ARM BASED ADVANCED ELECTRONIC GADGET CONTROL AND MANAGEMENT SYSTEM USING ZIGBEE

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Abstract

A method of intelligent house based electronic gadgetry control based on Zigbee wireless communication technology by using ARM controller is introduced in this paper, and the specific design scheme is presented. The system can achieve normal PWM dimming, timing dimming, self-adaptive dimming and Automatic Mode (Temperature, Photo electric and RTC), with a corresponding human-computer interface. This method is more intelligent and fully atomized than traditional lighting control system. Alternate energy resources like conventional batteries along with solar power back up were provided for the efficient operation of the equipment throughout.

Keywords- Intelligent illumination; Zigbee; LED; ARM; PWM

I.INTRODUCTION

Scientific inventions have made this world worth living. They have provided us with various means of comforts and luxuries. The invention of electricity is one of the greatest of its wonders. Indeed, we cannot even dream of living in absence of electricity in modern times. There is no walk of life in which it is not used these days. Some of the more important of its uses are given below. We now light our lamps with electricity. Switch on the button and there is the day-like light even in the darkest night. Through such a system only they did avoid the power wastage. So we are in need of an effective system for power conservation. LED light source is gradually to the replacement of traditional lighting equipment with high power consumption. Meanwhile, the "next-generation light source" matching intelligent lighting control system is produced. Advanced electronic gadget control and management system using

zigbee is a combination of Zigbee's advantages in wireless network and short-range wireless transmission and LED's characteristic of high lighting efficiency and low power, it is not only security, intelligence, easy to control, but also engineering convenient in wiring and maintaining. Figure1 shows the diagram of interior illumination scene based on Zigbee wireless network. It has good applicability in interior illumination and road lighting engineering.
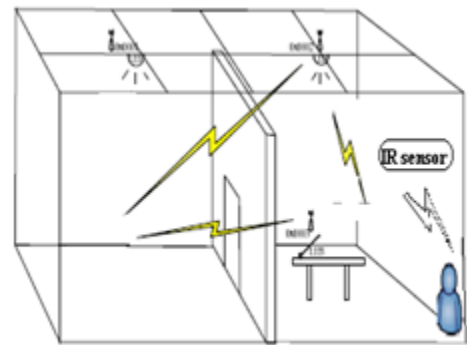

Figure 1: Interior gadget control

II.WORKING PRINCIPLE

The proposed system is designed for automation of electronic gadgets. It consists of sensors, which responds to various conditions so that the system can operate in different modes. It also consists of alternative power supply for the efficient utilization of the equipment. The system can control and manage different electronic gadgets. User can also get suitable brightness (light),speed(fan) and color temperature(Air conditioner) etc.

III. SYSTEM HARDWARE DESIGN

Advanced electronic gadget control and management system implemented based on the 2.4GHz ZigBee wireless Modules, ARM7,PIC18F microcontroller, IR sensor and few sensors. This system consists of two parts, respectively for Transmitter module and a Lighting modules.

The major components of Transmitter module include main control chip PIC18F452, ZigBee RF transmission system, 4x4 matrix keypad, mode selection keys, IR sensor and a LCD screen. An infrared sensor is an electronic device that emits and/or detects infrared radiation in order to sense some aspect of its surroundings. Infrared sensors can detect motion. 4x4 Matrix keypad will helps us to access the password based authentication. PIC 18F is a 16 bit micro controller with a program memory of 32KB and data memory of 4kB, which is used for authorization of a person. Once the person is authentified, the system will operate in different modes based on the conditions from the sensor. The selected mode will be displayed in a LCD screen. LCD screen consists of two lines with 16 characters each.User can send commands to the controller by the mode selection keys, and the data will be transmitted by the ZigBee modules, which is shown in figure1.
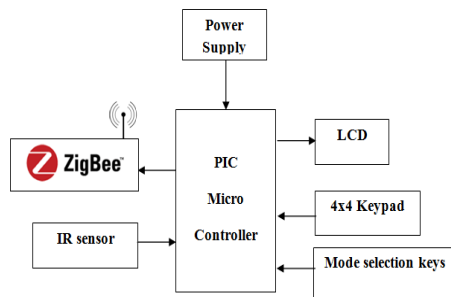

Figure2.Transmitter section

Receiving Lighting module consists of ARM7 Microcontroller, LED driving circuits, sensors as depicted in figure2. ARM7TDMI based LPC 2148 microcontroller is   a 16-bit microcontroller .Which contains an on chip static RAM of 8 kB to 40 kB and on-chip flash memory of 32 kB to 512 kB ,and abundant internal and external resources.

The data will be transformed into the corresponding PWM signal when receiving module receives the orders from the sender, then, the PWM signal is transferred to the LED lighting terminal, which makes lighting terminal produce the presupposed lighting effects.In the proposed system, the user is provided with list of functions. LCD will display the function selection menu. According to the needs of application and demonstration, user may select different function, for that they are provided with keypad in transmitter module.
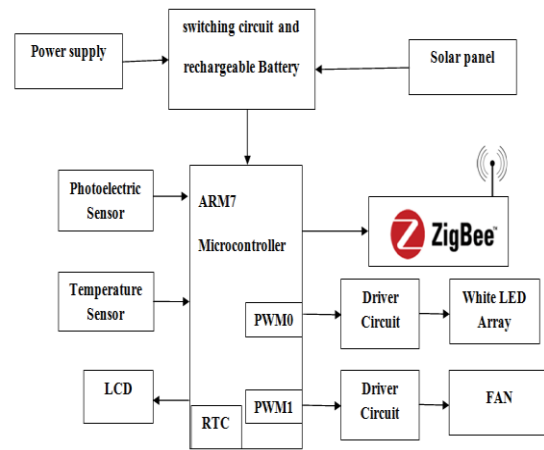

Figure 1.Lighting section

IV. SYSTEM NETWORK DESIGN

A. Zigbee technology

Zibee is a Low data rate, Low power consumption system operates in Unlicensed Bands. Zigee ISM 2.4 GHz Global Band operates at 250kbps.This band can be used to Control of lights, switches, thermostats, appliances, etc. The basis of Zigbee technology is IEEE 802.15.4, according to the contents of the Zigbee technical agreements. The agreements can be divided into 5 layers. IEEE 802.15.4 defines the PHY layer and MAC layer, Zigbee alliance establishes NWK layer and security layer by themselves, the application layer, according to the user's needs, can be used and developed by user, therefore, this technology can provide a mobile and flexible way to building network for user. According to the standard of IEEE 802.15.4 agreement, the operating frequency of Zigbee can be divided into 3 frequency ranges: 868MHz, 915MHz

and 2.4GHz. The 2.4GHz falls into 16 signal channels. This frequency is a proprietary band for industry, science, and medicine, it is toll-free and no application. In this band, data transfer rate is 250Kb/s, and it use DSSS and O-QPSK technology .

B. Network Building

The ZigBee ZNet 2.5 OEM RF Modules interface to a host device through a logic-level asynchronous serial port. Through its serial port, the module can communicate with any logic and voltage compatible UART; or through a level translator to any serial device (For example: Through a Digital proprietary RS-232 interface board).
UART Data Flow:
Devices that have a UART interface can connect directly to the pins of the RF module as shown in the figure3below.
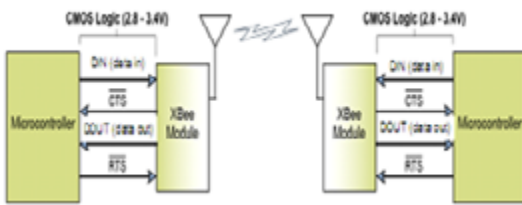

Figure 2. Zigbee RF Module

Serial Data:
Data enters the module UART through the DIN (pin 3) as an asynchronous serial signal. The signal should idle high when no data is being transmitted. Each data byte consists of a start bit (low), 8 data bits (least significant bit first) and a stop bit (high). The following figure illustrates the serial bit pattern of data passing through the module. Below Figure4 shows UART data packet 0x1F(Decimal number) as transmitted through the RF module
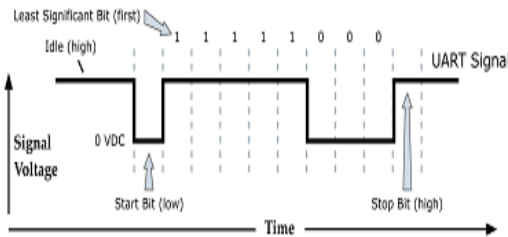

Figure 3.Example format

V. REALIZATION OF THE SYSTEM

There are five mode of operation:
1) Normal PWM dimming (Photo electric)
2) Self-Adaptive dimming (Temperature)
3) Timing dimming (RTC)
4) Self-Adaptive dimming (Photo electric and RTC)
5) Automatic Mode (Temperature, Photo electric and RTC)

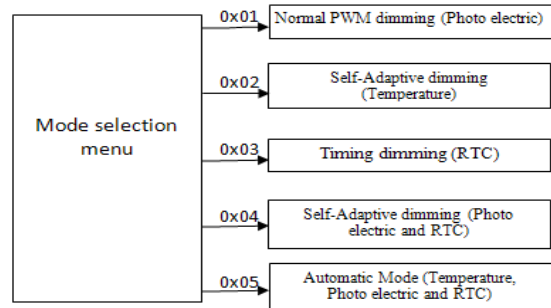The five modes with the function selection menu is shown in figure6 below.

Figure 4.Function selection menu

Through the ZigBee network, the receiver receives the command signal and executes corresponding functions. When the user select **mode 1** in the selection menu, the receiver will startup ordinary dimming mode. When the coordinator sends illumination level again, the receiver will produce pulse signal with different Duty-cycle to control the luminance of LED lamps, thereby achieve multilevel diming. When the user selects **mode 2** in the selection menu, the receiver will startup self-adaptive dimming (Temperature) mode. The LCD automatic displays temperature. The sensor will send the data to receiver, then, controller will produce PWM signals. When temperature changes, the proportion of light will change, thereby the temperature would be controlled. In this mode, user will feel comfort in sense. When the user selects **mode 3** it set the timing for such a LED control to be On/Off. When the user selects **mode 4** in the selection menu, the receiver will startup self-adaptive dimming (Photo electric) mode. The sensor will send the data to receiver, then, controller will produce PWM signals. When luminescence changes, the proportion of light will change, thereby the intensity would be kept in constant which is already stored in it. In this mode, user will get power conservation. The system will

check for the light availability in the room. When the user selects **mode 5** that is automatic mode. In this mode the light intensity based on all sensor and Time based. the Mode act as default mode in the system. The patterns for PWM in different modes were shown in figure5.
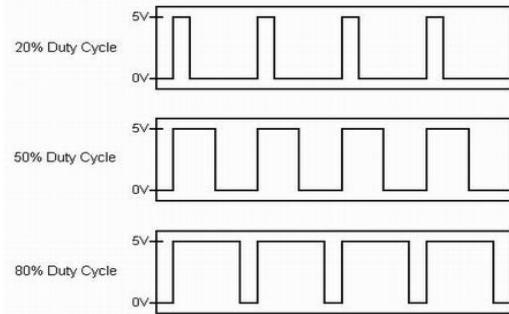

Figure 5. PWM pattern in different modes

This system has an additional feature like works based on the rechargeable battery. This battery will be charged solar power or conventional power based on the user selection. The default mode will be solar powered it consists of 10W solar panels change the battery. other end a conventional power based battery charger. Even though the power off the this system will be worked.

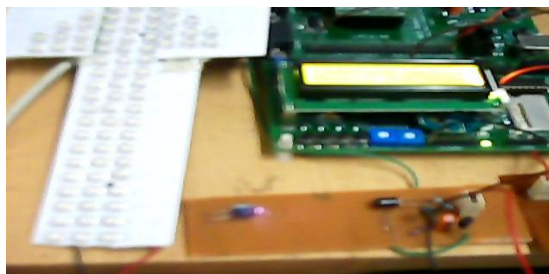## VI.RESULTS

Figure 6.Self Adaptive dimming (During Evening)

Figure 7.Self adaptive Dimming (During Day Time)

Figure 8.Self Adaptive Dimming (During night)

VII. CONCLUSION

The system has many advantages due to the realization of functional modes above. Firstly, LED is known as the "green light source", lighting conversion rate can reach 90%, Advanced electronic gadget control and management system using zigbee is the "Secondary energy saving. Secondly, it is about control mode. Taking indoor lighting as an example, traditional lighting system has many disperse switches, and can only achieve two effects, either light or extinguish. The method provided in this paper can gather all the switches of all the electronic gadgets, into a controller. User can also get suitable brightness (light),speed(fan) and color temperature(Air conditioner) etc. To sum up, system can not only save energy, but also incorporate atomization and intelligent.

VIII.REFERENCES

[1] Yin jun, Wang Wei" LED lighting control system based on zigbee wireless network",IEEE 2010

[2] Zhan Jie, Wu Ling-xi, Tang Zhi-jun. "Design and Realization of the Intelligent Illuminating Control System based on ZigBee" Power Electronics, Vol.41, No.10,pp:25-26/51,2007.

[3] Mao Xing-wu, Zhang Yan-wen, Zhou Jian-jun, Zhu Da-wei. "New generation of green light LED and Applications" Beijing: People's Posts and Telecommunications Press, 2008.

[4] Texas Instruments. Z-Network Getting Started Guide,V1.2[EB/OL],2006-03- 01.

[5] L. Chushan, W. Jiande, and H. Xiangning, "Realization of a general LED lighting system based on a novel Power Line Communication technology, " in Applied Power Electronics Conference and Exposition (APEC), 2010 Twenty-Fifth Annual IEEE, 2010, pp. 2300-2304.

[6] F. Kaku, M. Miki, T. Hiroyasu, M. Yoshimi, S. Tanaka, T. Nishida, N. Kida, M. Akita, J. Tanisawa, and T. Nishimoto, "Construction of intelligent lighting system providing desired illuminance distributions in actual office environment,.