A Smart City Adaptive Lighting System

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Abstract— Today electricity may be a major concern worldwide and most of the facility generation stations area unit supported typical fuels like coal however we've got restricted sources of those nonrenewable fuels. So as to minimize the dependence on these sources, we have to move on to new and renewable sources like solar and wind, etc. However proper usage of electricity could also is one of the effective tools for saving the conventional fuels. Street lights are one of the most crucial parts for public lighting systems which consume major part of the generated electricity. The conventional or manual controlled street lighting system has demerits like high power consumption, high cost and absence of effective monitoring system. This paper describes an energy economical approach of Good Street lighting system, which can mechanically management the shift and intensity of street lights supported encompassing intensity level. Basically a smart street lighting system could be a versatile street lighting system.

Key words: Adaptive Lighting System

I. INTRODUCTION

A Smart Street Lighting System is associate intelligent street lighting system that has got to light at the correct time and function seamlessly. A city's street lights meant for providing safer traffic conditions, safer pedestrian environment and may represent an excellent improvement to the city's architectural, touristic and commercial output. By implementing this system individual dimming and ON/OFF switching of the road lights becomes a simple task. We can choose our pre-programmed schedules; plan a schedule of our own to manage every street lamp, automatically according to our needs [1], [2].When the road lighting must decrease in an exceedingly sure space or within an exact time span, this system helps to dim the lights accordingly. If the pedestrian traffic decreases significantly say between 1:00AM and 5:00AM, then dimming the lights is the right solution. It will reduce the illumination of the street lights to twenty whenever no pedestrian or vehicle was detected. By this we will considerably reduce energy consumption and CO2 emissions, also reducing light pollution and overall environmental impact. The system architecture of a smart street lighting system is shown below (Figure 1) through a simplified block diagram. It consists of a microcontroller module which regulates the entire sensing and controlling activity for the system. This proposed system also having different sensors for sensing various parameters, a voltage regulation circuit which regulates the input voltage for the LED module, an LCD for local display and GSM/GPRS module for wireless communication with the control centre. .

II. METHODOLOGY

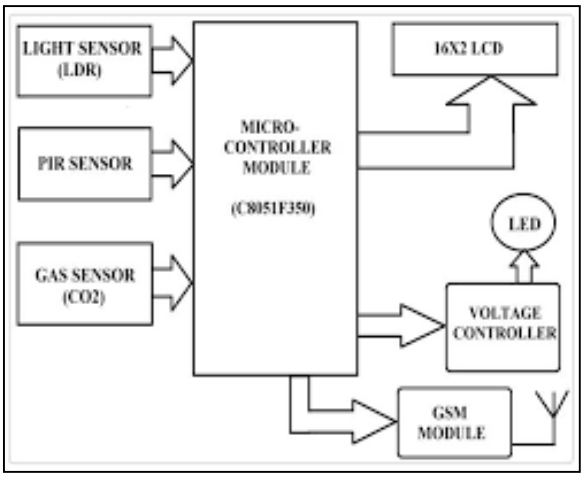

Fig. 1: Block Diagram of Smart Street lighting System

III. HARDWARE DESCRIPTION

A. *Microcontroller (MCU) Module*

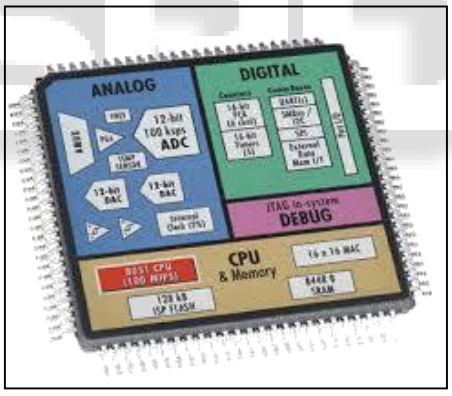

Fig. 2: Pin Diagram of Microcontroller C8051F350/1/2/3

Microcontroller C8051F350/1/2/3 devices are fully integrated mixed-signal System-on-a-Chip MCUs. There highlighted features are listed below. They have a high-speed pipelined 8051-compatible microcontroller core (up to 50 MIPS). In-system, full-speed, non-intrusive debug interface (on-chip). Also having a 24 or 16-bit single-ended / differential ADC with analog multiplexer. Two 8-bit Current Output DACs. A precision programmable 24.5 MHz internal oscillator and 8 kB of on-chip flash memory. On-chip RAM is of 768 bytes. SMBus / I2C, Enhanced UART, and SPI serial interfaces implemented in hardware. Four general-purpose 16-bit timers. Programmable counter / timer array (PCA) with three capture / compare modules and watchdog timer function. On-chip power-on reset, VDD monitor, and temperature sensor. On-chip voltage comparator and 17 I/O.

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B. LCD Display

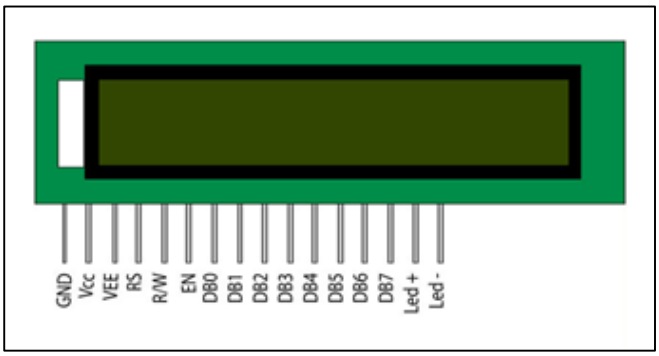

Fig. 3: LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LCDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom character (unlike in seven segments), animation and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data [4].

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

C. GSM Modem

Fig. 4: GSM Modem

GSM module issued to establish communication between a computer and a GSM system**.** Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries**.** Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate**.** GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces **(**like RS-232, USB, etc) for computer. The MODEM is the soul of such modules.

IV. ADVANTAGE

The advantages of smart lighting are as follows:

1) Energy saving
2) Reduced maintenance costs.
3) Burn hour optimization
4) High up-time and immediate fault location
5) Load balancing and Load shedding
6) Provides user interface that makes the User to find the information they need quickly and easily.
7) Visual graphical environment to track failures, check system health and collect, organize and store data.
8) When a fault is detected, an alarm is immediately sent to the web platform. If necessary, the alarm can be distributed to relevant people via email or SMS.
9) Generation of automatic statistics for historic data analysis.

V. FUTURE SCOPE

Moving with the new & renewable energy sources, this system can be upgraded by replacing ordinary LED modules with the solar based LED modules. With utilizing the latest technology and advance sensors, we could serve the same purpose of automatically controlling the street lights much more effectively both by cost and manpower. The main objective of the project is to save the energy, and by doing so we would be able to lighten few more houses. This model could be implemented with few modifications as a source of revenue; as charging station for battery operated vehicles.

VI. RESULTS

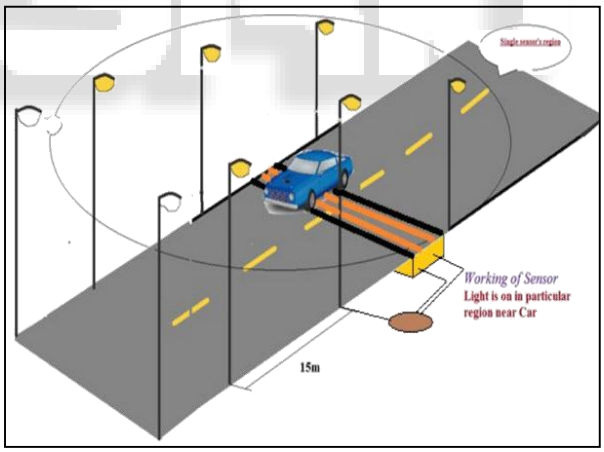

Fig. 5: Smart Street Lighting

In above fig. 5, we have seen that the more energy has saved. Problem of load balancing & load scheduling does not occur. The location as shown of fault is found easily & immediately. Provides user interface that makes the User to find the information they need quickly and easily. Therefore maintenance cost has reduced.

VII. CONCLUSION

The proposed system which is described in the paper can effectively save energy by reducing the power consumption as per requirement. Since this is a sensor based system, so it is self-controlled and automated system. Faults could be easily detected using LDR in this system and rectified accordingly, which is usually ignored in the conventional

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system. However at the same time the system is also flexible for any modification or further expansion such as interfacing of new sensors, connecting surveillance camera for the security purpose, etc. This project of Smart Street Light System is a cost effective, practical, eco-friendly and the safest way to save energy. It efficiently saves the energy by replacing the conventional bulbs by LEDs and by automatic switching/dimming of LEDs as and when required. Main drawbacks of this system are the initial cost and maintenance. However large scale implementation of this proposed system will definitely reduce the overall cost of the project up to great extent. The project has scope in various other applications like for providing lighting in bus shelters, parks and parking lots of shopping malls or market areas.

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