

A Survey on Street Light Monitoring and Control

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ABSTRACT

Street light is a raised source of light that is commonly used along walkways and streets when the surrounding turns dark. Today, power saving is very important and difficult, saving of power is need for our society. Faults in the street lights can be detected using a special embedded system called the Hitchhiker, which will be installed on fixed-route vehicles to collect the illumination readings along the vehicle's route. Intensity of street light can be controlled using passive infrared motion detector (dim during dawn and dusk as well as dark during night). Street light can be switched on/off automatically using Microcontroller. Power can be consumed efficiently by switching on/off the street light automatically using GSM technology via short message service. Street light can be protected by automatic detection devices, zigbee wireless and G3-PLC power line communication technology is used to build a street lamp monitoring and energy management system for street lamp security.

Keywords: Zigbee, G3-PLC, GSM, Raspberry Pi, street light, LED, wireless sensor.

I. INTRODUCTION

Basically, street lighting is one of the important parts of a city's infrastructure where detecting the faults in the street light is an important aspect of it. Earlier, faults were detected manually. In this approach, we are using a special embedded system called the Hitchhiker which will detect the faults automatically [1].

The main function of a street light is to illuminate the city's street during dark hours of the day. Previously, the number of street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density there are several factors that needs to be considered in order to design a good street lighting system such as night time safety for community members and road users, provide public lighting at cost effective and the reduction of crime. GSM based street light monitoring and control system is an automated system design to increase the efficiency and accuracy by automatically timed controlled switching of street lights [2].

Nowadays, most of the existing street light systems are wired which are not only difficult to construct but also has poor flexibility. To overcome this, wireless system is required. Thus, we are using GSM technology which uses power efficiently by remotely monitoring and controlling the system. This system will ease the fault detection and maintenance [3].

Street lamps were turned on/off by a simple timer or switch. When a street lamp did not light due to fault or electric leakage, it would not be found until it was reported by somebody or found by patrol men. Sometimes, the wires for street lamps were stolen. This can be protected by automatic detection devices that uses communication technologies like Zigbee wireless and G3-PLC power line communication [4].

[1] MANAGING ROAD LIGHTING WITH A HITCHHIKING SENSOR SYSTEM:

Realizing intelligent street lamps has been quite difficult. Wireless sensor networks are a promising technology to enable this goal. The key is to take

advantage of existing fixed-route vehicles, e.g. shuttle buses, to carry our specially designed embedded system, the hitchhiker to collect the illumination data over the bus route. The hitchhiker is installed on the roof of the shuttle bus, and collects road lighting readings and the location and acceleration of the bus. The huge amount of data generated by the hitchhiker is saved on its SD card. Once the bus is back to the depot, the hitchhiker access point and actively uploads the SD card data to our cloud server build on Google App Engine (GAE). Since the amount of data collected by several hitchhikers is quite large, all the jobs of data processing, fault lamp detection and the web based management interface are executed on GAE to minimize the loading of the hitchhiker.

The advantage of using this approach is that the hitchhiker will run autonomously without human intervention or manual control and errors or damage to the hitchhiker will not hinder the shuttle bus service. Also, the operation and hardware cost of the hitchhiker is low. The disadvantage of hitchhiker system is that if one of the hitchhiker's illumination readings is significantly different from the calibration point (CP) and the other hitchhiker readings, its data may be discarded and the hardware service may be needed.

[2] GSM BASED AUTOMATION OF STREET LIGHT:

GSM based street lights monitoring and control system consists of a P89V51RD2 microcontroller which on setting of time switches on/off the street lights and dims at 12 mid night for reducing power consumption and when any movement is detected it brights. This is the smart way of managing street lighting systems. There are basically two modules which include the client side and the server side. The client side consists of the GSM modem which is further connected to the microcontroller. The server side consists of the cell phone it has a core engine.

There are four LEDs for indication of bulb solar street lights are immersly useful as standalone source of light on streets and in premises, gardens and industrial appliances. Solar streets is also available in power LED version. Automatic dimming after present time in the evening is optionally provided. LEDs are automatically put on dimming mode after 4 or 5 or 6 hours after dusk. This saves on panel and battery cost.

By using this approach, any authorized person can control the whole cities street light through a single point of control. A Street light can be switched on/off according to the time automatically at specific location. It is reliable and low cost communication method. Dimming of light is also possible according to the required intensity. But the drawback is that the usage of solar panel leads to increased cost.

[3] AN INTELLIGENT SYSTEM FOR MONITORING AND CONTROLLING OF STREET LIGHT USING GSM TECHNOLOGY:

Street lights can be automated using smart systems. Smart system is an autonomous operation which detects the change in environment with the help of sensors and act to correct the offset cause of the environment.

The latest technology, which is used globally in these days is light emitting diode based system, it is treated as energy efficient, which reduces the public lighting cost, as well as energy consumption up to 80% and also responsible for the reduction of CO2 emission. For energy saving on street lights we can install an automatic system which can turn on/off lighting system or the brightness of lamps increase or decrease according of traffic on the road. The system is designed in such a way that light sensors (LDR), RTC and presence sensor placed in all street light circuits will turn on/off lamps automatically. When the lights are turned on every light pole having current sensor informs about fault to the centralized system by using GSM module attached to the circuit via SMS. The information through SMS is received at base station Raspberry Pi (a compute module) analyses the data and the status of street lamps is virtualized with the help of GUI. This will make Fault detection and maintenance of the system easier than the conventional system.

The advantage is light should be turn 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 both parameter LDR and RTC at the same time. Wireless technologies are also used (GSM). The disadvantage is that Raspberry Pi cannot run X86 operating system and users must not use normal computer standards to judge Raspberry Pi.

[4] INTELLIGENT STREET LAMP MONITORING AND ENERGY MANAGEMENT USING G3-PLC TECHNOLOGY:

The combination of LED street lamps and intelligent lighting can optimize energy and meet the requirements of the public, management and safety.

1) Common people's requirements:

Road lighting shall provide good night vision to protect pedestrians and drivers. When a street lamp is faulty, the fault in the overall section or region shall be rapidly remedied to avoid darkness influencing pedestrian and traffic safety.

2) Safety requirements:

If street lamp wires are stolen, street lamps cannot work normally. The electric leakage of street lamps can cause electric injuries. Therefore if a street lamp leaks electricity, there must be a relay for automatic power off to protect the public. The effects of street lamps monitoring includes automatic street lamp's fault cable guarding against theft (voice (short message), and data transmission) street lamp off. The regional state of street lamps off and electric leakage of street lamps, as caused by theft of power supply lines and power supply system faults, can be instantly reported to the management's unit. This study uses the G3-PLC to propose the experiment to the street lamp monitoring and management. A 3-phase G3-PLC connection architecture meaning whichever phase the street lamp terminal controller G3-PLC slave is connected to it, can be connected to the G3-PLC master. When a street lamp condition is abnormal, the street lamp terminal controller G3-PLC slave can send an alarm signal via G3-PLC which informs the concerned person by short message or mail and the abnormal condition of the street lamp can be promptly handled. In addition, the street lamp main controller can control the street lamp on/off via power line by G3-PLC master in order to save energy.

The advantage of this approach is windows server and SQL server is used as the platform. Also easy maintenance and personnel handover. But the disadvantage is the complexity in construction maintenance.

II. CONCLUSION

Faults in the street light can be detected using hitchhiker embedded system efficiently with lower cost. The GSM based Automatic Street light control system based light intensity and traffic density will be more effective in case of cost, man power and security. An intelligent wireless street light system is designed that eases system fault detection and thereby maintenance and offers power saving.

This is achieved by the use of highly economical LED technology. G3-PLC power line communication technology is used to build a street lamp monitoring and energy management system for street lamp security and trouble display. Thus, it meets the requirements for lighting and energy saving.

III. REFERENCES

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