

Survey of Wireless Sensor Network and Street Light Monitoring

Miss. Aparna M. Bagde¹,
P.G. Student,
Department of Computer Networking,
K. J. College of Engineering and Management,
Pune, India.

Prof. D. C. Mehetre²
Professor,
Department of Computer Engineering,
K. J. College of Engineering and Management,
Pune, India.

Abstract- In this research paper we compare and study the street light monitoring technologies and compare with their advantages and disadvantages. Street Light Control System which operates automatic street light system is an intelligent system but also not easiest system. This system can be set to operate in automatic mode; it senses climatical condition and decided the dimness and brightness of the street light. This control can make a reasonable adjustment according to the seasonal variation. We can control the whole street lights with the help of monitor. The system senses the climatically changes with the help of sensors and will dim and bright according to variation in the climatically condition. Comparatively lighting which is blowing in the night this street light system save more electricity. We can use these street light system everywhere such as at highways, schools, hotels industries and so on. In addition, we use signal conditioning with monitoring different condition related to street lighting such as gas sensor, temperature sensor, MIC, L.D.R. which not only detect temperature but also pollution and big sound which indicate the accident. System employed with network processing device (nodes) for sensing of light and then collected information is used for monitoring streetlight. Life of Street Lamps depends on the duration for which they get used. In this paper, we discuss all the techniques which used for the monitoring the streetlight with their merits and demerits and how we can make street lighting better than the previous research.

Keywords— *Led Lamps, Ldr, And Motion Sensor.*

I. INTRODUCTION

In Today's condition, continuously electricity supply to the consumers is not possible because of production of electricity is less than the utility of electric energy. The solution can be save the electrical energy rather than production of the energy. Saving the energy is more economical than the produce the electrical energy. Street light monitoring is the perfect solution for saving energy, the aim of street light monitoring system using wireless sensor network is to control use of electricity via remote ON/OFF/DIM of lights which can save energy costs and maintenance costs and increases the life of lamp. We all know that, street lighting is one of the important parts of a city's infrastructure where the main function is to lightning the streets of area if cities during the night. Earlier, the number of streets in the town and city is very less and narrow. And hence street lamps were very simple but after urbanization, acquire modern lifestyle and due to population traffic is also an increase because of this reason the number of streets increases rapidly. There are several factors need to be considered in order to design a good street lighting system

such as safety of drivers and reducing crimes which held at night, we can get immediate help for the accident area and save person which get accident, reduces pollution and this system safe for everybody which uses highways and streets. At the beginning, street lamps were controlled by manual control where the switches set in the each of the street light lamps. It is called first generation of the original street light. After this type of manual method of monitoring streetlight system it uses another method which using high pressure sodium lamp [2] in their system. This method is used today's. In this method Optical control circuit is used to change the resistance by using the light sensitive device to control street lamps on automatically at morning and street lights off automatically at night.

II. TECHNIQUES USED IN STREET LIGHT SYSTEM

AT89S52 single-chip microcomputer

An AT89S52 single-chip microcomputer [1] is proposed by Hengyu Wu, Minli Tang. It contains a power circuit for supply the electric energy, a fault detect circuit for detecting all faults with components, a photosensitive detection circuit for making vibration sensitive tiles to trigger the light, an infrared detect circuit for senses modulated IR pulses, an LCD display circuit to display visual images and monitor them, a street light control circuit to control the working of street light, plurality of keys proposed by the pressed key which is used to reduce their power. This system can turn on or turn off the lights automatically and according to traffic Flow control the switches. In this light control system is based on AT89S52 as control core. A Digital clock, a timer, LCD (Liquid crystal display), a photosensitive induction, alarm function, an infrared control and a statistics of traffic flowing magnitude these all gadgets are used in the creation of the multi function street light control system. In this, for detecting vehicles which is pass way from the street light. The author used time cut off function and for more electricity consumption it uses automatic control pattern. Using this design we can save the energy much more amount of than the overnight glowing street lights. This design can perform all operation without creating any hardware unit. For detecting Damage Street light and the serial number of the street light, the system uses auto alarm function. And this function is very useful to detect and repair the damage street light.

Advantages of single chip microcomputer

1. It is compact in structure so complexity reduces
2. It is cost efficient

Disadvantages of single chip microcomputer

1. The researcher didn't tell us about the working principle of the Single chip micro computer system.
2. Use of fault detection circuit will create a problem which when it is damaged.
3. It is not a real time set up Experiments, only it shows simulation result and theoretical proof.

Remote streetlight monitoring system based on wireless sensor network [2]

Lighting systems, especially in the local areas, street lighting system are still designed according to the old standards and they often do not take advantage of the latest technological developments. And the administrators which is uses old methods to lighting street lights yet, However, the today's increasing burden of the material costs and the social to environmental issues are encourage manufacturers to develop new technologies which allow ample saving of the cost and also environmental safety. In this literature we can find possible three solutions to these problems. Remote street light monitoring system is proposed to overcome the already proposed technologies which are research manually. And can be time consuming and their complexity issues. To observe today situation of population and increase in traffic this system is perfectly matches all the requirements.

Remote streetlight monitoring system based on wireless sensor network [2] is proposed by Gong Siliang. It controls streetlight according to light intensity and Sunrise and Sunset Algorithm. This controls reasonable adjustment and seasonal Variation. We can control streetlights because this system also can run in controlled mode with the use of display monitor terminal. In addition, the system contains a digital temperature-humidity sensor for monitoring the streetlight Real-time, temperature and humidity. Because of this system is equipped with the high-power relay output and can be widely applied in all places such as streets, stations, mining, schools, and electricity sectors and so on. This system specially proposed for urban area. Sensor node remote, controller center and the remote terminal system these all gadgets are use to form this system. The sensors nodes are installed in the each pole of the lamp to monitoring the each lamp pole, remote terminal unit for perform the entire task from the remote places.

Advantages of Remote streetlight monitoring system based on wireless sensor network

1. It controls streetlight according to light intensity and Sunrise and Sunset Algorithm.
2. Power consuming and also economical.
3. These systems can works to rural as well as urban areas.

Disadvantages of Remote streetlight monitoring system based on wireless sensor network

1. In this work a wireless network for streetlight remote control is discussed. In particular, the novelty of the proposal is in the location awareness of nodes, which cannot self-localize themselves.
2. Prototypes have been built using costly hardware.

3. The capability of the ranging measurements, the basis for localization, is not characterized and showing some problems on the order of one meter.
4. In near future, location aware routing algorithms will developed that will improve the efficiency of the network.

LED STREET LIGHTING SYSTEM

In recent years, environmental issues have get attention globally, and because of this the development of energy-efficient technologies take place which aimed is to reduce the consumption of electric energy. One outlook of this depleting situation is an increasing demand for a deflection in the amount of electricity used for illumination. Specially, energy conservation for broad range illumination tasks such as street lighting is gaining considerable importance. Mostly external illumination sources, such as street lights, highways, clubs, schools and so on use HID Lamps as light. Universal disquiet has been increases respecting to the consumption of power by HID lamps and by raising the amount of carbon dioxide released because of consumption of power in the form of electricity. Because of this LED array illumination has received attention recently as an energy reducing light source. LED road illumination requires about one third to one half of the electric power needed for HID lighting.

The LED street lighting system [3] Proposed by Gustavo W. Denardin. For the modern street lighting systems the use of LED is very convenient and economic because compare to others lighting system LED has a longer lifetime, higher luminous efficiency and higher CRI. In this control network disconnection of the street lighting system can done, automatically consumption of distributed power system, management cost is less than the others and it observes to control and monitor the s information of each street lighting unit. In order to meet the system requirements, a wireless sensor network based on IEEE 802.15.4TM standard is employed. Its geographic routing strategy is used for this system handling, which make it more scalable. It's a novel routing algorithm which is overcome drawbacks of the already proposed systems. The algorithm improvement of routing performance when applied to sparse large scale scenarios, which shows while simulation. Field tests have been performed on IEEE 802.15.4-compliant wireless control units. This all shows that the control network is able to meet the requirements of a LED street lighting system.

Advantages of LED street lighting system

1. It consumes electricity with safe and intelligent power system.
2. This system contains automatic street light intensity which controls and detects the movement of vehicles which are passing through the street light area.
3. Climatological condition decided the on or off the lights.
4. And this technique is helpful for the consumption of the electricity and that is most important thing for the street lighting system.
5. With the help of this system it can also detect the drivers which are consumed alcohol while driving for detecting the alcohol breath it uses alcohol sensor module which contains skin sensor, breath alcohol sensor and proximity sensor.

Disadvantages of LED street lighting system

1. Each lamp pole wants a separate sensor node and hence this installation is very time consuming.
2. Slightly relay upon the Climatrical condition.
3. Vehicle movement is quite unusual. Cause if street lights are on/off on the basis of passing vehicle then driven can be confused about the above scenario.

Comparative analysis of photovoltaic (PV) street lighting system in three different lamps

Comparative analysis of photovoltaic (PV) street lighting system in three different lamps[4] proposed by Somchai Hiranvarodom. In this paper researcher discusses about pressure sodium lamp, a high pressure sodium lamp and a fluorescent lamp. All three systems have been mounted with the same module type. 18.00-22.00 hours and 05.00-06.00 hours are the two time of period of operation of solar street light system. Control circuit of this system is run properly. Protection of the battery is also done properly. Here it compares the three different lamps and it also analyses their cost. The present worth of each system can be compared and the least cost option selected. There paper shows the progress of PV in the street light system. The aim of this paper is to promote the solar energy system on the basis of PV system based. In this project it involves some PV systems such as board of the faculty map, pumping system, solar home system, street lighting and so on. The systems installation capacity is around 2,170W. It is reliable, acceptable and user satisfaction. The cost of life cycle is comparable and the key issues problems encountered under installation. The combination of low pressure sodium lamp, electronic ballast and photovoltaic generation are now widely used. It protects the environment and save energy. The author tries to combine all these three separate techniques.

Advantages of the Comparative analysis of photovoltaic (PV) street lighting system in three different lamps

1. It is reliable, acceptable and user satisfaction
2. The cost of life cycle is comparable

Disadvantages of the Comparative analysis of photovoltaic (PV) street lighting system in three different lamps

Nevertheless, the aim of this work is to determine the appropriate system to install in a typical rural area or a typical rural village of Thailand when the cost of lamps and system performance and possibility for purchasing the components of the system are compared. While considering in other areas it is difficult.

Solar energy based street light with auto-tracking system

Solar energy based street light with auto-tracking system[5] proposed by A.C.Kalaiarasan. Using the solar system in the street light system is consuming electric energy because instead of electric energy to produce electricity it uses solar energy. And for generation of electricity from solar energy it requires sun light. But generate the energy from the sunlight is costly. It has been estimated that the yield from solar panels can be increased by 30 to 60 percent by utilizing a tracking system instead of a stationary array. In this paper automatic tracking system is required to maximize efficiency which will keep the solar panel straight. The sun tracking sensor is the device, which sense the position of the sun at the time to time

continuously and it gives the output via sensing the light density from the sun. Here the sun tracking sensor is LDR (light dependent resistor). The amplifier unit is used to amplify the LDR signals, which makes the low level signal into high level signals and this output is given to the comparator. The LM324 IC is used as an amplifier. Comparator compares the signals and gives the command to the AT89C51 microcontroller.

Advantages of solar energy based street light with auto tracking system

1. This system has a high efficient light and consumes very low power.
2. Auto sun tracking system is successfully used in this experiment.
3. Battery in which energy will store can be successfully employed.
4. This system does not make pollution and so it will not harmful for the environment.
5. This system consists of automatic on/off system. So no physical source is required and manual operation required.

Disadvantages of energy based street light with auto tracking system

1. Whereas this system consumes low power but its initial cost is very high.
2. Their cost of required equipment is very high.

Zigbee based Street Light Control System

Today's Solar PV based street lights are commonly used. People became conversant with significance of moving from conventional resources based energy production to renewable energy based power production. We know that fossil fuel resources are limited and we cannot be recycled it. So it is very important for us to turn it from renewable energy based power production and usage as it is the only substitute available. We all know that society never lived without power. So we want to increase the usage of renewable method after that we can maintain conventional resources.

The Development of Zigbee based Street Light Control System[6] is proposed by S.H. Jeong. In this paper a new method is suggested that is ZIGBEE and sensors which increases the efficiency of the street lighting system so as to maximize the efficiency of the street lighting system it uses combination of sensor to control the system. Using ZIGBEE transmitter's information or data can uses point to point and it sent and to check the state of the street lamps it uses control terminal and hence we can take immediate actions if required which monitor and control condition of street lights which installed beside the street. Lights are switched to ON/OFF by this control system. Control system monitored the local information status through communication channel. Status information which is monitored are on/off status information, energy saving mode status, control group status information and information related safety, etc. for control command transfer and status information between streetlight control system and street light control remote terminals in which each light pole installed, it uses various communication protocols and communication media. As communication media, wireless or power lines are used generally. Various frequency bands from tens of MHz to Rebrands are used for wireless

case. This Street light control system can save maintenance time and costs and which can improve safety level.

Advantages of Zigbee based Street Light Control System

1. In this paper new technique introduces which will power consumption reduces of the street lighting system about 30-34 % compared to other technologies as per their design.
2. This system is fully automated and is using ZIGBEE so that the control station can analyze all the performance of the system.
3. And Climatical condition reduces their performance.

Disadvantages of Zigbee based Street Light Control System

Zigbee based Street Light Control System has a very complex in structure

III. COMPARITION OF TECHNIQUES IN PAPERS

Papar	Advantages	Disadvantages
Street light system Using GSM	1. Scalability is high 2. Deployment is easy	Semantic point of view is not defined.
Street light system using Zigbee based system	1. Save more energy 2. Reduces manual work	Design is complex
Street light system using Single chip microcomputer	1. Cost is low 2. structure is compact	maintenance cost is high and have to regular maintain
Street light system using solar light system	1. Pollution free 2. maintenance free	1. performance depend upon Climatical condition 2. High initial investment
Photovoltaic (PV) Street lighting System	1. cost efficient 2. easy installation	Only can useful in rural area.
LED Street Lighting system	Consume power	Regular maintenance
Remote streetlight monitoring system	1. consume power 2. scalability is high	Cannot self localized

CONCLUSION

On comparing and studying the all above technologies, we concluded that our project is fulfilling all the requirements it's not only cost efficient but also it contain less complexity. In this project PIC microcontroller is used and their programming and implementation is also convenient compare to other technologies. The main intension of this project is to save the maximum electricity and it will be economically sound. It requires the initial cost only for designing and installation and not for utilization. Hence, such systems are very much useful for the government to reduce the utilization of conventional power (generated by hydraulic power stations). Therefore, such systems are once implemented on a large scale can bring significant reduction of the power consumption caused by street lights. This initiative will help the government to save this energy and meet the domestic and industrial needs. The other advantages of the circuit are that it is simple circuit, avoids constant supervision of time and flexibility in design. After having implemented this Intelligent 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. This system controlling the Traffic Signal lights would be another feature that we could look into after successful

implementation of our system. Depending on the traffic and their direction, necessary controlling actions could be taken. Also emergency vehicles and VIP convoys can be passed efficiently. Moreover, attempts can be made to ensure that the complete system is self dependant 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.

ACKNOLEGMENT

I remain immensely obliged to Prof. D. C. Mehetre for providing me with the idea of this topic, and for his invaluable support in garnering resources for me either by way of information or computers also her guidance and supervision which made this research paper happen I would like to thank my college K.J. College of Engineering and Management Research, Pune. Our source of inspiration, Principal Dr. S.J.Wagh and the H.O.D. of Computer Engineering Department for their invaluable support. I would like to say that it has indeed been a fulfilling experience for working out this research paper. I am also thankful to all those who helped directly or indirectly in completion of this work. Last but not least I would like to express my heartfelt thanks to my family members for their help and wishes for the successful completion of this research paper.

REFERENCES

- [1] "Design of Multi-functional Street Light Control System Based on AT89S52 Single-chip Microcomputer" Hengyu Wu, Minli Tang, IEEE, 2010.
- [2] "A New Streetlight Monitoring System Based On Wireless Sensor Networks" IEEE 2010
- [3] "Automatic Street Light Intensity Control and Road Safety Module Using Embedded System" International Conference on Computing and Control Engineering (ICCE 2012), 12 & 13 April, 2012.
- [4] "Intelligent Street Lighting System Using Gsm" International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726 Volume 2 Issue 3 March. 2013
- [5] "Analysis Of Solar Energy Based Street Light With Auto Tracking System", International journal, 2012
- [6] "Wireless internet lighting control system", Budike, E.S. Lothar (Power web Technologies), US patent 7,167,777, Jan 23, 2007.
- [7] "Development of Zigbee based Street Light Control System" S.H. Jeong, S.B. Choi, H.S. Ryoo, D.K. Kim Korea Electro technology Research Institute 142440178X /06@2006 IEEE
- [8] [8]. "Street Light Monitoring – a Practical Solution magazine" November/December 2002
- [9] [9]. "A Win-Win-Win for Municipal Street Lighting: Converting Two-Thirds of Vermont's Street Lights to LED "by ACEEE Summer Study on
- [10] Energy Efficiency in Buildings. March 2012.