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Automatic Room Light Controller with Bidirectional Visitor Counter

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Abstract: *This project presents a Smart Hall Automation System using the ATmega328 microcontroller, integrating IR sensors, a DS1820 temperature sensor, and an LCD display for real-time monitoring and control. The system is designed to count the number of persons entering and exiting a hall using two IR sensors. Based on the count, the system automatically controls lights and a fan, ensuring energy efficiency. Additionally, it continuously monitors the room temperature and displays both the count and temperature on the LCD screen. The power supply for the system is designed using a 12-0-12 center-tap step-down transformer, a rectifier circuit with 1N4007 diodes, and voltage regulation using a 7805 regulator. The relays for controlling the light and fan are driven by a relay driver circuit connected to the ATmega328. The logic ensures that lights are turned on when at least one person is inside the hall, and the fan is activated only if the room temperature exceeds 36°C. The automation process is implemented using an embedded C program, interfacing the IR sensors for person detection, the DS1820 sensor for temperature sensing, and the LCD for displaying system status. A buzzer is included for alerting when a person enters or exits. This project provides an efficient, low-cost automation solution suitable for classrooms, conference halls, and other enclosed spaces where automatic energy management is required.*

Keywords: Smart Hall Automation System

I. INTRODUCTION

Automation plays a crucial role in modern energy management systems, optimizing power consumption and enhancing user convenience. This project presents a Smart Hall Automation System using an ATmega328 microcontroller, designed to automatically control lighting and fan operation based on occupancy and temperature. By integrating infrared (IR) sensors for person detection and a DS1820 temperature sensor for thermal monitoring, the system ensures intelligent energy management. The Liquid Crystal Display (LCD) provides real-time updates on the number of persons inside the hall and the current room temperature, making it an effective solution for enclosed spaces such as classrooms, conference halls, and offices.

The system employs two IR sensors positioned at the entrance to count the number of persons entering and exiting the hall. When at least one person is detected inside, the light relay is activated, ensuring illumination only when necessary. Additionally, if the temperature exceeds 36°C, the fan relay is switched on, maintaining a comfortable environment. A buzzeris also included for alert notifications upon person entry and exit. This intelligent control mechanism significantly reduces energy wastage and promotes automated energy conservation.

A stable power supply is critical for the system's operation. This project utilizes a 12-0-12 step-down transformer, a center-tap rectifier with 1N4007 diodes, and a 7805voltage regulator to ensure a steady 5V DC output. The relays for controlling the light and fan are driven through a relay driver circuit, ensuring proper electrical isolation and safe switching.

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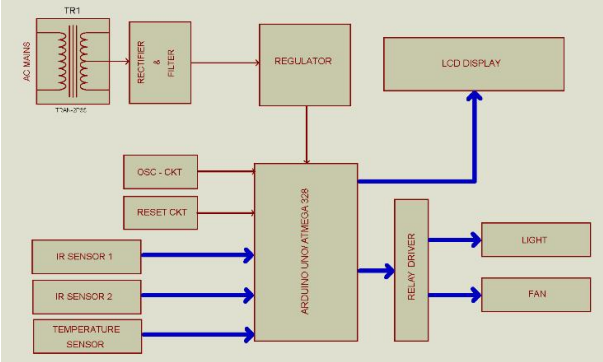
II. BLOCK DIAGRAM



III. WORKING OF THE PROJECT

Powering the System

- The system starts when 5V DC is supplied to the microcontroller from the regulated power supply.
- The LCD initializes and displays "Room Monitor ON" for 2 seconds, then clears.

Person Counting Using IR Sensors

- The IR sensors are positioned at the hall entrance:
- IR Sensor 1 (A0) detects an existing person, decreasing the count.
- IR Sensor 2 (A1) detects an entering person, increasing the count.
- Every entry and exit triggers the buzzer for 2 seconds as an alert.
- The updated person count is displayed on the LCD.

Automatic Light Control

- If the count > 0 (at least one person inside), the Light Relay (Pin 3) is activated, turning ON the light**.**
- If the count = 0 (no person inside)**,** the Light Relay is deactivated**,** turning OFF thelight**.**

Temperature Sensing & Fan Control

- The DS1820 sensor (A2) reads the room temperature.
- If the temperature exceeds 36°C, theFan Relay (Pin 4) is activated, turning ON the fan for cooling.
- If the temperature drops below 36°C, the fan is turned OFF to save energy.
- The real-time temperature value is displayed on the LCD.

LCD Display Output

- The LCD updates continuously, showing:
- Number of persons inside ("Count: X")
- Room temperature ("Temp: XX°C")

Energy-Saving Mechanism

- The system ensures lights and fans operate only when necessary, reducing electricity wastage.
- The automation eliminates human intervention, making it efficient for classrooms, halls, and offices.

IV. RESULT

Thus our group actively coupled with project, and we develop this project named as “Automatic Room Light Controller With Bidirectional Visitor Counter”.

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The Smart Hall Automation System is an efficient and cost-effective solution for energy management in enclosed spaces. By utilizing infrared sensors for person detection and a temperature sensor for environmental monitoring, the system ensures automatic control of lights and fans, reducing energy wastage. The integration of a microcontroller-based system enhances reliability and minimizes the need for human intervention.

This project provides significant benefits in terms of power savings, convenience, and operational efficiency. The automatic switching mechanism ensures that electrical appliances are used only when necessary, making it ideal for applications in classrooms, offices, auditoriums, and other public spaces. The inclusion of an LCD display allows for real-time monitoring, providing users with essential information on occupancy and temperature.

V. CONCLUSION

This paper proposes and implements a novel architecture for an economic bidirectional Visitor Counter and space lighter controller. It explains how to use Arduino to power a bidirectional [19]guest counter and a room light counter. The cost of this equipment is very low. This project makes use of low-cost, off-the-shelf materials. As a result, the net deployment cost is very low and affordable to the average consumer. This low-cost scheme is intended to increase the quality of living and the difficulty of guest counting. It contains reliable data and strives to eliminate errors whenever possible. Any recommendations for future work can be made, such as the installation of cameras from which not only the count but also the image can be precisely processed. Through managing the Wi-Fi modules[20], wireless networking can be applied to the device. The whole device can be designed as a low-cost commercial hardware kit.

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