

# Smart Management of Street Light for Energy Conservation

Dr. A. Senthil Kumar<sup>1</sup>, Dr. R. Nafenna<sup>2</sup>, Feroz Basha<sup>3</sup>, Karunya Jeni<sup>4</sup>  
<sup>1,2</sup>Associate Professor, Department of Electronics and Communication Engineering  
<sup>3,4</sup>Student, Department of Electronics and Communication Engineering  
 Kings Engineering College, Sriperumbudur-602117, Tamil Nadu, India

**Abstract:-** This Paper proposed ‘smart management of street light for energy conservation using Arduino with Wireless module (IEEE 802.15.4)’. We use two parts in this paper it includes IR sensors and zigbee transceiver. In city side the street lights are always working at night even though no vehicle moving in the road, so lot of electricity are consumed. To reduce much more consumption of electricity we proposed zigbee and sensor technology. IR sensor controls the switching on/off light when it detects any person entered into road.

**Keywords:** Smart Street Light, Energy Conservation, ZigBee, IR Sensor

## 1. INTRODUCTION

The potential can be gauged by the fact that a city like Chennai has 2, 14, 008 street lights maintained by the Corporation of Chennai. Of these, 84,664 use 70 watt Sodium Vapor lamps, 49,420 use 40 watt tube light, 42,250 use 250 watt Sodium Vapor lamps [1-4]. The total energy consumption in Chennai, on account of the above, is 19 MW. It comes at a cost of Rs 200 lakhs per month. To reduce this consumption of electricity we proposed our idea.

## 2. EXPERIMENTAL DESCRIPTION

### Requirements:

#### Hardware

- Arduino nano
- Street light
- Relay
- Ir sensor
- Zigbee transceiver
- Arduino uno R3

#### Design

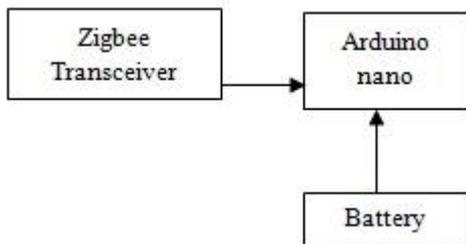


Fig.1 Schematic Diagram of Transmitter

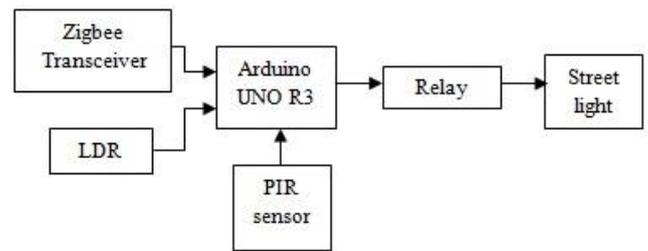


Fig.2 Schematic Diagram of Receiver

### 2.1 ZIGBEE TRANSCEIVER

ZigBee is a low-cost, low-power, wireless mesh network standard targeted at battery-powered devices in wireless control and monitoring applications. ZigBee delivers low-latency communication [6-8]. ZigBee chips are typically integrated with radios and with microcontrollers. ZigBee operates in the industrial, scientific and medical (ISM) radio bands: 2.4 GHz in most jurisdictions worldwide; though some devices also use 784 MHz in China, 868 MHz in Europe and 915 MHz in the US and Australia, however even those regions and countries still use 2.4 GHz for most commercial ZigBee devices for home use. A data rate varies from 20kbit/s (868 MHz band) to 250kbit/s (2.4 GHz band).



Fig.3 ZigBee Module

### 2.2 ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P; offers the same connectivity and specs of the UNO board in a smaller form factor. The Arduino Nano is programmed using the Arduino Software (IDE), our Integrated Development Environment common to all our boards and running both online and offline. For more information on how to get started with the Arduino Software visit the Getting Started page. or power it with a AC-to-DC adapter or battery to get started.



Fig.4 Arduino Nano

**2.3 RELAY**

Relay is an electromagnetic switch, which is controlled by small current, and used to switch ON and OFF relatively much larger current means by applying small current. We can switch ON the relay which allows much larger current flow. Relay is the good example of controlling the AC (alternate current) devices, using much smaller DC current. Commonly used relay is SPDT (Single pole double throw).the application of relay started during of the invention of telephones. They were also used in long distance telegraphy. They were also used to switch the signal coming from source to another destination. Relays are used to provide time delay functions. Relays are used to control high voltage circuits with help of low voltage signals. Relays are used to realize the logic functions. It has three terminals COM, NO, NC are Common Connection it is the center terminal, and it is hot as power to the load is connected at the terminal.



Fig.5 Relay

**2.4 IR SENSOR**

IR sensor is an electronic device produce IR waves.IR sensor frequency range varies with the cost and these radiations are invisible to our eyes.



Fig.6 IR Sensor

IR sensor works as an Object detection sensor. It consists of IR transmitter (LED) and IR receiver (Photodiode).When IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. IR sensor is also capable of measuring the heat emitted by the object and detecting motion.

**2.5 ARDUINO UNO R3**

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR

microcontroller. Programs can be loaded on to it from the easy-to-use Arduino computer program [9]. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno. The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button.



Fig.7 Arduino Uno R3 Module

**3. WORKING PRINCIPLE**

In our paper we are using both IR sensor and zigbee transceiver. The zigbee transceiver used as transmitter and receiver. The receiver section is fixed in all street lights. And the transmitter section is fixed in all vehicles. The IR sensor is used for detecting the non vehicle like pedestrians in the road. The working function of zigbee transceiver is, if the vehicle enters within the frequency the street light automatically will glow and if the vehicles leave that frequency range the light will automatically off. The IR sensor working is, if the person walking in road, the light will glow with low potential the IR sensor transmit data the detect by any obstacle then the data received by the receiver then the light turn to high potential i.e “the lights will glow brightly”.

**4. CONCLUSION**

By using this technology we are reducing 25% consumption of electricity per year. And the accident also will reduce by our paper that’s if the accident cause by the drivers won’t have concentration in driving they think about anything then accident may cause. This paper will gives the concentration to drivers in driving, the light will glow low potential to high potential that’s gives intimation to the drivers. This will give the attention to the drivers to drive correctly.

**5. REFERENCE**

- [1] Jeffrey Nichols Carnegie Mellon University, P., PA, et al. Generating remote control interfaces for complex appliances. In proceeding UIST’02 Proceeding of the 15th annual ACM symposium on user interfaces software and technology 2002. New York, NY, USA
- [2] Shirehjini, A.A.N., A novel interaction metaphor for personal environment control: direct manipulation of physical environment based on 3D visualization. 2004. 28(5): p. 667-675
- [3] Choonhwa Lee, S.H., and Wonjun Lee, Universal interactions with smart spaces in Pervasive Computing, IEEE 2006 p. 16 – 21
- [4] Jukka Riekkil, I.S., and Mikko Pyykkonen2. Universal Remote Control for the Smart World. In UIC ’08 Proceeding of the 5th

- international conference on Ubiquitous Intelligence and Computing 2008. Berlin, Heidelberg: Springer-Verlag Berlin, Heidelberg 2008.
- [5] Hsien-chao Huang, T.-C.L., and Yueh- Min Huang, A Smart Universal Remote Control based on Audio-Visual Device Virtualization Institute of Electrical and Electronic Engineers,2009,55:p. 172-178.
- [6] Laehyun Kim, W.P., Hyunchul Cho and Sehyung Park, A Universal Remote Control with Haptic Interface for Customer Electronic Devices, in IEEE Transactions on Consumer Electronics 2010. P. 913-918
- [7] Hyoseok Yoon, W.W., Design and Implementation of a Universal appliances Controller based on Selective Interaction Modes. Consumer Electronics, IEEE Transactions on November 2008 54(4): p. 1722-1729
- [8] Nurzhan Nurseitov, M.P., Randall Reynolds, Clemente Izurieta. Comparison of JSON and XML Data A Case Study. InISCA 22<sup>nd</sup> International Conference on Computer Application in Industry and Engineering. 2009. San Francisco, CA.
- [9] R.Paul Morris, M., IEEE, and Julie J. Tomlinson, A Mobile Device User Interface with a Simple, Classic Design. Consumer Electronics, IEEE Transactions on 2008 54(3): p. 1252-1258 [10]. Zhiqiang Wei, X.N., Dongning Jia Research on Software Reuse of User Interface for Mobile Computing Devices Based on Xml, in Software Engineering and Service Sciences (ICSESS), 2010 IEEE International Conference 2010: Beijing p. 146- 149.