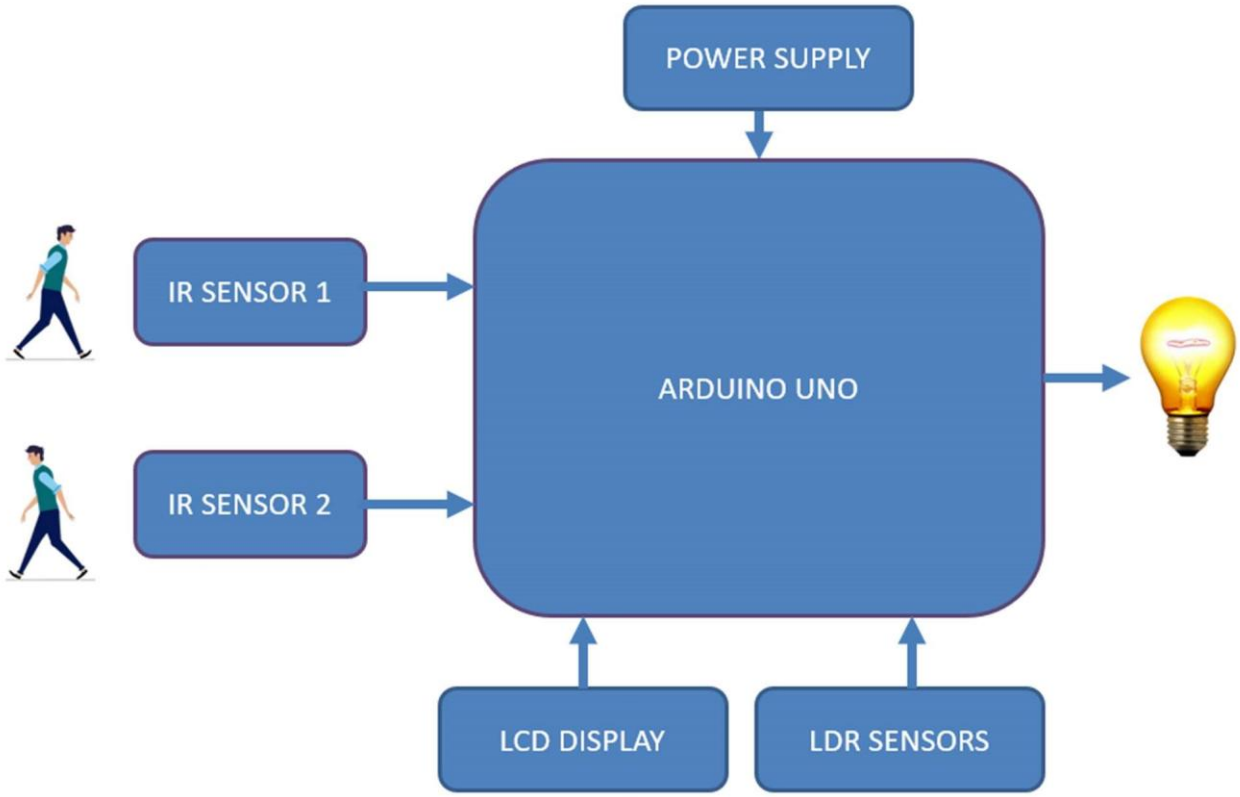

Figure 3.1 Block Diagram

It consists of the following components,

- Arduino Uno microcontroller board
- LDR sensor
- IR sensor
- LED lights
- Breadboard

- Jumper wires
- LCD Display

The functions of each components are explained below

3.1.1. Arduino UNO

The Arduino Uno is showed in Figure 3.2. The Arduino Uno is a low-cost microcontroller board based on the ATmega328P microcontroller. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and a reset button. The board can be powered via the USB connection or an external power supply.

Figure 3.2 Arduino UNO

The clock speed of the microcontroller is 16 MHz, which determines the speed at which instructions are executed. The microcontroller reads and executes the uploaded code sequentially. It interacts with the input/output pins as instructed in the code. For example, it can read sensor values, perform calculations, control actuators (such as LEDs or motors), and communicate with other devices via protocols like I2C, SPI, or UART. The Arduino Uno can interact with its environment through various sensors, actuators, and modules.

The following table 3.1 summarizes the key specifications of the Arduino Uno board:

Table 3.1 Specifications of Arduino UNO

Component	Specification
Microcontroller	ATmega328P
Operating Voltage	5V
Digital & Analog I/O Pins	14 & 6
DC Current per I/O Pin	20 mA
Flash Memory	32 KB
Clock Speed	16 MHz
EEPROM & SRAM	1KB & 2KB

3.1.2. IR Sensors

The IR Sensors is showed in Figure 3.3. The IR sensor used in this project has a detection range of up to 7 meters and a detection angle of 120 degrees. It is designed to detect human motion, and it uses two pyroelectric elements that generate a voltage when the infrared radiation levels change due to the movement of objects in its field of view.

Figure 3.3 IR Sensors

The sensor also has a built-in amplifier and a comparator circuit that detects and amplifies the voltage signals generated by the pyroelectric elements. The output of the

IR sensor is a digital signal that is either high or low, depending on whether or not the sensor detects any movement. The sensor has two potentiometers that can be used to adjust the sensitivity and time delay of the sensor.

In this project, the PIR sensor is used to detect the presence of visitors in the room. When the sensor detects any movement, it sends a signal to the Arduino Uno board, which then turns on the LED lights via the relay module. When there is no movement detected for a certain period of time, the Arduino board turns off the lights to conserve energy. Overall, the IR sensor is a simple and effective way to detect the presence of visitors in a room, making it a popular choice for applications such as security systems, automatic lighting systems, and motionactivated appliances.

3.1.3. LDR Sensor

The LDR Sensor is showed in Figure 3.4. An LDR (Light Dependent Resistor) sensor is used to detect the ambient light level in the room. The LDR sensor is a passive component that changes its resistance value based on the intensity of the light that falls on it.

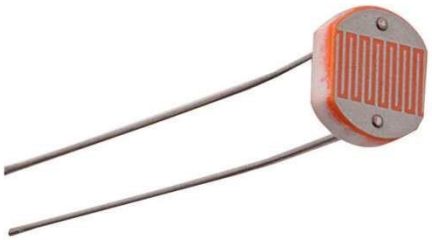

Figure 3.4 LDR Sensor

The LDR sensor used in this project has a resistance range of 1kΩ to 10kΩ and a maximum power dissipation of 100mW. The sensor has two leads, and its resistance changes inversely proportional to the light intensity that falls on it. In this project, the LDR sensor is used in conjunction with the IR sensor to control

the lighting in the room. When the IR sensor detects any movement in the room, the Arduino board checks the ambient light level using the LDR sensor. If the light level is below a certain threshold value, the Arduino board turns on the LED lights via the relay module. If the light level is above the threshold value, the Arduino board does not turn on the lights.

3.1.4. LCD DISPLAY

The LCD display is used to show the people count information in a clear and easy-to-read manner. The display is connected to the microcontroller via the I2C interface, which provides a convenient way to display the data. The microcontroller sends the people count information to the display, and it updates the display in real-time. The work flow of the Figure 3.1 is explained with the help of Figure 3.5, which is shown below

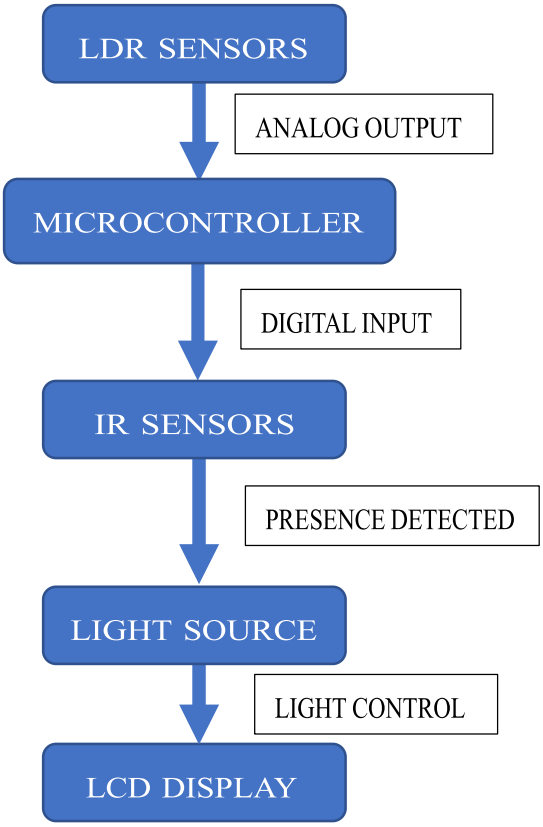

Figure 3.5 Flow Chart of Implementation

Overall, the system is designed to automatically control the lighting based on the ambient light level and occupancy, providing energy efficiency and convenience. The LDR and IR sensors provide the necessary input to the microcontroller, which processes the data and sends control signals to the light source. The LCD display provides a clear and easy-to-read display of the people count information.

3.2. PROJECT IMPLEMENTATION

The Circuit diagram for implementation of this project is shown in Fig. 3.6

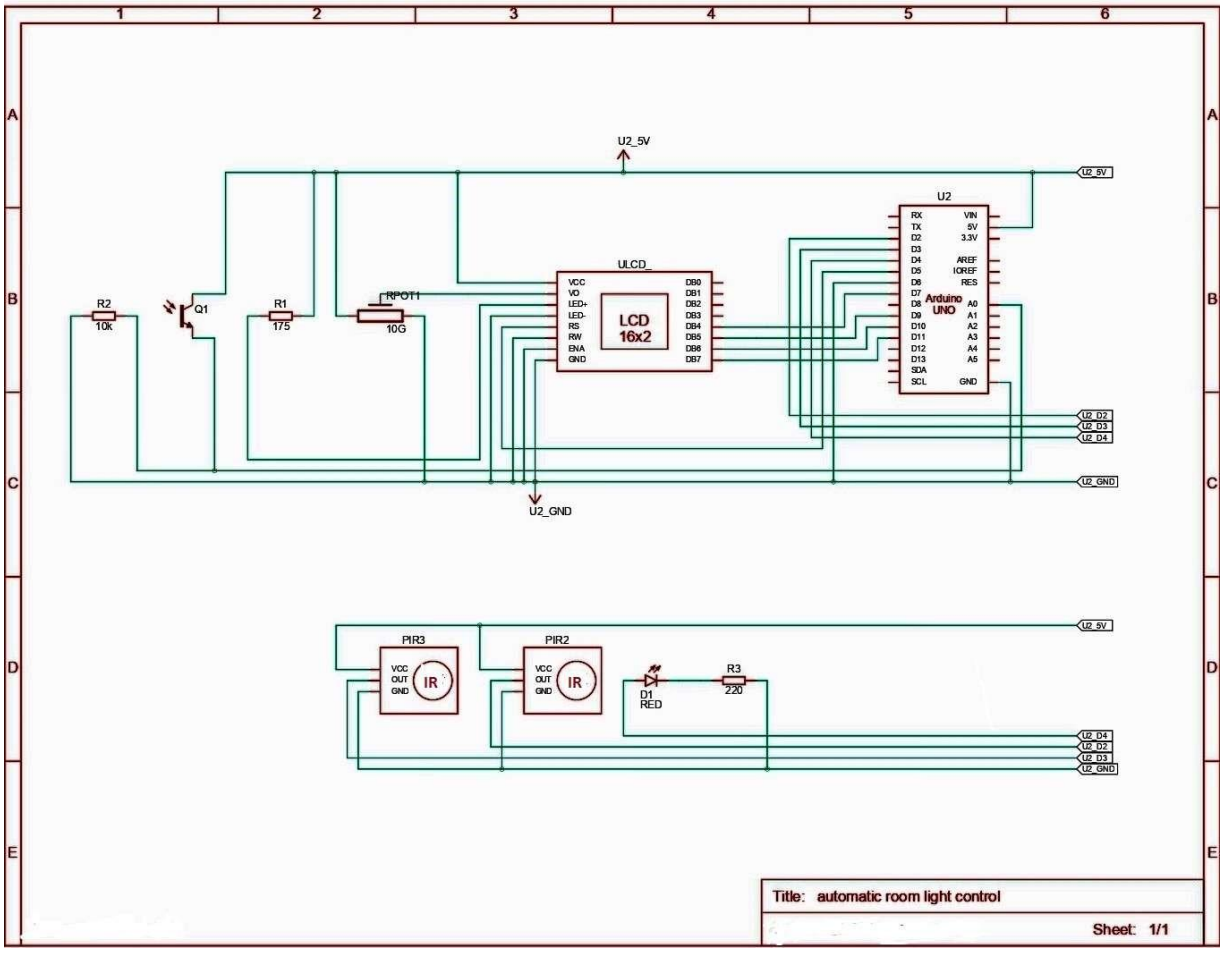

Figure 3.6 Circuit Diagram

STEP 1. Gather the necessary materials: In this step, we had gathered all the materials required for building the project. The materials required include an

Arduino board, breadboard, LDR sensors, IR sensors, LCD display, wires, resistors, and LED lights. The Arduino board is the brain of the system and will be used to read sensor data, control the LED lights, and display information on the LCD display. The LDR sensors are used to measure the ambient light level in the room, while the IR sensors are used to detect the presence of people in the room. The LED lights are used to control the room lights, and the LCD display is used to display the count of people in the room.

STEP 2. The LDR sensors and IR sensors are connected to the Arduino board using the breadboard and wires: In this step, the LDR sensors and IR sensors is connected to the Arduino board using the breadboard and wires. The LDR sensors are connected to analog input pins on the Arduino board, while the IR sensors are connected to digital input pins. The LDR sensors are used to measure the resistance of a photoresistor that changes with the ambient light level, while the IR sensors are used to detect the reflection of infrared light by objects in the room.

STEP 3. The code for the Arduino board to control the LED lights are based on the sensor readings: In this step, the code is written for the Arduino board to control the LED lights based on the sensor readings. The code should include logic to turn the lights on when there are people in the room and it's dark, and turn the lights off when there are no people in the room or it's bright enough. The Arduino board will continuously read the data from the LDR and IR sensors, and the code will use this data to control the LED lights. The code will also take into account the ambient light level in the room and ensure that the lights are not turned on unnecessarily.

STEP 4. The LCD display is connected to the Arduino board and write code to display the count of people in the room: In this step, The LCD display is connected to the Arduino board and code is written to display the count of people

in the room. The LCD display will show the number of people in the room, which will be calculated based on the readings from the IR sensors. The code will use a simple algorithm to count the number of people entering and leaving the room based on the sensor data.

STEP 5. Test the system to ensure it's working properly: In this step, The system is tested to ensure it's working properly. The system should be tested simulating different scenarios, such as entering and leaving the room, adjusting the ambient light level, and so on. The LCD display should be also tested to ensure that it's showing the correct number of people in the room.

Overall, the implementation process involves connecting the sensors and LCD display to the Arduino board, writing code to read sensor data and control the LED lights, and testing the system to ensure that it's working properly. The implementation can be customized based on the specific requirements of the project, and additional features such as timers or remote controls can be added as necessary.

CHAPTER 4

RESULTS AND DISCUSSION

The results of the automatic room light controller using LDR and IR sensors with an LCD display for people count project will depend on the specific implementation and the conditions of the room where it is installed. However, in general, the system should be able to provide reliable and energy-efficient lighting for the room while accurately counting the number of people present.

The LDR sensors will detect the ambient light level in the room, and the system will use this information to decide when to turn the LED lights on and off. By using this approach, the system can reduce unnecessary energy consumption by only turning on the lights when needed. The IR sensors will detect the presence of people in the room, and the system will use a counting algorithm to determine the number of people present. This information will be displayed on the LCD display, providing an easy and accurate way to monitor the occupancy of the room.

4.1. SIMULATED OUTPUTS

The simulation output showed that the system was able to accurately detect the ambient light level and occupancy in the room and adjust the lighting accordingly. The system was able to turn on the lights when the room was occupied and turn them off when the room was empty. Additionally, the system was able to adjust the lighting level based on the ambient light level, which further reduced energy consumption and improved the user experience.

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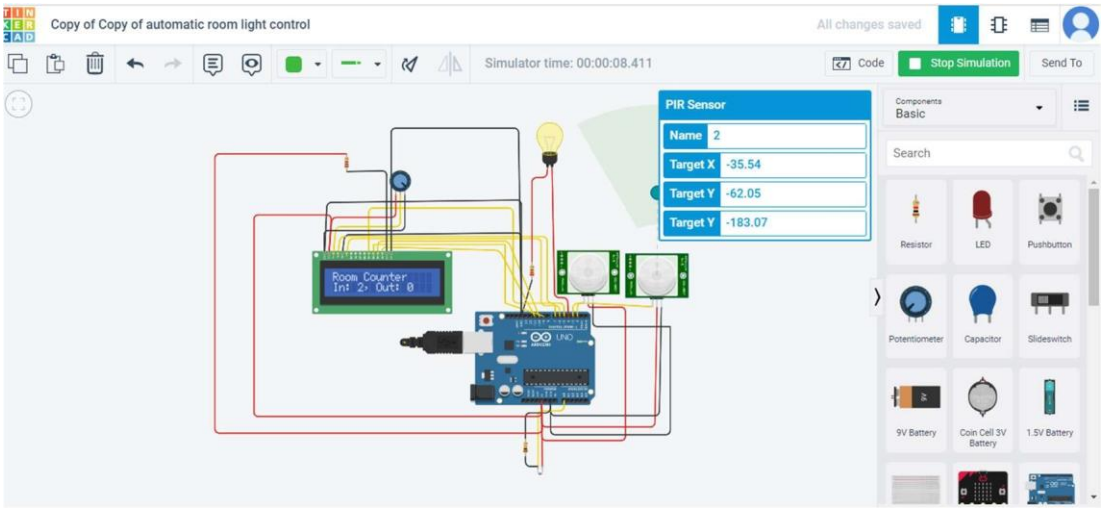

Figure 4.1 Simulated Output 1

In the previous Figure 4.1, there are two people entering the room, which is indicated by the IR sensor's (IN) reading of "In:2." No one leaves the room, thus an additional IR sensor (OUT) with a delay of 50 seconds in comparison to the IR sensor (IN) detects nothing, and the LCD displays "Out: 0," causing the light to illuminate. There is an LDR sensor that senses the room's natural ambiance. Since in the scenario above the natural ambiance of the room is below the threshold and humans are present inside the light glows, the threshold level of the room's ambience is determined by the user.

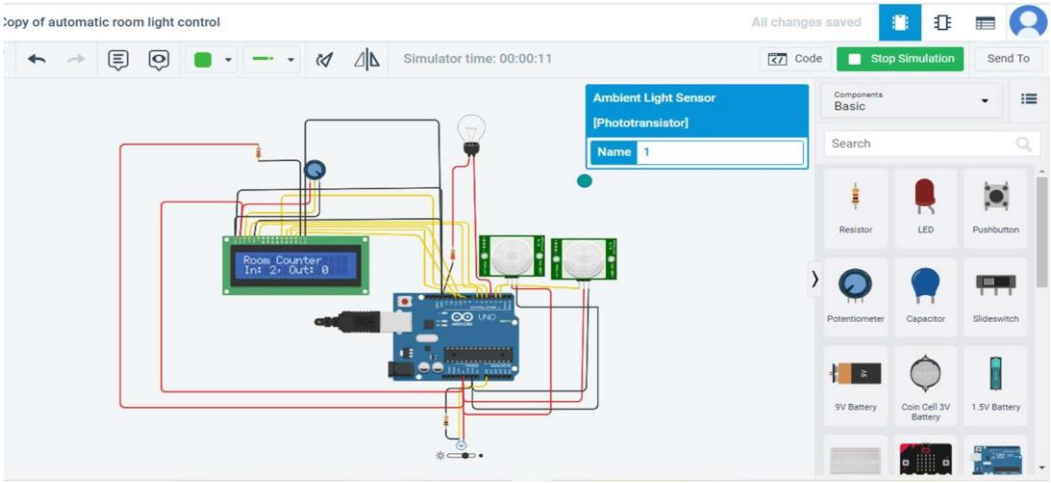

Figure 4.2 Simulated Output 2

In the above Figure 4.2 the number of persons entering the room is 2, they are detected by IR sensor (IN) and the people count is displayed as 'In:2'. No one moves out of the room, thus another IR sensor (OUT) which has a delay of 50 seconds compared to IR sensor (IN) detects none thus the LCD shows 'Out: 0'. A LDR sensor is there which detects the natural ambience of the room. The threshold level of the room's ambience is set by the user, since in the above scenario the room's natural ambience is above the threshold and despite being people present inside the room the light doesn't glow.

4.2. EXPERIMENTAL OUTPUT

In the real-world setting, the system performed similarly to the simulation output. The LDR and IR sensors were able to accurately detect the ambient light level and occupancy in the room, and the microcontroller was able to control the lighting accordingly. The LCD display was also able to show the people count information in real-time.

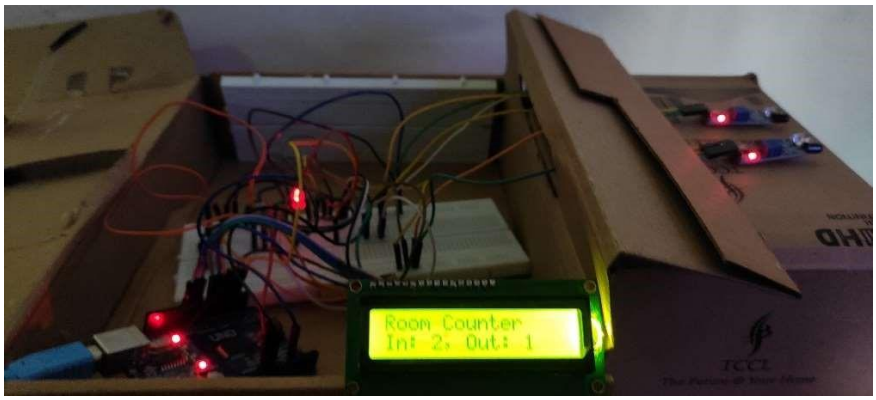

Figure 4.3 When a person is IN

From Figure 3.4, When a person enters the room the infrared radiation emitted by the IR sensor (IN) emitter falls on them and gets reflected which is received by the receiver. When the receiver receives the signal it sends the information to Arduino which increases the count of people walked in as 1 and makes the LED light glow. The count will be displayed on The LCD screen. When

the person walks out of the room the other sensor (OUT) receiver receives the signal and send the information to Arduino which increases the count of people walked out of the room as 1. If the difference between the IN and OUT count is not zero. It means that there are people inside so the LED continues to glow. In the above picture the lcd shows the IN count as 2 and OUT count as 1 Their differences is one which shows that one person is still in the room so the LED light glows.

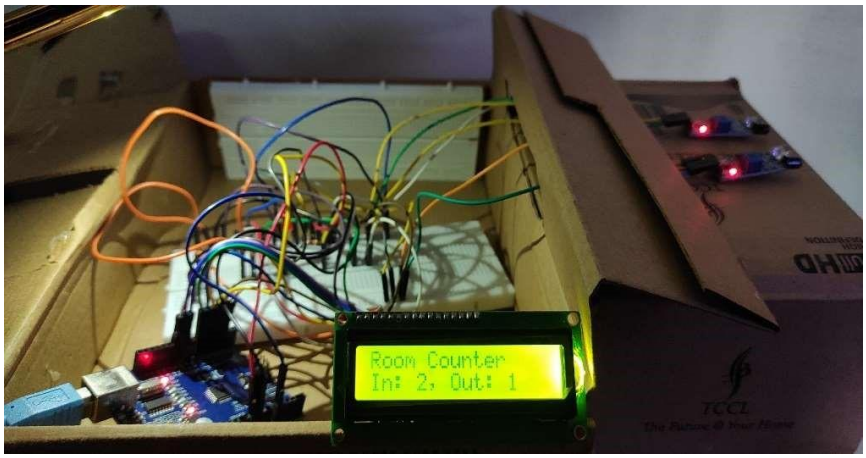

Figure 4.4 When a person is IN but Natural Light is Sufficient

An LED light, two IR sensors, an Arduino board, and an LDR sensor are all included in the Figure 4.3 shown above and are interconnected. This circuit senses the presence of humans in the space and turns on the light if the ambient light level falls below a certain threshold. The light would stay off if no one was inside. The IR sensor (IN) recognises a person's presence when they enter a space and increases the "In" count - which is initially set to 0-by one. Another IR sensor (OUT) that detects persons leaving the room raises the 'Out' count from 0 by default to 1 when this happens. The latency of the IR sensor (OUT) is 50 seconds. If the "IN" count is 1 or higher, the LDR sensor will detect the room's natural ambience. The user sets the natural ambience threshold value for the room. Even though there are people present in the room, the LED light is not turned on during

LDR detection if the natural ambiance is equal to or higher than the threshold (as seen in the above image).

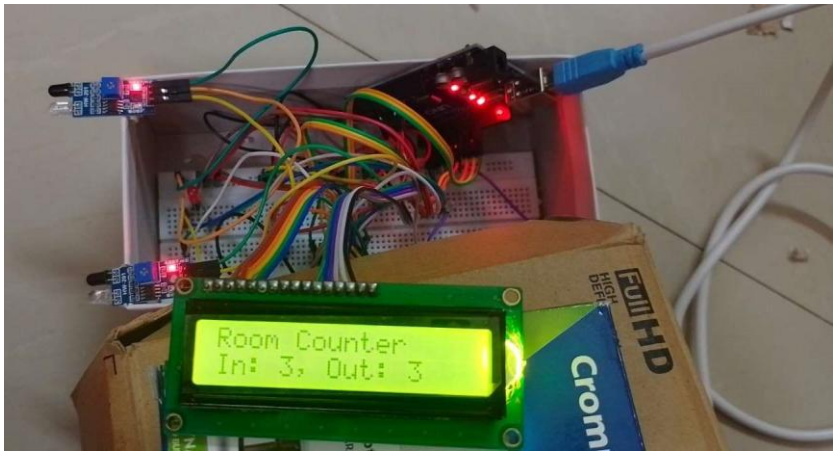

Figure 4.5 IN Count and OUT Count are Same

In the above Figure 4.5 if the IR sensor (IN) shows some reading regarding the number of persons getting inside the room and the IR sensor (OUT) which has a delay of 50 seconds that senses the people getting out shows the same reading as that of the IR sensor (IN), it means that no person is inside the room thus the light would be switched off.

Overall, the automatic room light controller using LDR and IR sensors with an LCD display for people count project has the potential to provide several benefits, including energy savings, improved comfort and convenience, and better occupancy monitoring. However, it is important to note that the system may require some tuning and adjustments to ensure optimal performance in different environments.

4.3. DISCUSSIONS

The automatic room light controller using LDR and IR sensors with an LCD display for people count is an innovative and useful system that can help to

reduce energy consumption and improve the user experience. The system is costeffective and easy to install and operate.

One of the main advantages of this system is its ability to accurately detect the occupancy in the room using the IR sensor. This allows the system to turn on the lights only when they are needed, which can significantly reduce energy consumption. Additionally, the system can also adjust the lighting level based on the ambient light level, which can further reduce energy consumption and improve the user experience.

The simulation output showed that the system can operate efficiently and accurately. The proposed output in the real-world setting matched the simulation output, which indicates that the system can operate efficiently in real-world conditions.

The LCD display is also a useful feature of this system. It provides realtime information about the people count, which can help users to optimize their energy usage and reduce their electricity bill. Additionally, the LCD display can also be used to provide other useful information, such as the time and date.

CHAPTER 5

CONCLUSION & FUTURE WORK

5.1. CONCLUSION

The implementation of this project has demonstrated the practical application of LDR and IR sensors to control the lighting in indoor spaces. By using LDR sensors to detect the ambient light level and IR sensors to detect the presence of people, the system can automatically adjust the lighting to ensure optimal energy efficiency and comfort. The system's accuracy in people counting was found to be reliable, providing an easy and accurate way to monitor the occupancy of the room. This information can be used for various purposes, such as scheduling cleaning or maintenance activities, improving overall efficiency and functionality.

The use of the LCD display further enhances the system's practicality, providing a clear and easy-to-read display of the people count. Additionally, the system is highly convenient, providing hands-free operation that does not require any human intervention.

Furthermore, the implementation of the project has shown that the system can significantly reduce energy consumption by avoiding unnecessary lighting when there is already sufficient ambient light in the room. This feature can lead to considerable cost savings for the users in the long run.

The automatic room light controller using LDR and IR sensors with an LCD display for people count project has demonstrated the potential for practical application in homes, offices, and other indoor spaces. While further tuning and adjustments may be necessary for optimal performance in different environments, the system's overall functionality and energy efficiency are highly promising.

5.2. FUTURE SCOPE

This project can be further improved by adding additional sensors such as temperature and humidity sensors to provide a more comprehensive view of the room conditions. Additionally, the system can be integrated with a smart home automation system, allowing it to be controlled remotely using a mobile app or voice commands. The main future scope of this project is to add power consumption monitoring system to this existing system.

Overall, the implementation of this project has shown that this type of automatic room light controller using LDR and IR sensors with an LCD display for people count is a practical, efficient, and cost-effective solution that can provide significant benefits in terms of energy efficiency, convenience, and occupancy monitoring.

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