

Insolated Street Lights with Flaw Detection

Anitha J^{#1}, Harshinee S B^{#2}, Lakshmi Priya V^{#3}, Saktheeswari K^{#4}, Mrs.Sarala R^{#5}

^{1,2,3,4} Dept.of Computer Science & Engineering,

⁵Assistant Professor, Dept.of Computer Science & Engineering,

Velammal College of Engineering &Technology,

Madurai, Tamilnadu, India.

Abstract

Street light is one of the most important source in our day to day life. The current system doesn't possess any separate device for controlling the unnecessary wastage of power consumption that causes because of street lights. As a human we cannot continuously monitor over the unnecessary wastages. This project concerns about how to control the power consumptions at the streets and eliminating manpower. The PIC 16F877A micro controller controls and coordinates the overall functioning of the system. We use two sensors (IR sensor and Light dependent resistor) to control and guarantee a better efficient system. The existing system cannot perform the presence of a person or an obstacle, fault caused in the light and power consumption in a single system. As a new system we put together the IR sensors to detect the movement of vehicle or person, LDR to identify the day and night mode, solar panel for power consumption and GSM for sending messages. Street lights will be switched ON only when a person or an obstacle comes in the detection range else it will be switched OFF. This system will help people in power consumption and detect the faults that occur in the street lights and to intimate the control room to take immediate action.

Keywords — PIC Microcontroller, GSM, IR Sensor, LDR, Fault detection using SMS alert

I. INTRODUCTION

In today's world street light plays an important role for safety purpose, especially during the night time. If the street light is not glow, it is difficult to find the way for our destination and cause the road accident and also it will increase the crime rate. To reduce the above problem, street light is important to glow automatically. In real time scenario, street lights are switched ON after the sunset and switched OFF before the sunrise with the help of man power. If the street lights is frequently glow for the whole night it will damage the street light and also increase the energy consumption.

However these street are lightened for nearly 13 hours daily even there is no need for lights. The consumption of electrical energy is high. Lightening

national highways to small streets need lot of electrical energy and approximately it consumes about 30% of total electrical power of any country is consumed in lighting the road and street. The cost for spending electrical energy for lightening is high. Additionally the use of sodium vapour lamp and mercury lamp CO₂ is emitted which increases the pollution and lifetime of lamp is also not efficient.

This project gives the best solution for the wastage of electricity. In addition, here another remarkable side of this project is that we can avoid electricity supply for lighting the street light, instead of that we can use solar cell for the power supply which can save around 30% of electricity wastage. This project will detect the fault in the street light and send the intimation to the control room with the help of GSM module.

II. EXISTING SYSTEM

- In the Existing system we find many types of street lights, where the power consumption is not efficient.
- In the Existing system where the street lights will be switched ON in the evening before the sunset and they are switched OFF in the next day morning after there is sufficient light outside. Therefore it waste lot of energy between the day and night time.
- It requires manpower to maintain and control the streetlights.
- The staff will not be able to initiate a repair until there is any intimation of fault.

III. PROPOSED SYSTEM

- In our proposed system enables maintenance and control of the streetlights.
- It will be easier to monitor and control the operation of streetlights.
- The system will detect faults in the streetlights to intimate the control room to take immediate action.
- Street lights will be switched ON only when a person or an obstacle comes in the detection range else it will be switched OFF.
- Solar energy is collected with the aid of solar cell and battery is charged during day time and this

energy is used for power street lights during night time.

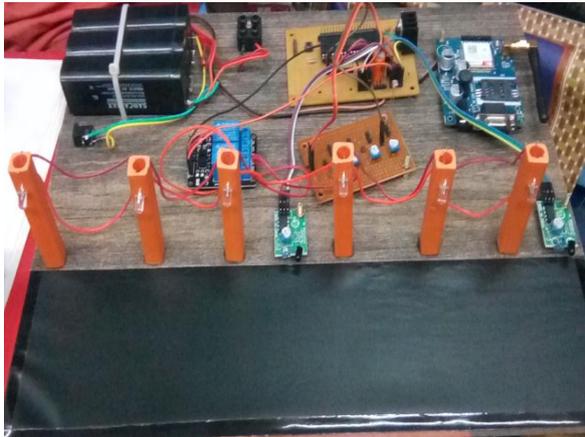


Figure 1: Automatic Street Lights

IV. BASIC FRAMEWORK

The system is designed in such a way that the street lights are automatically on when the resistance of the LDR reaches its threshold value and the IR sensor detects the movement of any object or vehicle.

Figure 2 shows all the interfaces used in the prototype of the system.

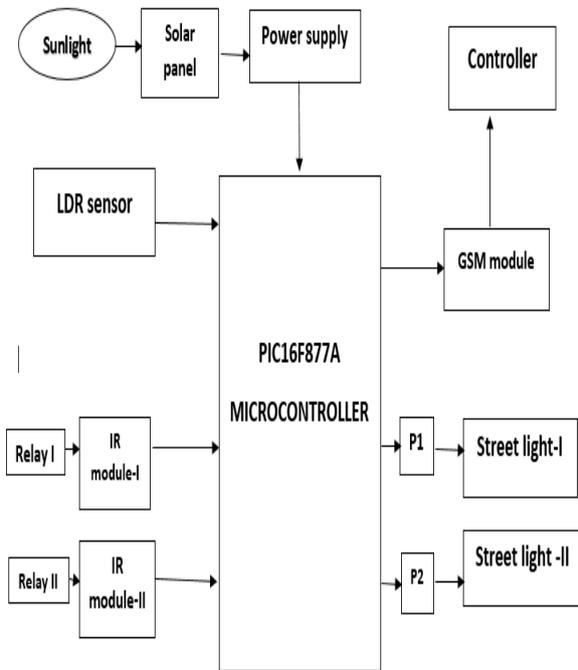


Figure 2: Block Diagram

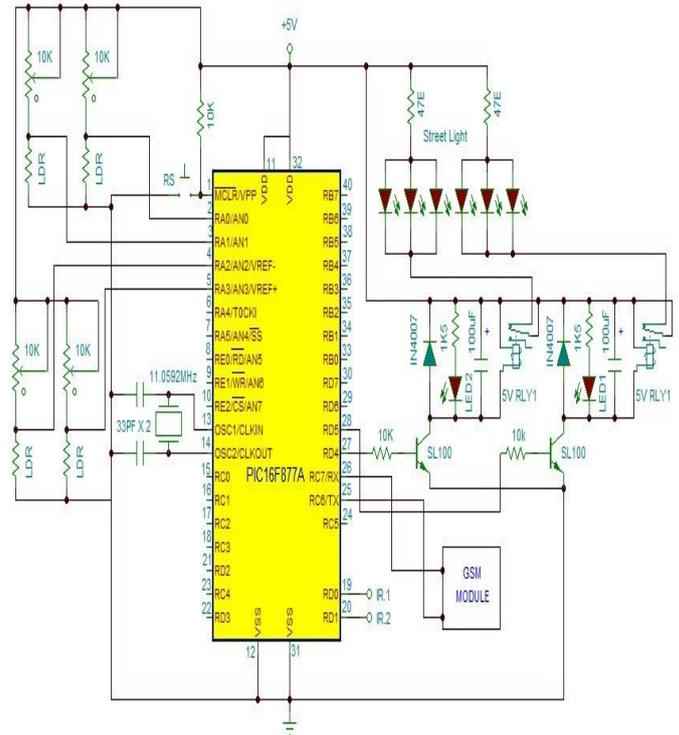


Figure 3: Pin diagram

A. Working Description

This proposed system consists of LDR, IR sensor, PIC16F877A Microcontroller, Relay, Solar panel, Rechargeable battery and GSM.

1). PIC16F877A Microcontroller :

A microcontroller is one of the powerful computer control system on a single chip. This microcontroller has many electronic circuits built in it, it will decode written instructions and convert them to electrical signals. The microcontroller will work with the above step through these instructions and execute them one by one.

2). LDR (Light Dependent Resistor) :

LDR circuit is used as light sensor to sense the ambient light. Street lights are to be automatically switched on or off depending on the intensity of the sun light on LDR. As the intensity of sunlight reduces, the resistance of LDR increases.

This threshold value decides when the street lights are required to switch ON. As the resistance value will be maximum in the nights, the LDR will switch the street lights to higher intensities and it will remain at high until real time clock reaches a preset value.

3). Infrared Sensor (IR Sensor) :

For detecting the presence of a person or vehicle in the detection range it is accomplished by using IR sensors.

After detection of vehicle by IR sensor, IR sensor send signal to Micro Controller to turn ON street li
When the vehicle is not detected by IR sensor, street light will remains OFF.

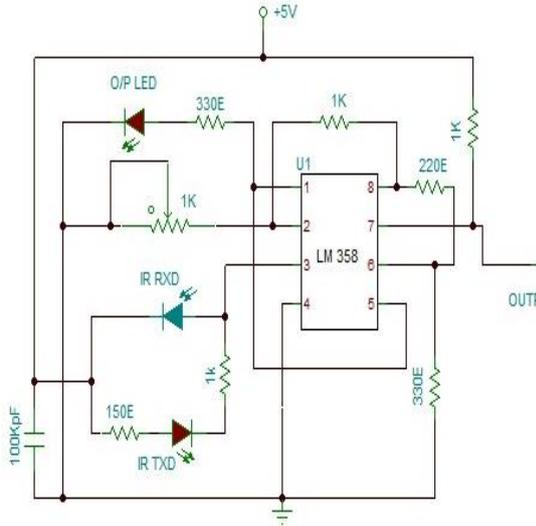


Figure 4: Pin diagram for IR sensor

4). GSM module :

GSM stands for global position for mc communication. GSM is a kind of protocol that is used for connecting mobile or radio communication. It is used because it is low cost and long wire communication channel there is no need of high rate.



Figure 5: GSM SIM800

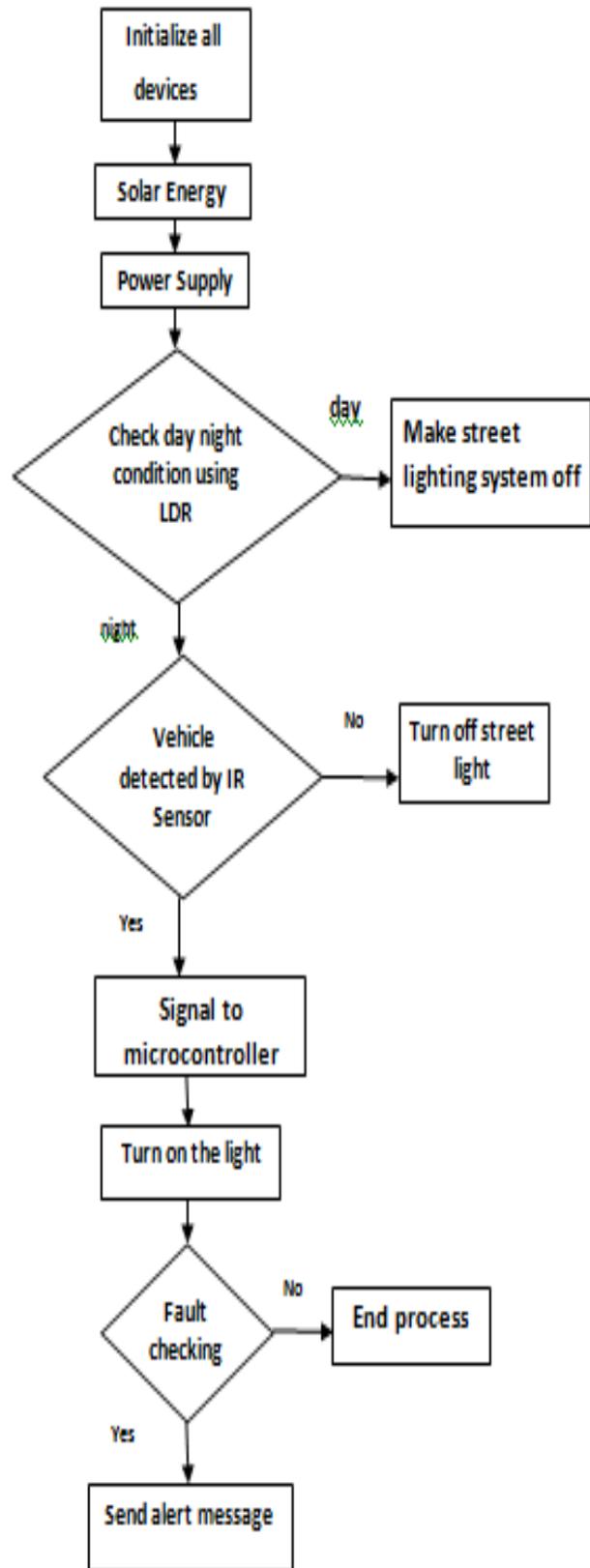


Figure 6: Flow diagram

B. Modules Identification:

Module 1: Automatic Switching

The entire system will on only when sunlight goes below the visible region of our eyes and when the sunlight comes visible to our eyes, the system will be off. This situation is sensed by the sensor called Light Dependent Resistor (LDR).



Figure 7: Automatic switching

Automatic switching module consist of LDR, IR sensor, PIC16F877A Microcontroller. LDR, in which resistance varies according to the amount of light falling on its surface, that checks whether it is a day time or night time. The street lights are in off condition, when it is in day time. The street lights will get on only when the light dependent resistor sense it is in night time.

IR sensors are placed on the side of the road, which can be controlled by PIC16F877A microcontroller. The IR will be activated only on the night time. If any vehicles or persons crosses the IR beam, a particular light will be automatically ON.

Module 2: Saving Solar energy for power supply

Street lamps runs using solar energy which are non-polluting source of power and requires much less maintenance compared to conventional street lighting system. The stored energy in the battery is used to give power supply to the street lights.

Module 3: Fault detection

The proposed model street lights are managed by using GSM module when they are not in working condition. UART (Universal Asynchronous Receiver-Transmitter) is a computer hardware device that is used by microcontroller, for asynchronous serial communication in GSM module is to send alert messages. Each street lamp will be monitored continuously by the use of fault detecting circuit. If the circuit detects any faults in the street lights it sends the information to the controller which in turn notifies to corresponding maintenance department using the GSM module

The faulty condition of the lamps are detected by using light dependent resistor attached close to the street lights. In this system we use LDR for two main purposes that is to check the Day/Night condition and another is to detect the faulty lamps. PIC Micro Controller will check this condition only when the corresponding street light is switched ON. When the IR sensor detects the movement of vehicles or any other objects in its range in night mode then the street lights are automatically switched on, at this situation if any lamps is not in working condition then it is sensed by the LDR, then the signal is send to the microcontroller. When this condition is triggered the PIC Micro Controller will sends a alert message to the control room using the GSM modem connected to the processor and thereby making a better management system.

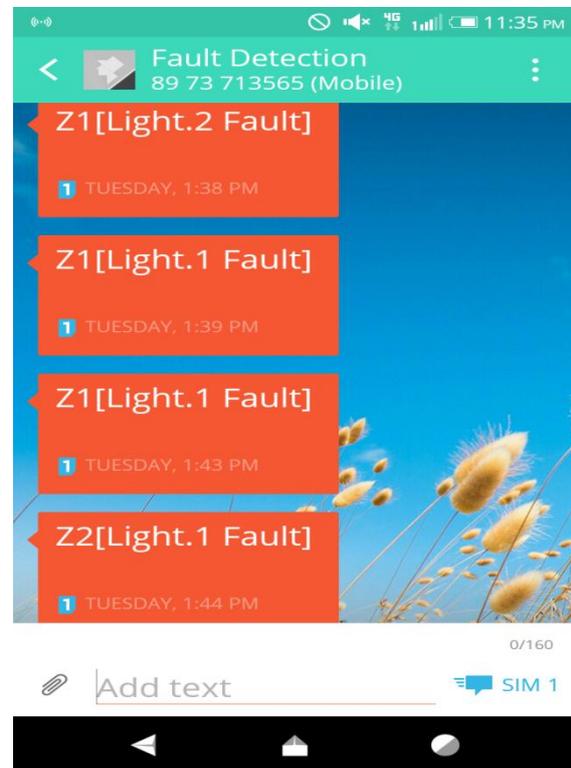


Figure 8: Fault detection alert message

I. FUTURE WORK

- Objects and animals are differentiated by using various sensors.
- Pole damage detection by using suitable sensors.
- Traffic speed sensors are used to manage traffic.
- In, Future we detect sensor's faults and power supply faults in the system.

- The project has scope in various other applications like for providing lighting solutions in industries, campuses, garden lighting and parking of huge shopping malls.

II. CONCLUSIONS

This is a cost effective and the safest way to optimize the use of street-lights. Being an automated system, it overcome the man-made problems regarding switching off the lights. We can easily identify the light faults in this system easily and also the system sends alert message to the authorized person's mobile numbers. Use of GSM technology made the system wireless, less complex. Finally this control circuit can be used in a high ways between the cities.

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