AN ENERGY EFFICIENT INTELLIGENT LIGHTING SYSTEM OF LED BASED ON MOTION AND WIRELESS TECHNOLOGY

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Abstract— This project proposes a framework to implement an intelligent lighting system. The main reason for developing such project is that maximum energy is wasted due to inefficient use of the consumer appliances. To be specific, a light accounts for a huge part of the total energy consumption. Though there are number of light control systems are introduced but most of them are outdated. This is because the existing light control systems cannot be applied to home and working place successfully. The ARDUINO UNO R3 is used as the main component which interfaces IR sensor, LUX sensor, GAS sensor and GSM module. LUX sensor is used as light to digital converter which senses the brightness and with the help of ARDUINO. This will reduce the intensity of the LED according to the surrounding, by this the energy consumption is reduced. The main advantage of the usage of the IR sensor is, it can count the number of individuals entering into the room and according to that it will improve the intensity of the LED. Here we added an additional features which can able to detect the gas and notifies through GSM to a phone. These technologies have been concentrated more so that this system can be used in domestic applications.

KEYWORDS: LED, ARDUINO UNO, IR sensor, LUX TSL2561, GAS sensor, GSM module.

I. INTRODUCTION

As the increase of environmental concerns and to have a sustainable development it is important that the energy has to be conserved and environment have to be protected. Here, lighting control systems will play an important role in the reduction of energy consumption of the lighting as light plays a huge part in utilization. In order to use efficient Electricity we propose an Intelligent LED Lighting System, which automatically regulates the lighting system. By operating a system intelligently we can save energy, say according to user presence and the demand. It is also noted that in India there is lack of such lighting system which operates intelligently.

There are many discoveries done on the lighting system. A light accounts for approximately 20 percent of the world's total energy consumption. The invention of a LED lighting devices consumes 50 percentage of consumption compared to fluorescent lighting device. A system that can control illumination intensity of LED light accordingly to the surrounding was

discovered by Y. Uhm. Jinsung Byun, Insung Hong, Byoungjoo Lee, and Sehyun Park proposed Intelligent Household LED Lighting System with Energy Efficiency and User Satisfaction. Chunfeng FAN proposed lighting system with the help of dimming process. Denardin discovered a street light controlling and monitoring system based on a wireless data network.

To be noted the existing system are constructed without considering user satisfaction and also it is not appreciable to place it in home or offices where user satisfaction is more crucial factor than cost benefits due to energy saving. Hence the proposed system considers both user satisfaction and energy efficiency as we use multi sensors and wireless communication technology. It basically regulates illumination intensity of a lighting device according to user presence and brightness of surroundings. The main reason for concentrating on lighting system is that it was realized that dimming of lights can save energy by 40%, save lights maintenance costs by 50%, and prolong lamp life by 25%. However, it implies the possibility that inconvenience of users can be bigger because of frequent light on/off, and dark indoor environment, etc. whereas the energy saving effect becomes larger.

II. DESIGN AND IMPLEMENTATION

Power supply: It is a circuit which accepts 230V AC mains supply as its input and gives output voltage and current after converting it into proper format that can be acceptable for further circuitry. Sensors: The sensor senses different physical quantities. Two sensors are used in our system that is IR sensor, LUX sensor. The function of IR sensor is to trigger the ARDUINO when user is present and the function of the LUX sensor is to control the brightness of the system according to the brightness of the surrounding. Here we added an additional features which can able to detect the gas and notifies through GSM to a phone. These technologies have been concentrated more so that this system can be used in domestic applications.

We first initialize the sensors and ARDUINO by applying power supply to the system. First the ARDUINO is supplied with 5V. Brightness of the LEDs is control by LUX sensor autonomously. If there is detection of human then the LEDs will turn ON with considering brightness of the surroundings. If there is no human present then the LEDs will remain OFF. Gas leakage is notified through alarm and wirelessly with the help of GSM module, as here the phone is used as gadget.
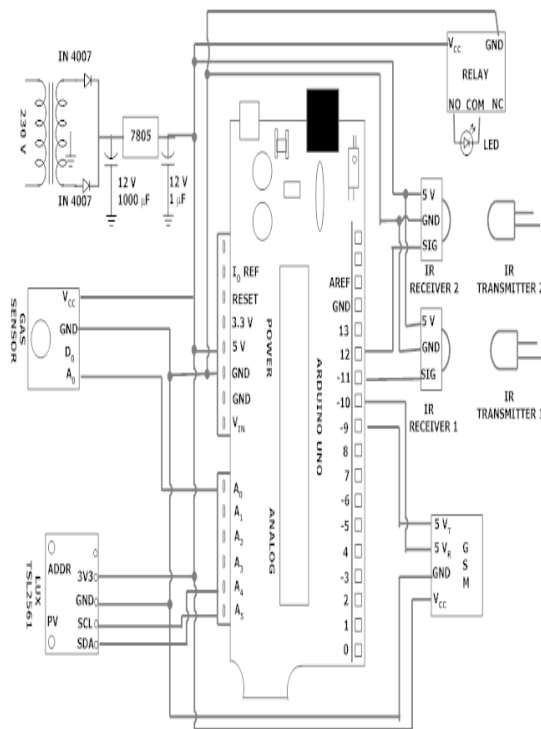
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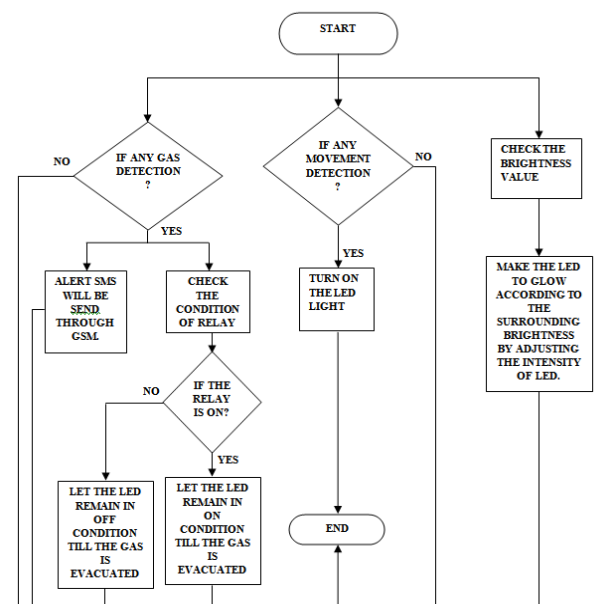
HARDWARE DESCRIPTION

The major hardware components used in proposed system are

- ARDUINO UNO R3 AT MEGA 328
- AT89C2051
- IR sensor
    1. IR RECEIVER
    2. IR TRANSMITTER
- LUX TSL2561
- GAS sensor MQ6
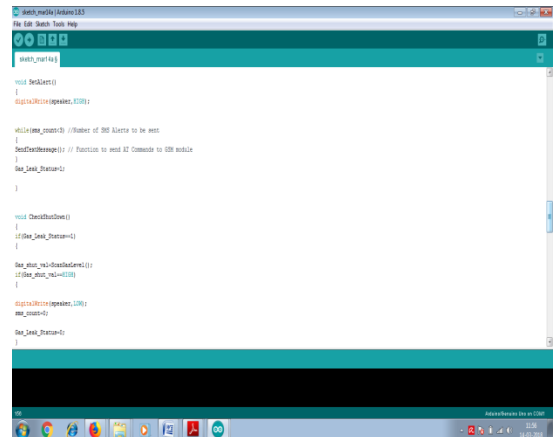- GSM module
- Relay
- LED

CIRCUIT DIAGRAM

SOFTWARE DESCRIPTION

- ARDUINO UNO IDE
- SMART DRAW

SOURCE CODE:

RESULT

The energy efficient system was implemented in our department store room and the changes are compared.

PARAMETERS:

Before Implementation

No. of fluorescent lamp = 1

Working hours = 8

Power consumed = 36Watts

No. of days = 30

Installed load = (Working hours * No. of appliances * Watts * No. of days)/1000

Therefore the total consumption = 8640kW

After Implementation

No. of LED = 1

Working hours = 4 (The LED will ON only when it senses human)

Power consumed = 15Watts

No. of days = 30

Installed load = (Working hours * No. of appliances * Watts * No. of days)/1000

Therefore the total consumption = 1800kW

This is clear that we can save 6840kW of power when one FL is replaced by LED.

COMPARISON OF LED AND FLURESCENT LAMP

Specification	FLURESCENT LAMP	LED
Average source life span	30,000 hours	50,000 hours
Brightness	2000 lm	2000 lm
Power consumption	36W	20W
Luminous efficiency	56 lm/W	100 lm/w
Mercury contain	Yes	No
Cost	100INR	200INR
Cost of electricity	3328INR	1920INR

APPROXIMATE CALCULATION OF HALL

If we implement this in hall consisting of 15 fluorescent lamps then the following changes are calculated approximately:

Calculation with 15 fluorescent lamps

No. of fluorescent lamp = 15

Working hours = 8

Power consumed = 36Watts

No. of days = 30

Installed load = 129600kW

If these 15 fluorescent lamps are replaced by LED with our proposed system:

No. of LED = 15

Working hours = 4 (The LED will ON only when it senses human)

Power consumed = 15Watts

No. of days = 30

Installed load = 27000kW

Theoretically it is proven that we can save 102600kW of power when 15 FL are replaced by 15 LEDs with proposed system.

CONCLUSION:

Energy efficiency and user satisfaction are considered as the important factor and has been fulfilled by this system. According to the brightness of the surrounding the intensity of the LED is controlled automatically. Since, this system employees multi sensors and GSM to enhance energy efficiency and user satisfaction by turning ON/OFF LEDs as per user presence. The GAS sensor MQ6 is used for safety purpose and we also made this to interface with GSM so that it notifies to our phone.

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