Development of Smart Cities to Control Illumination and Fault Monitoring System

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ABSTRACT: The objective of the project is provide automatic control and fault detection on street lights Street lighting is one of the major parts of a city's infrastructure where the main function is to illuminate the city's streets during night time. Each streetlight is digitally connected to the network and can be interconnected to each other to provide a higher accuracy of data collection. In the current situation, public lightings are usually turned on before the local sunset and turned off after the local sunrise where visibility is sufficient. Sensory network incorporating infrared sensor, temperature sensor, light sensors are used for real time vehicular detection and ambient light monitoring. Programmable displays, alert system and a real time clock dimming scheduling, notification and measurements are implemented. The microcontroller acts as a microcomputer to govern the operations of the Intelligent street Lighting system. Evaluation shows that through combining different methodology it allows more energy and cost saving in street lighting

KEYWORDS: Light Emitting Diodes. Street Lighting, Microcontroller, sensors, Communication

I. INTRODUCTION

 In lighting system, particularly within the public sector are not designed as per the standards of the reliability and low power consumption and they wont use latest technological developments. Recently however with the increasing importance for saving power and proper maintenance are leading to develop new techniques and technologies which permit significant power savings and larger respect for the environment and more effective management. In this model we proposed three solutions to those issues. The main lamp types used in street lighting are the high pressure discharge lamps, e.g.: mercury vapor lamps, HPS lamps, and metal halide lamps. The discharge lamps demand a ballast that provides their starting and steady state behavior, which is commonly electromagnetic. The power consumption is achieved using High power LEDs for the source of light, which uses less power and gives more illumination. The second one and perhaps the most revolutionary is the use of remote management system. This system uses light dependent resistors for finding the faulty condition of any bulbs and then giving the information to the processor, which will then send a message to the control room, by using GSM modem. Finally, the third solution is to use of renewable energy as power source instead of typical power sources, therefore taking care of the environment. In this field solar

energy is the most often used resource. Our work aims at unification of the three prospects, making an intelligent street lighting system, which uses high power leds , and using solar energy as the alternative energy. The management system is implemented by using fault detector circuit to gather the faulty state of the lamp and then transferring the data to the arm processor. Arm processor takes the relevant action whether to notify to the control room or not based on the state of the street lamp.

Therefore, it highlights the energy efficient of street lighting design using LED lamps through intelligent sensor interface for controlling and managing. The original contribution of this is to design of a streetlight node based on which the system can be set to run in automatic mode, which control streetlight according to Sunrise and Sunset Algorithm and light intensity. Reasonable adjustment according to the seasonal variation can be made using this control

II. EXISTING SYSTEM

Street light is poorly designed and not regularly maintained. The switches of street lights are switched ON/OFF manually by the workman in the entire zone. This leads to the rise of man power and time. As it is human operation it is lead to errors. The street lights are switched ON/OFF manually by the workman in all the zones. This leads to the rise of man power and time. As it is human operation it is prone to errors. There is a complaint register in every zonal office street light section. The maintenance of street light is done by the line technician. The complaint received from public and corporation officials either over phone is in person being recorded in the complaint register. The complaint which is entered is cleared by the technician.

The complaint received from public, councilors and corporation officials either over phone is in person being recorded in the complaint register, the complaint registered is handed to the certain street light officials where they repair the street light which involves a lot of wiring work. Fixing these lines may take more than 2 to 3 days which creates a lot of problems to the people and also sometimes telephone line may be busy, sometimes no response.

III. PROPOSED SYSTEM

In this project a new innovative street light system with optimized street light management and efficiency is presented. Hence the health of the street lamp status is monitored by this system .Instead of switch off the lamps we control the intensity of lamp which reduces the maintenance of lamp as well as increases life of lamp. This feature allows great energy conservation. In addition, any faulty lamp will be automatically turning OFF which avoid more energy wastage causes by the faulty lamps. PIC16F877A controller will check the state of street lamp and informs through GSM module to the control by sending a message to the prescribed number. The system allows substantial energy savings with increased performance and maintainability. By using this system the manual works will be reduced to a great extent.

3.1 MICRO-CONTROLLER
it contains one or more CPU's along with memory and programmable I/O peripherals Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also integrated on chip, as well as a small amount of it on RAM.

3.2 GSM MODULE
GSM (Global System for Mobile communications) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation digital cellular networks used by mobile devices such as tablets

3.3 CURRENT SENSOR
A current sensor is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control.

3.4 VOLTAGE SENSOR

Sensors are basically a device which can sense or identify and react to certain types of electrical or some optical signals. Implementation of voltage sensor and current sensor techniques has become an excellent choice to the conventional current and voltage measurement methods

3.5 PIR SENSOR

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors.

3.6 RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.
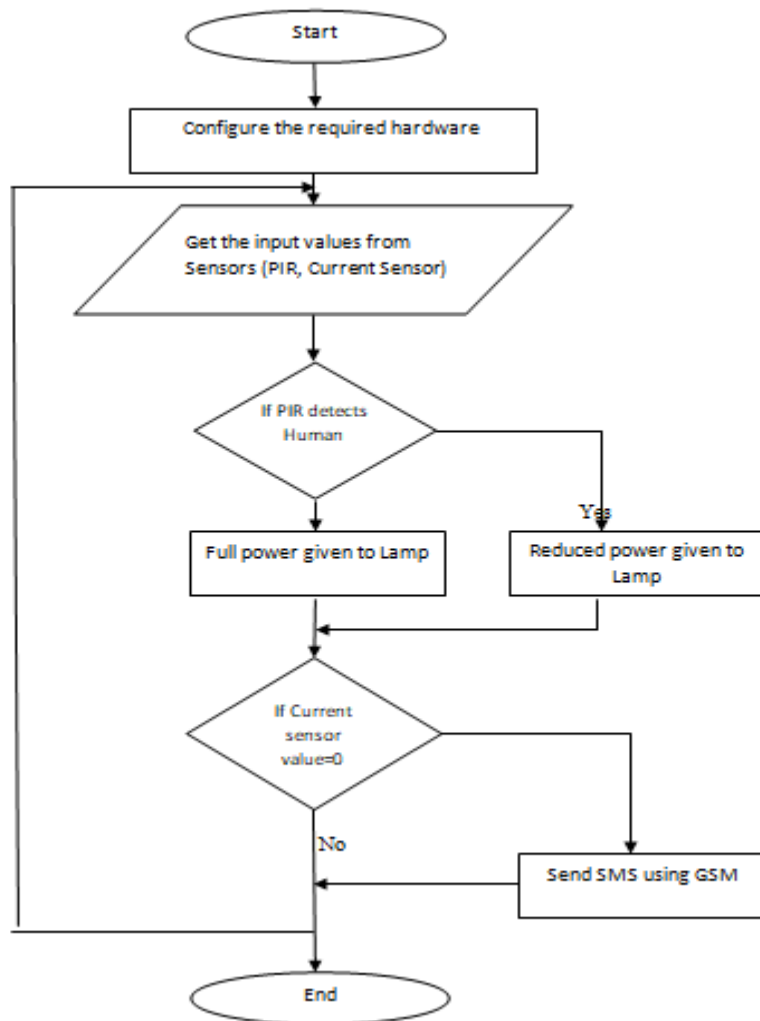
IV. SYSTEM ARCHITECTURE
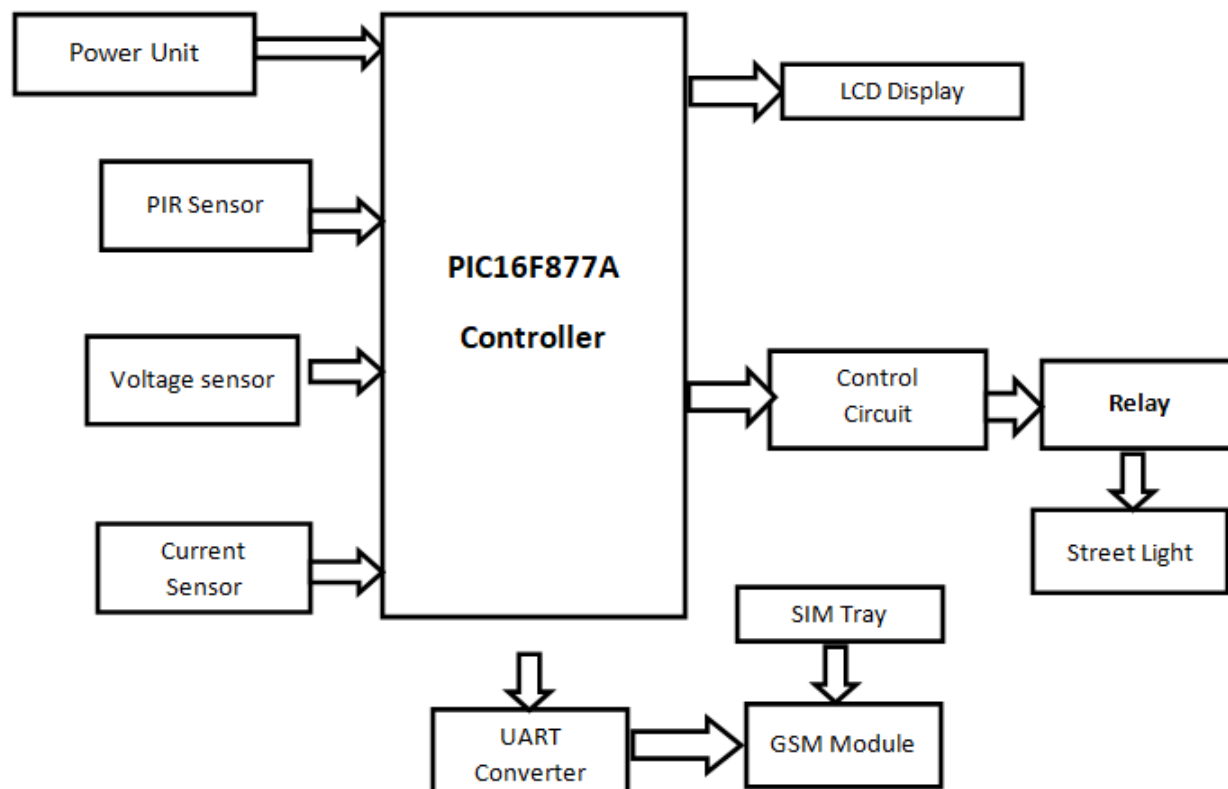
Hardware required:
- PIC16F877A
- Current Sensor
- PIR Sensor
- Relay
- AC Loads
- UART Cable
- GSM Module

Software required:
- MPLAB IDE
- PicKit-3

FLOW CHART

4.1 LCD

LCD stands for liquid crystal display. They come in many sizes 8x1 , 8x2 , 10x2 , 16x1 , 16x2 , 16x4 , 20x2 , 20x4 ,24x2 , 30x2 , 32x2 , 40x2 etc . Many multinational companies like Philips Hitachi Panasonic make their own special kind of LCD'S to be used in their products. All the LCD'S performs the same functions (display characters numbers special characters ASCII characters etc).Their programming is also same and they all have same 14 pins (0-13) or 16 pins (0 to 15). Alphanumeric displays are used in a wide range of applications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc.

4.2 SIMCOM GSM/VOICE MODEM

This GSM Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using this. The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send/receive SMS and make/receive voice calls. It can also be used in GPRS mode to connect to internet and run many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging. This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. The SIM800C is a complete Dual-band GSM/GPRS solution in a SMT module featuring an industry-standard interface, the SIM800CS is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, delivers performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

4.3 TWO RELAY BOARD

Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. They were used to switch the signal coming from one source to another destination. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors .A relay is an electromechanical switch which is activated by an electric current. A two relay board arrangement contains driver circuit, power supply circuit and isolation circuit. A relay is assembled with that circuit. The driver circuit contains transistors for switching operations. The transistor is use for switching the relay. An isolation circuit prevents reverse voltage from the relay which protects the controller and transistor from damage. The input pulse for switching the transistor is given from the microcontroller unit. It is used for switching of a two device.

V. CONCLUSION

The intelligent street lighting model has been successfully built and reveal the full capability of an actual lighting system. Varies real time monitoring functions which includes operating dimming schedules with integrated advanced lighting for oncoming vehicle on the street, a programmable street signs to divert traffic or notify of important road condition and a light sensor that constantly tracks ambient ighting is incorporated. The system is fully equipped with multiple sensors are use ful for data collection to understand the city's management need sand to perform preventive maintenance. The implementation of a microcontroller with sensors in the intelligent lighting system for street lighting enables controller of the public road regulator to adopt scene as well as linkage controls to street lighting on the road. This ensure that the adequate lighting is provided for all road users and at the same time optimizing the usage of our energy resources with the adoption of suitable diming schedule based on volume of traffic at different time of the day and the different stretches of the road

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