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Design and implementation of intelligent lighting multi-function desk lamp

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Abstract

This article introduces a smart lighting multi-function desk lamp, its functions include, intelligent reminder, weather forecast, sitting posture correction, voice assistant, wireless charging a variety of functions. So that users can have healthier eye habits, more convenient lifestyle, and more intelligent lamp experience while using desk lamps. Combine user experience design with intelligent technology to guide a healthy lifestyle. This product is a more innovative work in terms of human health and perfect experience by upgrading traditional industrial products through the means of modern scientific and technological design.

Keywords

Desk lamps；The consumption of energy；Weather；Part of the technical principle and implementation.

1. Project background introduction

1.1. Domestic desk lamp lighting power consumption

With the rapid development of today's society, the consumption of energy is increasing, and the lighting electricity in people's lives accounts for a relatively large share.

According to statistics, in 2016, China's light lighting power consumption accounted for 15% of the total annual power generation (more than 10 billion kilowatts per hour), of which the consumption of desk lamps should not be underestimated. Because some users do not turn off the lights when they leave, a large part of electric energy is wasted; At the same time, most of today's desk lamps use incandescent bulbs as wicks, and their service life is relatively short, and the garbage waste generated is not easy to handle, which has become more and more unable to meet the social needs of energy conservation and emission reduction.

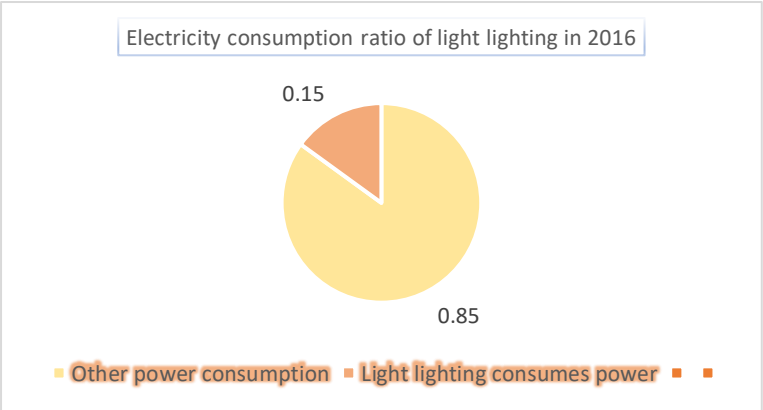

Fig 1 Electricity consumption ratio of light lighting in 2016

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LED lamps can better improve the problems of incandescent lamps to a certain extent. When electrons and holes are recombined can radiate visible light, based on this principle produced LED wick LED wick emitted a cold light source, high electro-optical conversion efficiency (close to 60%), low working voltage (about 3V), and low energy consumption, can be controlled, no radiation, in the same brightness, LED energy consumption is only 10% of incandescent lamps, 5% of fluorescent lamps. LED life can reach 100,000 hours, which is 10 times that of fluorescent lamps and 100 times that of incandescent lamps. At the same time, the cost of LED wicks is only one-tenth of incandescent lamps, in contrast, it is a wise choice to choose light-emitting diodes and the like as desk lamp wicks

1.2. The desk lamp has a single function

Household appliances are becoming multi-functional because of the addition of single-chip microcomputers, and with the improvement of people's living standards becoming more and more civilian, our lives are becoming more and more convenient and comfortable with the development of household appliances. With the development of household appliances, as a small desk lamp in household appliances, it has gradually adapted to the pace of scientific and technological development and become multi-functional. Although the button-type desk lamp is still the main body of the table lamp market. However, with the development of modern electronic technology and the improvement of people's needs, traditional desk lamps have felt the threat of product upgrading. Table lamps not only become increasingly multifunctional in function, but also gradually develop in the direction of combination, decoration and interest in appearance. Combination is with the acceleration of people's pace of life, some convenient and practical, novel, beautiful combination of desk lamps are emerging in the market, there are alarm clocks and desk lamps combined, there are thermometers and desk lamps combined, there are electronic clocks and lamp combinations, there are also pen holders, stationery boxes, etc. and desk lamps combined, is the desk lamp is more practical. At the same time, some table lamps not only have modern technology, but also have a variety of styles, exquisite craftsmanship, ingenious shape, and different materials. Heterogeneous, diverse colors. Consumers can choose table lamps of different styles and materials according to the decoration style and furniture style of the room, so that the table lamp and the interior layout form a perfect artistic whole. Based on the above background, I propose the design of a multifunctional desk lamp based on a single-chip microcomputer.

1.3. Healthy living is in high demand

According to relevant data from the National Health Commission, in 2018, the overall myopia rate of children and adolescents in China was as high as 53.6%. In 2020, data from the Ministry of Education showed that compared with 2019, the rate of myopia among primary and secondary school students increased by 11.7% compared with 2019. From this point of view, smart desk lamps protect their eyes by removing harmful blue light and other ways to meet the needs of children's healthy eyes, and once again cut to the need.

Under the influence of the rapid development of today's society, people's dependence on electronic products when staying at home is gradually increasing, adults work from home, and students go to school from home. This leads to increased contact with electronic products in our lives, so we must consider the goal of eye protection when we sit for a long time to work, or sedentary study.

In the effective questionnaire of the online survey, it was found that the group concerned about children's health was concentrated among young parents, who generally had a good higher education and paid more attention to whether lighting had a positive impact on the physical and mental health of the next generation from the perspective of intrinsic function. This trend also represents the future of children's products and products used by teenagers as a blue ocean with great potential.

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In combination with the table lamp, the table lamp is more practical. At the same time, some table lamps not only have modern technology, but also have a variety of styles, exquisite craftsmanship, ingenious shape, and different materials. Heterogeneous, diverse colors. Consumers can choose table lamps of different styles and materials according to the decoration style and furniture style of the room, so that the table lamp and the interior layout form a perfect artistic whole. Based on the above background, I propose the design of a multifunctional desk lamp based on a single-chip microcomputer.

1.4. Project Objectives

This project combines the desk lamp with its own desk lamp function, to carry out a traditional lighting work, the shape of the lamp body is simple and light, you can adjust the height of the lamp pole, the direction and brightness of the light, mainly lighting reading function. There are also many modes of desk lamps, such as learning mode, sleep mode, and entertainment mode. The softest light is in the learning mode, which can protect our eyes as much as possible when reading books. They also give us time and supervise us. In sleep mode, the lamp will automatically adjust the brightness until it goes out, and will also provide us with some soft music to promote our sleep and play a role in supervision. When in entertainment mode, some more rhythmic music will be played, accompanied by flash effects and so on.

2. Part of the technical principle and implementation

2.1. MQTT protocol application

MQTT (Message Queuing Telemetry Transport) protocol is a very light communication protocol. Compared to protocols like HTTP, MQTT excels when it comes to transmitting data over a network. The protocol has the characteristics of controllable service quality of data transmission, small bandwidth occupation, unpredictable data content of transmission, and knowable device connection status. Another important feature of the protocol is its ease of implementation on theclient side. It has been widely used in the fields of Internet of Vehicles, smart home, instant chat applications and industrial Internet. At present, there are more than 100 million devices connected through the MQTT protocol, all of which benefit from the MQTT protocol to provide a stable, reliable and easy-to-use communication foundation for devices.

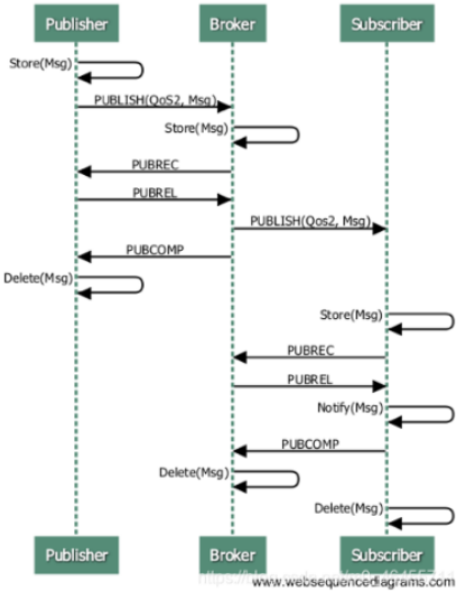

Fig 2 MQTT protocol

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Through the use of MQTT protocol, the effect of interconnection communication between desk lamps and mobile phones is stably and reliably realized, which increases more functions and interesting functions of desk lamps, and can also develop subsequent functions more perfectly.

2.2. ESP8266 Flash File System

Every ESP8266 comes with a flash memory, much like a small hard drive, where the files we upload are stored. The full name of this flash memory is Serial Peripheral Interface Flash File System (SPIFFS).

In addition to storing uploaded programs, we can also store web files or system configuration files in the flash memory of ESP8266.

The Arduino IDE's tool ESP8266 Sketch Data Upload can upload files to the ESP8266's flash file system. Our lamp display background can be uploaded and modified through this tool, and users can set their own lamp background.

2.3. Know the weather

Nowadays, there are many weather information platforms on the Internet, and knowing that weather is the most accurate information and most stable service platform we have ever used. What's remarkable is that the basic services provided by Knowing the Weather are completely free. This free weather information includes weather forecast information (3 days), real-time weather, and life index. The free and perfect service makes it more convenient for us to use this platform and save our development costs. The ESP8266-Seniverse library we use provides the following free information through the Know the Weather API:

– Real-time weather information (temperature, weather)

– Weather forecast information (temperature, weather, precipitation probability, wind, wind direction, humidity)

– Get real-time life indices (dressing, UV intensity, car wash, travel, cold, exercise)

2.4. WiFi Manager network management

When developing IoT projects, it is often necessary to set up WiFi for ESP8266, but since our desk lamp is for ordinary people who do not know programming, they will only use it, so we used ESP8266's third-party library for this project: WiFiManager library.

By connecting to the network generated by ESP8266, you can jump out of the wifi connection interface, enter our wifi name and password in the interface to make our desk lamp and wifi network network, eliminating the cumbersome process of entering the program and entering WiFi and password, only need to complete the wifi network distribution on the mobile phone, our desk lamp can work normally.

3. Product advantages

1. Compared with traditional desk lamps, the volume of smart desk lamps is no different from the size of ordinary desk lamps; Smart desk lamp does not occupy more space in the case of improving functional performance, under the same volume, smart desk lamp can help users accomplish more things, save more time and space, and let it become your helper in learning and work.

2. The traditional desk lamp has a single function, usually idle and wastes space, and the intelligent desk lamp lighting is only one of his functions, he is a smart home assistant, which can help us better complete some tasks in learning and life.

3. The intelligent desk lamp integrates the functions of lighting, voice assistant, charging, clock and other equipment well, which not only improves the utilization of space, but also greatly reduces the cost of multiple equipment.

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4. Under intelligent management, the desk lamp will automatically turn off the light and cut off the power if no one or the owner forgets to turn off the light, which is of great help to the saving of resources and reduces potential safety hazards.

5. the addition of intelligent sitting posture correction module can better help us develop good work and study habits, in daily life, we are easy to cause fatigue and myopia because of long-term incorrect sitting posture and long-term concentration, intelligent desk lamp by detecting sitting posture and performing incorrect sitting posture reminder well help us solve this problem, but also remind us to pay attention to drinking water and looking into the distance during work, effectively alleviating our study and work fatigue.

Acknowledgments

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