Intelligent Voice Control Lighting Device Based on Arduino UNO Microcontroller

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Abstract. This work is an intelligent voice control lighting device based on Arduino UNO microcontroller. It will save a lot of time and bring more convenience to life, work and study. When using, need to speak to desk lamp only "turn on the lamp", "turn off the lamp" can realize the switch of intelligent desk lamp. Say "up", "down", "left" and "right" to control the direction of the light. At the same time, it also has the function of small night lamp night closed room fluorescent lamp, desk lamp on the photosensitive intelligent components will sense if the change of light intensity, light up to 10 seconds automatically, can prevent to turn off the lights after walking knock against. In addition, we added clock on the panel, using DS1302 clock module to save time, and can be saved without power. Increased the practical use of intelligent desk lamp, more optimized movement inconvenient people to use.

1. Introduction
This design adopts ASRM08 non-specific voice recognition module, which is used to collect passwords issued by users. This module uses the principle of pinyin recognition for speech, the recognition success rate is more than 85%. In a quiet environment, the recognition distance can reach about 3 meters, which can meet the daily use distance. This module takes the form of serial port communication, communication with single-chip microcomputer, a different voice commands have different return value, the return value of a single chip microcomputer through different you can judge the user instructions. At the same time, it uses two steering machines to form a two-axis cloud platform, which can rotate the lighting direction freely in the direction of x axis and y axis, and has...
reached the function of adjusting the lighting direction. At the same time, it also has the function of small night lamp night closed room fluorescent lamp, desk lamp on the photosensitive intelligent components will sense if the change of light intensity, light up to 10 seconds automatically, can prevent to turn off the lights after walking knock against. In addition, we added clock on the panel, using DS1302 clock module to save time, and can be saved without power.

2. Program
This program design mainly adopts conditional statement, serial communication, protocol and other statements. The program block diagram is shown as follow, which mainly consists of three parts.

The first part is the main program for the lighting device to realize main functions, namely the serial communication program between Arduino and speech recognition module. The implementation principle is: the speech recognition module will send fixed condition codes when it receives the set statement, and Arduino can recognize different statements by identifying these specific condition codes.

The second part is the direct control of LED lights and steering gear after the data is recognized and processed by the single-chip microcomputer.

The third part is the communication, processing and display of the clock module, which needs to set the time parameters.

![Diagram](image)

**Figure 1.** Programming Block Diagram
3. Analyzation

1) The Working Principle

   a) In this device performance test principle of speech recognition module are as follows: unknown speech after microphone into electrical signals in recognition system of the input, the first after preprocessing, then voice model is established based on the characteristics of people's voice, to analyze the input speech signal, and extracts the required characteristics, based on the speech recognition for template. According to the speech recognition in the process of identification and computer models, will be stored in the computer voice template comparing with the characteristics of the input speech signal, according to certain search and matching strategy, find out the optimal range of templates to match the input speech. Then, according to the definition of this template, the recognition result of the computer can be given by looking up the table. This optimal result is directly related to the choice of features, the quality of speech model and the accuracy of template.

   b) The principle of single chip microcomputer control part: after the recognition to the speech signal from the module of signal processing, according to the result of signal processing to the corresponding operation, for example, in recognition to the "lights" statement, then will connect the device channel to high potential, to achieve the lighting, in the same way as recognition to "turn off the lights after the statement" pull under the corresponding port voltage, can close the lighting. The same principle applies to the movement of control devices up and down, left and right.

   c) The principle of realizing the function of device automatically lights up as: SCM access photosensitive resistance when the light dimmed, measured data values will have change, according to the numerical change can judge whether the light dimmed, and control of lighting brightness.

2) Performance Analysis Test Data

   a) According to multiple tests in different environments, the system has high stability and low power consumption.

   b) The test effect is better in a quieter environment, and the recognition success rate of the device is more than 90%. The recognition result is related to whether the operator himself/herself pronounces correctly. Basically meet the design requirements, can be applied in practice.

   c) In a noisy environment, testing and recognition rate has dropped, recognition rate above 70%, prone to identify errors, identify the phenomenon such as slow response, this phenomenon can be according to the specific environment by adjusting the sensitivity was improved.

4. Conclusion

   1) The innovation point of this device design lies in the successful speech recognition technology applied in the daily work of life, people can through voice control instead of manual operation, so that we can promote work efficiency.
2) This work not only can the brightness of voice control device for lighting, also can through the voice control the direction of the lighting, hands free in the learning process, cannot stop working content control under the condition of the device.

3) The lighting device also adds the function of clock, increasing the practicability of the device.

4) In addition, when the fluorescent lamp is turned off, the device will automatically be on for a period of time to be used as a lighting night lamp, increasing the intelligence of the device.

5) The design concept of this device can also be applied to other fields, such as intelligent fans, all of which can be controlled by voice, which has strong practicability.

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