

Advance Power Saving System Using RTC, GSM and PWM Technology

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ABSTRACT

The goal of this project is to design a lighting system with the aim of energy saving and autonomous operations. One of the most important challenge is faced by costumer electronics in these days is energy saving. Artificial luminaries account for a great part of day to day total energy consumption. This emphasizes the need for an energy efficient lighting system.

I. INTRODUCTION

The earth provides enough to satisfy every man's needs but not every man's greed. We use energy faster than it can be produced, the resources like coal, oil and natural gas take thousands of years for formation. At present the available resources are limited and these resources cannot be reused or renewed. With the constant increase in the demand and deficit in the power generation a gap has been created. Our main aim should be at decreasing this gap which can be achieved by effective utilization of the energy and its conservation. Energy that is conserved is equal to the energy generated that is when we save one unit of energy, it is equivalent to 2 units of energy produced.

Energy conservation can be achieved in domestic, public or in any other sector, under current situation the public utilization such as street lights is considered. As Street lamp lighting is city's part of infrastructure, which plays major role in illuminating the city. With growth in urbanization, the number of streets lamps has increased which has made its control and management difficult. At present, street lamps are controlled manually in most of the cities, in case of manually operated street lights, lack of timely switching ON and OFF is accounting for unnecessary wastage of electrical power. So in order to overcome this issue, automatic street light controls are introduced.

In the designed system control is based on 1) Intensity & 2) Time. In the intensity, control method is related to light intensity. When the light intensity is low, lamp will glow and will turned OFF automatically when the light intensity become more. However, the drawback of this control method is, during cloudy days, the intensity of light is very low all over the day. This will make the lamp to glow for the entire day which leads to power loss. Also, in case of lighting there is always chance for false triggering. Hence time based method which uses RTC (Real Time Clock) is combined with intensity control method (LDR).

In time based control method, light should be ON/OFF for the fixed time duration. However, this method also have some disadvantages as, in summer, days are of long duration and vice a versa in winter. So, the lights should be turned OFF earlier during summer than in winter. But the time duration is already set and it cannot be changed.

To overcome these drawbacks, microcontroller is introduced which will consider the parameters LDR and RTC according to the mode selected. This makes the system easy to operate in any environmental condition. Here we use GSM communication system as a method of wireless communication for mode selection of operation of street lights. This switching system eliminates human intervention, thus replacing the manual operation which is prone to errors and bringing in cost effectiveness.

II. RELATED WORK

2.1 Intelligent street lighting system by the author Rajput K remotely control the street light during various peak and off peak hours and also tackles the problems of power theft, and also responsible to handle the unpredictable climatic change.

2.2 A Huge amount of energy is wasted in the street lights where the street lights burns with full intensity even in the absence of traffic. In-order to overcome this problem, Lavric A have designed the WSN to remotely control the street lights and its intensity according to the data received from the Doppler sensor .

III. PROPOSED WORK

3.1 Working of RTC

Real Time Clock (RTC) is a battery-powered clock that is included in a microchip in the computer motherboard. A small memory on this microchip stores system description or setup values, including current time values stored by the Real Time Clock. The time values are for the year, month, date, hours, minutes, and seconds. When the computer is turned on, the Basic Input-Output Operating System (BIOS) that is stored in the computer's Read Only Memory (ROM) microchip reads the current time from the memory in the chip with the real-time clock. A Real Time Clock (RTC) is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time.

Although tracking of time can be done without an RTC, using one has the following benefits:

- power consumption (important when running from alternate power)
- Low Frees the main system for time-critical task
- Sometimes more accurate than other methods
- The main advantage of RTC is that they have an arrangement of battery backup which keeps the clock / calendar running even if there is power failure.

(RTC) IC is an 8 pin device uses I2C interface. The DS1307 is a low-power clock/calendar with 56 bytes of battery backup SRAM. The clock/calendar provides seconds, minutes, hours, day, date, month and year qualified data. The end date of each month is automatically adjusted, especially for months with less than 31 days. The DS1307 IC is as shown in the Figure 3.1.

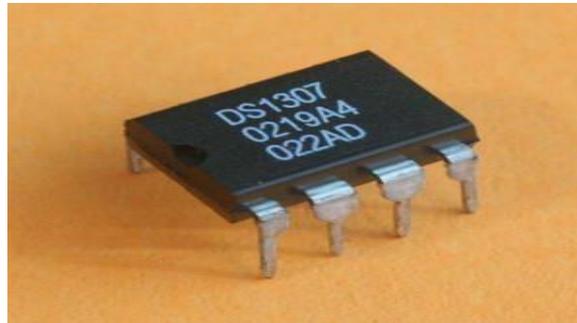


Figure 3.1: IC DS 1307

3.2 Working of LCD

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 looks like as in figure 3.2.1 and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and soon.



Figure 3.2.1: LCD Display

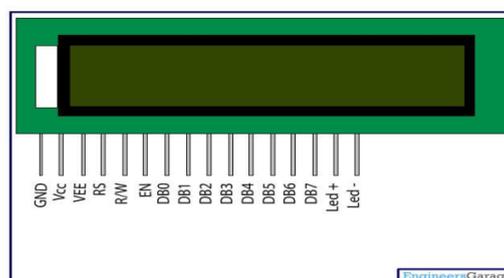


Figure 3.2.2: Pin diagram of 16*2 LCD

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. The various pins that are available for the connection can be viewed in figure 3.2.2. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

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. Most LCDs contain Hitachi HD4478 controller.

3.3 GSM Module

GSM (Global System for Mobile Communications) is a standard to describe the protocols for second-generation digital cellular networks used by mobile phones. GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. The GSM module that has been used is shown in figure 3.3. The coverage area of each cell varies according to the implementation environment.

Cell horizontal radius varies depending on antenna height, antenna gain, and propagation conditions from a couple of hundred meters to several tens of kilometers. The longest distance the GSM specification supports in practical use is 35 kilometers. Indoor coverage is also supported by GSM and may be achieved by using an indoor pico cell base station, or an indoor repeater with distributed indoor antennas

One of the key features of GSM is the Subscriber Identity Module, commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM



Figure 3.3: GSM module

IV. HARDWARE AND SOFTWARE REQUIREMENTS

In this project the list of hardware components used are given below:

- 1) LDR (Light Dependent Resistor)
- 2) RTC (Real Time Clock)
- 3) LCD Display
- 4) Power supply
- 5) Voltage regulator
- 6) PIC-16F877A Microcontroller

- 7) MOSFET
- 8) Capacitor
- 9) Resistor
- 10) Diode
- 11) LED(Light Emitting Diode)
- 12) Vapor lamps
- 13) Relay
- 14) USB to UART Connector

V. CONCLUSION

The proposed system can able to reduce the power consumption to the maximum limit and also this system will help us to keep the working environment in a pleasant and comfortable manner. The results show that the implemented module is functional and the proposed module is useful for the energy saving purpose in the lighting space.

Our main aim of conserving energy was achieved by controlling the intensity at which the LED lamp glows. This was carried out by continuously sensing the available intensity in the surrounding environment. This project ADVANCE SWITCHING SYSTEM FOR STREET LIGHTS TO CONSERVE ENERGY is a cost effective, practical, eco-friendly and the safest way to save energy. Urban areas are the suitable places for implementation of such street lighting system where the wastage is more. As GSM technology is being made use of complexity in wiring is reduced.

VI. ACKNOWLEDGEMENTS

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