ULTRA POWER SAVING FOR STREET LIGHTING SYSTEM

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ABSTRACT: *In this paper an ultra power saving for street lighting has been implemented. It helps to reduce the unnecessary power consumption due to over illumination in natural light. By using RTC (Real-Time-Clock) and it generates the timer automatically. With the help of PIR sensor the presence of a person or any obstacle detected by using the presence detector. Street lights will be switched ON only when a person on any obstacle comes in the detection range else it will be automatically dimmer mode. The designed system avoids the human intervention in power management. It displays the particular billing information on LCD and data can be sent to the prescribed number by using GSM module.*

I. INTRODUCTION

Streetlights are an integral part of any developing locality. They are present on all major roadways and in the suburbs too. Every day, streetlights are powered from sunset to sunrise at full strength, even when there is no one around. On a global scale, millions of dollars are spent each day on these street lights to provide the required electrical energy. This system is commonly used in all streets of street light system. But in this method, there is a loss of heavy electricity in the whole night. If the street light is not stopped after the night, the loss will continue throughout the day. And also the street light illumination is not necessary when there are no human movements in the street. So to come out of these disadvantages this project this allows the significant cost savings and a greater respect for the environment.

So, the environmental issues have gained widespread international attention, resulting in the development of energy-efficient technologies aimed at reducing energy consumption. One aspect of the situation is an increasing demand for the reduction of the amount of electricity used for illumination. In particular, energy conservation for large scale illumination tasks such as street lighting is gaining considerable importance. The street light system is one of the largest energy expenses for a city, accounting for upwards of 35-45% of a municipality's utility budget .The power saving lighting control system can cut municipal street lighting costs as much as 70%. This lighting system is a system that adjusts light intensity based on usage and occupancy of the traffic as it illuminates a certain number of street lights ahead and fewer behind, depending on movement of vehicles.

The main objective of this project is to design an ultra power saving for street lighting system. The most use of new technologies for the sources of light is presented. In this area, the PIR sensor is used to find the human movements and vehicle movements or any oscillation between any objects in streets. When the presence is detected, all surrounding street lights glow at their brightest mode, else they stay in the dim mode. Incandescent bulb is the source electric light works by incandescence (general term for heat driven light emission). It has the lowest efficiency or the highest power consumption among the lights, which the power are mostly wasted in the bulb heating So, this control can be implemented through a GSM network of sensors to collect the

relevant information related to the management and maintenance of the system, send the information via SMS by using the GSM network.It is used to monitor the street light status and to control the street lights in emergency condition. To control this PIR sensor here, we are using the ARM7 (LPC2148) microcontroller to communicate with all the peripherals present in the project.

II. PROPOSED SYSTEM

In the proposed system, we implemented five new things are there. They are:

1) RTC (Real-Time-Clock).
2) PIR Sensor 1&2.
3) Relay (ULN2803).
4) Incandescent Bulbs.
5) ARM7 (LPC2148).

In the figure1 shows that block diagram of the proposed system. Here we are using LPC2148 which is an advanced RISC machine. It is a 32 bit controller which follows von Neumann architecture. While we switch on the power supply the experimental operation will takes place in evening 7pm to 7am. How means based on RTC timing conditions. It is capable of changing its luminance level during day and night time. By using PIR sensor, the presence of a person or any obstacle is detected by using presence detector sensors. Street lights will be switched ON only when a person or an obstacle comes in the detection range else the light will be dimming mode. Incandescent bulbs can be implemented here because of more efficiency and it can be easily identified the light dimming mode and brightness mode. With the help of Relay Driver (ULN2803), we used 4 relays. By using these relays we can control the power supply for light brightness and dimming mode. For light brightness mode the voltage can takes in 220V and for dimming mode the voltage can takes place in 110V.So, for these purpose power supply can control by relay. Finally, it displays the corresponding billing information on LCD displaying unit and data can be send in the form of SMS way through the GSM Module. The ARM7 (LPC 2148) based hardware system consists of a processor core board and the peripheral board. The entire programming for microcontroller operation is based on Embedded C Language in Keil software. If this ultra power saving for street lights is designed and installed in the cities, then, lot of power can be saved and this will also minimize the cost of maintenance over traditional wired systems.

A. BLOCK DIAGRAM

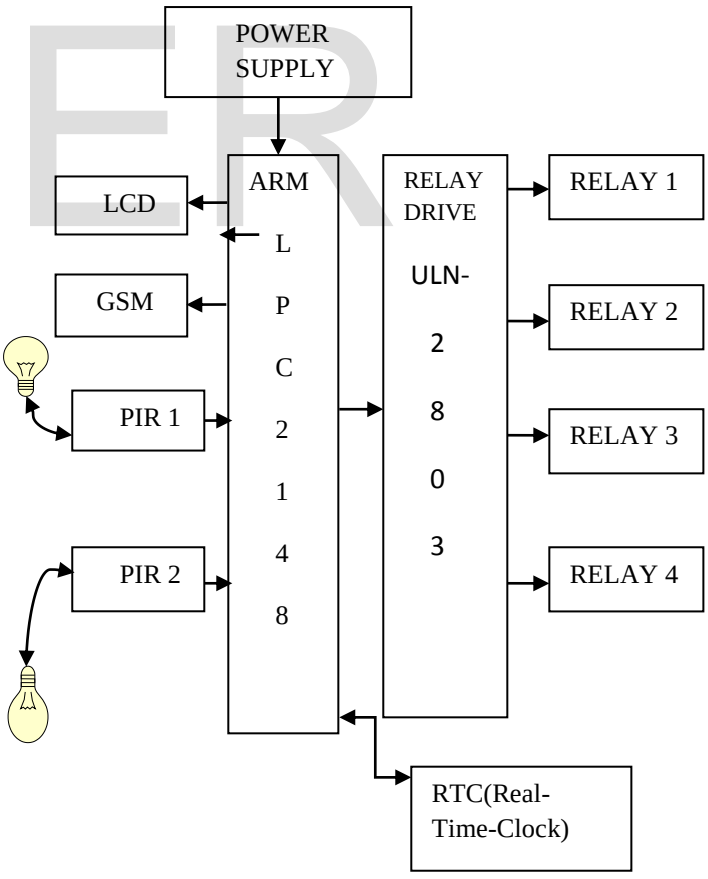

Fig1:Block diagram of the proposed system.

B. FLOW CHART

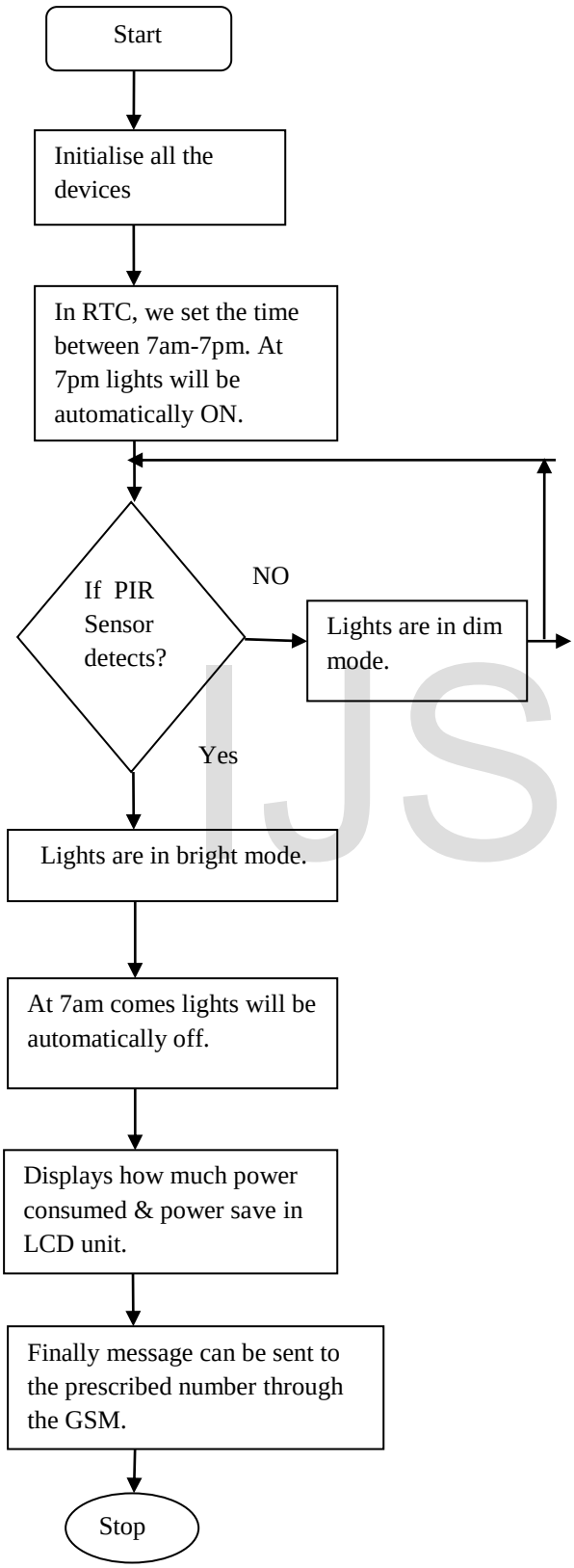

Fig 2: Flow chart of the proposed system.

C. APPLICATIONS

1) Cities or any remote areas also.
2) Hospitals.
3) Educational Institutions.
4) Industries.

D. ADVANTAGES

1) RTC (Real Time Clock) can work based on given timing conditions.
2) The range of PIR sensor is very high.
3) It can detect up to 6mts.
4) Billing rates will be reduced.
5) Manual work can be reduced.

III. RESULTS

When the power supply is connected to the supply unit. Port connections are given to the Port P0.11 is connected to PIR1 and P0.12 is connected to PIR2 sensor. The port P1.16 is for RS and P1.17 is for RW and P1.18 is for EN pins. These 3 are control lines. P1.24 to P1.31 is connected to LCD for data lines connections (D0-D7). GSM is connected to UART 0. Relay connections are P1.21 for relay1 and P1.22 for relay 2 and P1.23 for relay 3 and P1.24 is for relay 4.

The experimental results are as shown as below. Here we have taken two conditions namely **Condition 1: Both the street lights are in dimming mode.**

Fig3: Both the street lights are in dim mode.

In the above figure 3 represents that, both the street lights are in dim mode. It indicates that both the PIR sensors are closed. It means that there is no motion detection happens at this moment. Here the experimental operation can takes place in 2 minutes.

For 2 minutes calculations:

Total power = power consumed + power save

= 0.5610W+0.5610Wdisplays in LCD unit.

Fig4: Power consumes & power saves displayed in LCD unit.

In the above figure 4 represents that 'C' indicates that Consume and 'S' indicates that Save.

Fig5: Message sent to the control room.

Fig 6: Message received to the prescribed number.

In the above figure5 &6 represents that, message sent to the control room then how much power consumes and power saves receives in the form of SMS way to the prescribed number.

Condition 2: Both the street lights are in bright mode.

Fig7: Both the street lights are in bright mode.

In the above figure7represents that both the street lights are in bright mode. Here the experimental operation can takes place in 5 minutes.

For 5 minutes calculations:

Total power = power consumed + power save

= 2.2100W + 0.3740W displays in LCD unit.

Fig8: Power consumes & power saves displayed in LCD unit.

In the above figure 8 represents that 'C' indicates that Consume and 'S' indicates that Save.

Fig 9: Message sent to the control room.

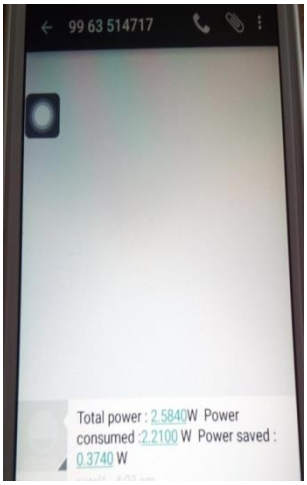

Fig10: Message received to the prescribed number.

In the above figure10 represents that, how much power consumes and power save received to the prescribed number.

Tabular Column:

S.No.	Conditions	Time(Sec)	Power Consume in (W)	Power save in (W)	Total power(W)
1	Both the street lights are in dim mode.	For 2 minutes	0.5610 (W)	0.5610 (W)	1.1220 (W)
2	Both the street lights are in bright mode.	For 5 minutes	2.2100 (W)	0.3740(W)	2.5840 (W)

Table 1: Power calculated in minutes format.

S.no	Conditions	Time(s)	Power consume in (W)	Power Save in (W)	Total power (W)
1	Both the street lights are in dim mode.	1 hour	16.830 W	16.830 W	33.66 W
2	Both the street lights are in bright mode.	1 hour	26.524 W	4.704 W	31.228 W

Table 2: Power calculations in one hour format.

S. No.	Conditions	Time (S)	Power consume in (W)	Power save in (W)	Total power (W)
1.	Both the street lights are in dim mode.	For 12 hours	201.96 (W)	201.96 (W)	403.92(W)
2.	Both the street lights are in bright mode.	For 12 hours	318.288(W)	56.448 (W)	374.736(W)

Table 3: Power calculations in 12 hour format.

IV. CONCLUSION

The proposed system can detect day/night time and vehicles and vary the intensity of the street lights using RTC (Real–Time-Clock) technique in incandescent lamps as per the traffic flow. With the help of Relay the street lights can control in the position of On/Off/dimming mode. Thus, if an ultra power saving for street lighting system can designed and installed in the cities, then, lots of power can be saved. In which integrates new technologies available on the market to offer higher efficiency and considerable savings. Another advantage obtained by the control system in power saving management of the lamp posts by sending data to a central station by using GSM communication. The proposed system is particularly suitable for street lighting in urban and rural areas where the traffic is low at a given range of time. The goal is, therefore, reduction of power consumption and harmful atmosphere emissions. The system is versatile and can be extended according to user needs.

V. FUTURE SCOPE

After having implemented this ultra power saving for street lighting system, what remains is the scope for improvements. Firstly, we could directly go for Wireless Power Transmission which would further reduce the maintenance costs and power thefts of the system, as cable breaking is one of the problems faced today. In addition to this, controlling the Traffic Signal lights would be another feature that we could look into after successful implementation of our system. Depending on the amount of traffic in a particular direction, necessary controlling actions could be taken. Moreover, attempts can be made to ensure that the complete system is self-sufficient on nonconventional energy resources like solar power, windmills, Piezo-electric crystals, etc. We hope that these advancements can make this system completely robust and totally reliable in all respects.

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VII. REFERENCES

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