Multiple Colour Generation by using RGB LED

Mohd Parvez Ali[1] Swamy Shivakumar[2] Sukka Bhavani[3] M.Vijaya Bhargavi[4] S.V. Altaf[5]
[1,2,3,4]B. Tech. Student [5]Associate Professor
[1,2,3,4,5]Department of Electronics and Communication Engineering
[1,2,3,4,5]Lords Institute of Engineering and Technology, Hyderabad, India

Abstract— At present LED light sources are gradually applied to LCD backlighting and video projection. This is a simple and low-cost circuit for a multiple colour generator that can be built easily with a few components. The main objective of the paper is to generate multiple colour from RGB primary colours are used in Television display, computer monitor, and other colour display for LED projectors. The microcontroller other regulates LED light output current and changes the light colour with the ratio of red, green, and blue LED.

Key words: RGB, LED, Projector, LCD

I. INTRODUCTION

The project aim is to generate the multiple colour using the primary colours RED, GREEN, BLUE. RGB LED is used for generating multiple colours. An RGB LED is simply three separate LEDS crammed into a single 5mm LED package. RED, GREEN, and BLUE can be combined in various proportions to obtain any colour in the visible spectrum.

In this paper 8051 microcontroller is used. Program corresponding to the generation of multiple colours using RGB LED is written in embedded 'C' language. Light emitting diodes (LEDS) are widely used in special lighting areas like traffic lights, signalling. There is strong interest in using LEDs for general illumination and modern lighting. Colour mixing enables colour adjustability which is a most attractive feature of future.

II. BLOCK DIAGRAM

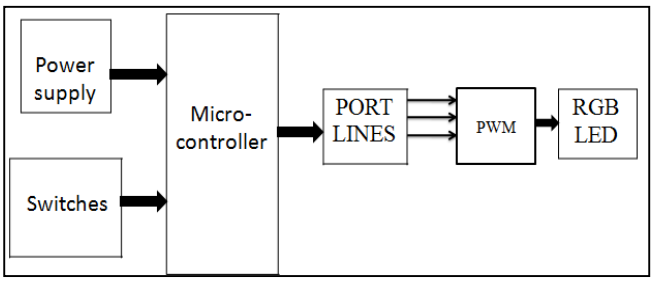

Fig. 1: block diagram of multiple colour generation

A. Description

1) Power Supply

The power supply is an electronic device which supplies power to the microcontroller. A dc supply of certain volts is being given to the rectifier followed by regulator inside the power supply which produces a regulated output. This regulated output is given to the microcontroller.

2) Switches

Switches can be used as operator controls. They can be in only one of two states: on (closed) or off (open). Switches are made to handle a wide range of voltages and currents. There are different types of switches like DPDT, slide switches, push button switches, pull button switches, etc.

3) Slide Switch

Slide switches are mechanical switches using a slider that moves (slides) from the open (off) position to the closed (on) position. They allow control over current flow in a circuit without having to manually cut or splice wire this type of switch is best used for controlling current flow in small projects.

There are two common internal designs of slide switches. The most common design uses metal slides that make contact with the flat metal parts on the switch. As the slider is moved it causes the metal slide contacts to slide from one set of metal contacts to the other, actuating the switch. The second design uses a metal seesaw. The slider has a spring that pushes down on one side of the metal seesaw or the other.

Slide switches are maintained-contact switches. Maintained-contact switches stay in one state until actuated into a new state and then remain in that state until acted upon once again.

Depending on the actuator type, the handle is either flush or raised. Choosing a flush or raised switch will depend on the intended application.

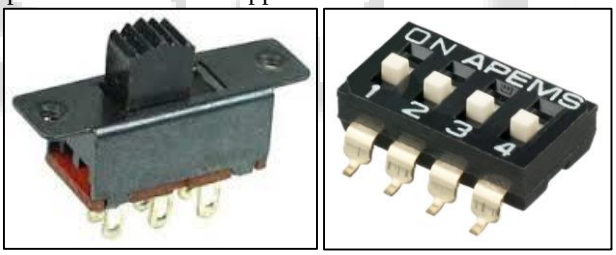

Fig. 2: Slide Switches

4) Microcontroller

Here we are using 8051microcontroller. Its clock speed is up to 20MHZ.The design engineer can choose to run the application with the conventional 80c51 clock rate(12 clocks per machine cycle)or select the X2 mode(6 clocks per machine cycle)to achieve twice the throughout at the same frequency clock. Another way to benefit from this feature is to keep the same performance by reducing the EMI. Internal RAM is of 128KB which is divided into: (a) 4 register banks. Each bank has eight 8-bit registers (R0-R7). (b) 16 bytes of bit addressable memory and (c) 80 bytes of general purpose memory. It has internal ROM or EPROM of 4KB. 128KB of external memory can be connected, 64KB for data and another 64KB for program.

The CPU requires quartz crystal to be connected to it. It determines the speed of CPU. Interrupt control block has two external interrupts, two timer interrupts and one serial port interrupt. It has two timers T0 and T1 which are used as either internal timers or counters for counting external events.

It has a serial port which can work in four different modes at various baud rates. There is a group of special function registers which are used for specific operations. There are 4 I/O ports P0, P1, P2 and P3. These can be programmed as either input or output ports.

5) Port Lines

Out of the 4 I/O ports P1 port is used for connecting to RGB LED. This port has 8 port lines among these any three lines can be used for connecting to RGB LED and four lines are used for connecting the switches.

6) RGB Led

There is one each of red, green and blue LED elements. These three LEDs share the same anode i.e. it has common anode connection. Current limiting resistors must be used to protect the LEDs from burning out.

III. WORKING

The microcontroller performs the operation of multiple colors generation from RGB primary colors by using the switches. When the circuit is switched on, red color of the RGB LED glows for a pre-programmed time interval. It then switches off for the same time.

This is followed by green and blue colours switching on and off in a similar manner and for the same time periods. By mixing red and green colours yellow colour is obtained. When red and blue colours are mixed together we get magenta. Cyan is obtained by mixing blue and green colours.

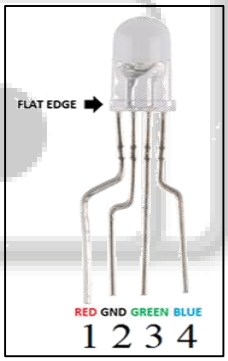

Fig. 3: 3 pin LED

1) Important components

- Microcontroller
- RGB LED
- Power Supply
- Slide switches

IV. SOFTWARE TOOLS

A. Kiel Compiler

The Kiel C51 C Compiler for the 8051microcontroller is the most popular 8051 C compiler which provides more features than any other 8051 C compiler.

The C51 Compiler allows you to write 8051 microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the C51 Compiler give you access to all resources of the 8051.

The C51 Compiler translates C source files into reloadable object modules which contain full symbolic information for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference information.

B. Flash Magic

Magic is an application developed by Embedded Systems Academy to allow you to easily access the features of a microcontroller device.

With this program you can erase individual blocks or the entire Flash memory of the microcontroller, programming and reading the flash memory, modifying the Boot Vector etc.

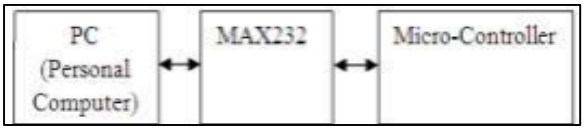

Fig. 4: Programming of software

1) Schematic Diagram

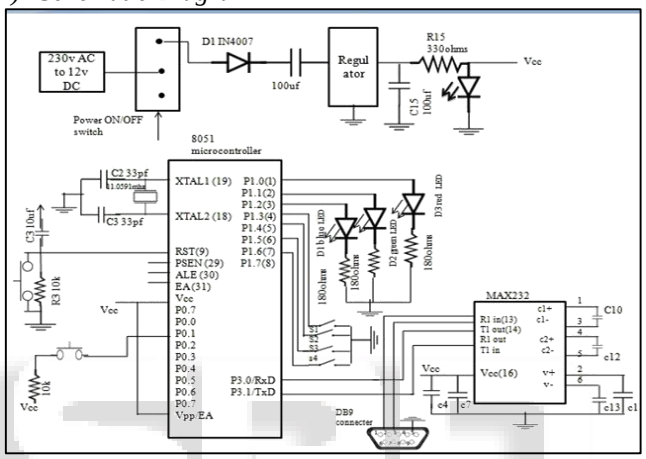

Fig. 5: Schematic diagram

2) Design Theory using PWM technique

The output color of RGB LED is controlled by varying the level of each of the three color LEDs i.e. red, green, blue. The three colors are combined to create a different color. The level of each color is set by the duty cycle of the PWM signal driving the transistor controlling the LED. As long as the frequency of PWM is higher than 50Hz no flickering is observable to human eyes. Higher the duty cycles gives higher levels of each color.

The following diagram gives the result of 3pwm signals. The red PWM is 50% duty cycle, green is 100% duty cycle and blue is 33% duty cycle due to this we get light green color.

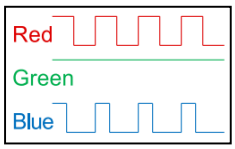

Fig. 6: PWM color mixing

The overall brightness of RGB LED is adjusted by the pulse width modulating the PWM signals for each color; whereas the overall modulation is the same for all three PWM signals. This allows the color levels to remain the same ratio between red, green and blue while dimming or increasing the overall brightness. The resulting waveforms create a different color but the overall brightness of RGB LED will be significantly reduced.

To create the three PWMs the timers of 8051 are used. To create the brightness PWMs the software counters are used.

V. ADVANTAGES

RGB LED lights create a range of colours and types of light, be easy to program and to control in real time and easy to install discreetly. Their brightness can be easily changed. On top of this, their long lifetime and small size make them the light source of the future.

VI. APPLICATIONS

They are mainly used in backlighting, general lighting systems, traffic signals, advertising signs. RGB LEDs are widely used in status and power indicators in electronic devices.

VII. CONCLUSION

This paper we can able to generate the multiple colour using the primary colours RED, GREEN, BLUE. RGB LED is used for generating multiple colours. An RGB LED is simply three separate LEDS crammed into a single 5mm LED package. RED, GREEN, and BLUE can be combined in various proportions to obtain any colour in the visible spectrum, using microcontroller.

REFERENCES

[1] Mrs. S. S. Umare, Prof. A. M. Jain, Prof. Dr. B. E. Kushare. Development of computer controlled colour mixing illumination network using RGB LEDs. IOSR Journal of engineering.
[2] St.micro electronics Application note. Generating multicolour light using RGB LED.www.st.com
[3] Controlling RGB LED colour using atmega16 AVR microcontroller. www.engineersgarage.com
[4] RGB colour generator article by Pamarthikanakaraja. www.electronicsforu.com

