Mode Control System of Intelligent Lighting Scene

Faquan Yang*, Porong Liang, Zihong Cai and Di Lan

School of Electrical Information Engineering, Foshan University, Foshan 528000, China
*Corresponding Author Email: Yafaquan.fosu@163.com

Abstract. In this paper, through the wireless data communication technology to digital control of lighting, reach the purpose of reference light intelligent control, through the single chip microcomputer technology for home lighting more in terms of intensity, color, steering gear (each shift 6 or above) setting, a variety of tie-in, in order to meet the people under the condition of different patterns of lighting requirements of light.

1. Introduction

At present, for the control of household lighting, at home and abroad, the research on the regulation and control of lighting in intensity, color and direction mainly stays in the wired and fixed button control mode, that is, the control terminal is fixed in the fixed position on the desktop or wall and the wired mode is used to control the lighting mode [1]. In addition, ordinary household lighting is fixed in intensity, color and direction[2]. With the improvement of living standard, people in the spiritual level continue to pursue high grade of life, especially for their own living environment structure requirements higher, therefore, people's emotional mode of home lighting requirements become a part of the material and spiritual high grade of life.

Compared with previous similar technologies, this paper highlights the digital control of lights with wireless data communication technology, so as to achieve the purpose of intelligent control over lights[3]. Through single-chip microcomputer technology for home lighting at the same time more in terms of intensity, color, steering gear set (each shift 6 or above), for a variety of tie-in, satisfy people under the condition of different patterns on the demand of lighting, which have certain advantages over the traditional methods, therefore, has a wide prospect of market.

2. System Composition

The system is composed of six parts: sensor, steering motor, wireless terminal equipment, Zigbee wireless network coordinator, single-chip microcomputer circuit, and digital remote control, as shown in figure 1 below:
2.1 Sensor
Sensor components include light intensity, color and steering sensor components, which collect the information of lighting intensity, color and steering Angle and send it to the wireless terminal for fusion processing.

2.2 Steering Motor
Steering motor is mainly regulated by single chip microcomputer circuit, through wireless data communication control lamp Angle intelligent adjustment, in order to achieve different emotional state requirements.

2.3 The Wireless Terminal Equipment
The wireless terminal equipment mainly controls and is controlled by the wireless data communication mode between the lamp and the single-chip microcomputer circuit, that is, the data collected by each sensor is transmitted to the single-chip microcomputer circuit by the wireless data mode after the fusion processing by the wireless terminal equipment, At this time, when people have different emotional state requirements of the control lamp, after the single-chip microcomputer circuit processing, also need wireless terminal equipment control lamp wireless control and regulation[4].

2.4 Zigbee Wireless Network Coordinator
Zigbee wireless network coordinator is the interface between wireless terminal equipment and network. It is responsible for format transformation of information and data uploaded by wireless terminal collected by sensor components and data format transformation of lighting mode controlled by data processing center after output by single chip microcomputer [5].

2.5 Single-chip Circuit
Single-chip circuit is mainly to control the emotional mode of the lamp state adjustment, that is, the brightness of the light, color, lighting rotation Angle adjustment, so as to form a variety of different types of combination, equivalent to reflect different emotional mode.
2.6 Digital Remote Control
The function of the digital remote control is to integrate different emotional mode states in the digital remote control keys in a wireless way, and to operate the data processing center, so that the single-chip microcomputer can execute the digital remote control instructions, thus controlling the lights to operate in the digital remote control mode [6].

3. Working Principle of the System
When the system works, the Zigbee wireless network coordinator automatically sets up the network, and connects the Zigbee wireless network terminal devices to the network, and each device communicates with each other through Zigbee technology. Among them, the data processing center sends control instructions to the terminal equipment through the network coordinator, and the terminal equipment can also transmit the data collected by monitoring to the network coordinator through routing, and then transmit to the data processing center through serial port. Data processing center using 51 single chip as the main control chip. Zigbee terminal respectively with light intensity, light color, light Angle conversion or steering motor is linked together, such as sensor system will be collected real time strong or light color or light Angle information transmitted to a Zigbee terminal equipment, Zigbee terminal device through the Zigbee network transmits to the data processing center, by the specific parameters and setting the scene mode (light intensity, light color, lamplight illuminate Angle), the output control signal to adjust the light, eventually to achieve the scene mode that set.

4. Software Design Process
(1) Zigbee network initialization process
Program flow chart is shown in figure 2:

![Figure 2. Flow chart of Zigbee network initialization process](image-url)
(2) Flow chart of lighting brightness adjustment program

![Flow chart of lighting brightness adjustment program](image)

Figure 3. Flow chart of lighting brightness adjustment program

(3) Flow chart of lighting color adjustment program, flow chart of lighting steering adjustment procedure, flow chart of lighting scene mode adjustment program are similar to the above procedure flowchart.

5. Conclusions
The main content of this paper includes five parts, such as sensor, steering motor, wireless terminal equipment, zigbee wireless network coordinator, single-chip microcomputer circuit, etc. Based on the single chip microcomputer technology for home lighting more in terms of intensity, color, steering gear set (each shift 6 or above), for a variety of tie-in, satisfy people under the condition of different patterns on the demand of lighting, and wireless data communication technology to digital control of lighting, achieve the goal of control lamp intelligent control.

6. Acknowledgements
This work was supported in part by the National Natural Science Foundation of China under Grand No. 61871129.

7. References
[1] Jiang Feng, Li Xing, XIONG Tingyu et al. Design of remote wireless Intelligent light control System based on ZigBee technology [J]. Modern Electronics Technique, 2017, 40(2):114-117.
[2] Shan Zhenhua, Wang Shu Jing, Qiang Jie. The realization of intelligent home remote control system based on Websocket [J]. Application of electronic technology, 2017, 43(10):124-127.
[3] Liu Huibing. Design of intelligent Home lighting Control System based on KNX Bus[J]. Smart Buildings and Smart Cities, 2017(7):76-78.
[4] Dong Quan, ZHANG Baokun, BU Xiaohui et al. Research and experimental verification of wireless gateway of sensor Network based on TD-LTE[J]. Data Communications, 2018(3).
[5] Guo Shaomin, Shi Jun Feng. Embedded Web Server design based on Android and ZigBee [J]. Modern Electronics Technique, 2018, 41(8).
[6] Xu Yuming, Yang Xiaohui, Cui Chaoyang et al. Design of wireless transmit and receive circuit based on digital code[J]. Fujian Computer, 2018(6).