AUTOMATIC LIGHTING SYSTEM

A Mini Project Report submitted to the Microprocessor lab

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ABSTRACT

This project utilizes a micro-controller to automatically control the lighting of a room. Electricity being a valuable resource, it must be used carefully. Conserving electricity also helps save money. We may forget to switch off the lights in a room and this device is the perfect solution to overcome this problem. Lighting automation is a great way to add convenience, energy efficiency and even security to your home or office.

The device works by detecting the presence of humans in the room and by sensing the presence or absence turns the light on or off accordingly. This was achieved by using two IR sensors and 8051 micro-controller. The IR sensors work by detecting the number of persons present in the room and turning the light on or off accordingly. When there is no one inside the room then the light turns off automatically.

Hence the device not only works as 'Automatic Lighting System' but also as a 'Bidirectional Visitor Counter' as the project also internally counts the number of visitors entering and exiting the room.

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CHAPTER 1
INTRODUCTION

1.1 Introduction:

This system basically works with the help of two IR sensors, an 8051 micro-controller and a lcd display. One of the IR sensors is placed just outside the door of the respective room. Whenever a person enters a room, his presence is detected by this first IR sensor. Next when the person is completely inside the room his presence is confirmed by the second IR sensor which then increments the counter value by 1 and which in turn detects the presence of a person and turns on the light. This process goes on whenever a person enters a room.

When a person leaves room the second IR sensor which is inside the room detects it and then when he leaves the room the IR sensor outside the room confirms that the person has left the room and decrements the counter value by 1. This process repeats whenever someone leaves the room. When the counter value becomes 0 it means that there is no one inside and the light automatically turns off.

1.2 Present day scenario:

Automatic lighting systems continue to be widely used in various environments, from residential settings to commercial and industrial spaces. It is most widely used in street lights where it acts as a source of energy saving devices along with wide range of features such as efficiency and motion detection.

But there are several challenges too to our present-day scenario. As they are beneficial, they have side effects too as health implications of blue-rich, solid-state or compact fluorescent lighting. Short-wavelength visible light at very high intensities can be phototoxic to the retina, and the newly discovered retinal cells that influence circadian rhythm are strongly blue-sensitive. Night shift workers have a higher cancer risk.

1.3 Objective:

This is very useful in today's time because often in our day-to-day busy life we tend to forget to turn off the lights in our room and waste a precious recourse like electricity. If implemented correctly it can be of great use to human beings. We can save electricity, time, reduce carbon footprints and also to ensure safety of pedestrians, drivers who are driving on the streets by implementing additional sensors in the lights.

1.4 Target Specifications:

The main target is reduced energy consumption, whether used at homes or outside a lot of energy can be saved if these are implemented correctly. From view of street light, a lot of accidents can be avoided by the sensors as they work by detecting moment and turn on or of accordingly providing better visibility and fewer shadows which can avoid accidents. For home and industrial uses, it can reduce the electricity bills too which can be used for other purposes.

CHAPTER 2
BACKGROUND THEORY

2.1 Introduction:

In this chapter we are going to discuss the basic background theory of this project which includes a brief of the title, theoretical discussions, general analysis and conclusion.

The project titled "Automation Lighting System" aims to enhance energy efficiency in indoor spaces by implementing an intelligent lighting control system. The core components of this system include two infrared (IR) sensors and an 8051 microcontroller. The innovative use of these technologies allows for the development of a responsive lighting system that not only adapts to the presence of individuals in a room but also incorporates a bidirectional counter for more nuanced control.

2.2 Theoretical Discussions:

i) Infrared Sensors (IR): The project harnesses the capabilities of IR sensors to detect human presence within a room. These sensors operate based on the principle of detecting changes in infrared radiation, making them highly effective for occupancy sensing. By strategically placing two IR sensors(one inside and one outside of the entry door), the system can distinguish between entries and exits, forming the basis for bidirectional counting.

ii)8051 Micro-controller: The 8051 micro-controller serves as the brain of the system, processing the input from the IR sensors and making intelligent decisions regarding lighting control. Its programmable nature allows for the implementation of complex algorithms to manage the bidirectional counting and lighting efficiently.

iii)Bidirectional Counter: The incorporation of a bidirectional counter is a key feature of this project. This counter keeps track of the number of people entering and exiting the room separately. This information is then utilized to switch on or off the lighting system accordingly. For example, if a person enters the room, the IR Sensors sends the information and the counter counts 1 followed by the switching on of the light, similarly when the person leaves the room, the counter decrements and accordingly the light is turned off when the counter counts 0.

2.3 General Analysis:

The system's real-time adaptability contributes to energy conservation by ensuring that lighting conditions align with the actual occupancy of the room. This not only enhances user comfort but also reduces unnecessary energy consumption during periods of low activity or if a person forgets to turn off the light while leaving the room. The bidirectional counter introduces a layer of sophistication, allowing for more nuanced control of the lighting system.

2.4 Conclusion:

In conclusion, the "Automation Room Lighting System" leverages the synergy between IR sensors and the 8051 micro-controller to create a responsive and energy-efficient lighting solution. The bidirectional counter adds a level of granularity to occupancy tracking, enabling more intelligent and context-aware lighting system. This project holds promise for applications in various indoor environments where optimizing energy usage is crucial. As technology continues to advance, such innovative systems contribute significantly to the development of smart and sustainable living spaces.

CHAPTER 3
METHODOLOGY

3.1 Introduction:

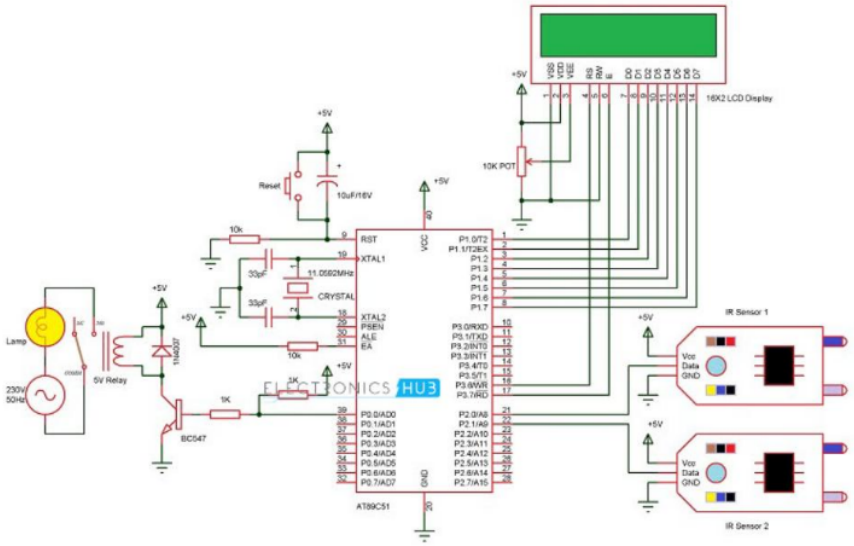
In this chapter we are going to discuss the proposed methodology for our project which includes circuit diagram, component specifications, the need for using these components and the software used.

3.2 Methodology:

Whenever a person enters a room, his presence is detected by this first IR sensor. Next when the person is completely inside the room his presence is confirmed by the second IR sensor which then increments the counter value by 1 and which in turn detects the presence of a person and turns on the light.

When a person leaves room the second IR sensor which is inside the room detects it and then when he leaves the room the IR sensor outside the room confirms that the person has left the room and decrements the counter value by 1. This process repeats whenever someone leaves the room. When the counter value becomes 0 it means that there is no one inside and the light automatically turns off.

3.3 Circuit Diagram:



3.4 Components Used:

- AT89C51 Micro-controller- generally used in embedded systems because of its low cost, small size and easy programming
- 8051 Development Board
- 2 x Infrared Sensors -we have used IR sensor in order to detect the presence or absence of a person or multiple persons in a room
- 16 x 2 LCD Display – we have used lcd display to display the number of persons inside the room
- 5V Relay Module- a relay module issued which helps the 8051 micro-controller to operate high voltage AC loads
- Lamp/LED- to demonstrate the working of the project
- Connecting Wires
- Power Supply

3.5 Software used:

Keil uvision5

3.6 Source code:

```
#include<reg51.h>
                    #define lcd P1
                    sbit rs=P3^6;
                    sbit e=P3^7;
                    sbit relay=P0^0;
                    sbit s1=P2^0;
                    sbit s2=P2^1;
                    void delay (int);
                    void cmd (char);
                    void display (char);
                    void init (void);
                    void string (char *);
                    void view (int);
                    int count=0;
                    int no[10]={48,49,50,51,52,53,54,55,56,57};
                    void delay (int d)
                    {
                            unsigned char i=0;
                            for(;d>0;d--)
                            {
```

```
                for(i=250;i>0;i--);
                for(i=248;i>0;i--);
        }
}
void cmd (char c)
{
        lcd=c;
        rs=0;
        e=1;
        delay(5);
        e=0;
}
void display (char c)
{
        lcd=c;
        rs=1;
        e=1;
        delay(5);
        e=0;
}
void string (char *p)
{
        while(*p)
        {
                display(*p++);
        }
}
void view (int n)
{
        cmd(0xc0);
        display(no[(n/10)%10]);
        display(no[n%10]);
}
void init (void)
{
        cmd(0x38);
        cmd(0x0c);
        cmd(0x01);
        cmd(0x80);
}
void main()
{
```

```
init();
      string("counter........");
      cmd(0xc0);

      view(count);


      while(1)
      {
            if(s1==1)
            {
                  while(s2==0);
                  if(count!=99)
                  count=count+1;
                  while(s2==1);
                  view(count);
            }
            else if(s2==1)
            {
                  while(s1==0);
                  if(count!=0)
                  count=count-1;
                  while(s1==1);
                  view(count);
            }
            else if(count==1)
                  relay=0;
            else if(count==0)
                  relay=1;

      }
}
```

CHAPTER 4
RESULT ANALYSIS

4.1 Introduction:

In this chapter we are going to discuss the expected and observed result of our project. The expected result of our project is that when a person enters the room, the IR sensor outside the room first identifies the person, then the IR sensor inside the room confirms the person's presence inside the room and the counter is incremented and the LED glows. Similarly when the person inside the room moves outside, the IR sensor inside the room first detects the person, followed by the person outside and the counter is decremented. When the counter decrements to 0, the LED is switched off.

4.2 Significance of the Result Obtained:

The result we have obtained does not differ from the expected result and hence our project is able to produce the expected output.

When a person's presence is detected by the IR sensors ,the LED glows while the counter is incremented and when the counter decrements to 0 after the person's departure the LED stops glowing.

CHAPTER 5
CONCLUSION AND FUTURE SCOPE OF WORK

5.1 Conclusion:

In conclusion our project is working as per the proposed objective. The light is switching on automatically whenever a person enters the room and stays on till the last person leaves. The counter is incrementing and decrementing as per requirement.

5.2 Future scope:

In the future the same concept can be applied but with a modification like using a battery which recharges during the day using solar power and uses that power to automatically turn on lights at night along with sensors with can rotate as per need during day as well as the night time.

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