Application of Laser Sensor in Intelligent Control

Cui Juan*, Cao Gaofei, Li Peixin, Song Jia

Xi'an Traffic Engineering Institute, Xi'an, Shanxi, 710300, China

*corresponding author

Keywords: Laser Sensing, Intelligent Control, Application

Abstract: In order to make better use of intelligent control system to realize energy saving function, it is necessary to design a system which combines laser sensor with intelligent control. We first design the hardware structure of the system and then design the overall structure, and the infrared transceiver module and other modules are given out, the system is controlled by a 32-bit processor. The intelligent module is used to realize energy saving control, and the related control is carried out by laser sensing signal to ensure the stability of the system. Through a series of experimental results, we design the system to run very well, the performance is also good, the accuracy of intelligent control is high, and the effect is good.

1. Introduction

In order to realize the improvement of environment automation and energy saving stability, we should make good use of intelligent control and energy saving system to carry on the related work. The intelligent operating system designed in this way can reduce environmental pollution and energy loss, improve people's adaptability to the environment and reduce environmental pollution. The country calls for an environment-friendly and resource-efficient society, and we should take this into account when designing the system and make a comprehensive strategic plan for sustainable development. Intelligent control and energy-saving system processing is in line with the pace of modern life, and laser sensor is the control of some of the main electrical equipment in today's social life, this technology has been gradually used in various fields of society, has a very important value. Through the performance of the intelligent control system and the requirements of all aspects, the system we designed can achieve better intelligent monitoring and energy saving control.

2. System Design of Laser Sensor

2.1. Overall Structure Design

We know that the core CPU of the system is the STM32 processor, through which the connected intelligent system can well realize the monitoring and management of the whole environment, because it is through the control center to transmit signals, so as to realize the control process of external parts, and establish a good intelligent control system.[1].

Figure 1 Self-driving applications of laser sensors

CMOS camera is used to detect the abnormal module environment. The purpose of this paper is

  DOI: 10.25236/cseem.2020.133

to find the problem better, then to deal with the related problems in time. The picture passed to the user is actually the processor and the serial port work together, so that can play the best effect. And in order to solve the security problem, we also design a set of algorithm of environment anomaly detection to carry on the related security co-work, once found the abnormal situation, the processor will send the alarm signal to the user in time, so that the user can receive the information in time, then the user can choose whether to alarm, and save the dangerous information and then realize the system reset. And the system can monitor abnormal phenomena at any time, but also to the user to forecast the work of alarm.

2.2. Design of Hardware Structure

The safe software and hardware structure can make the intelligent control system run normally. If the hardware and software have any problems, the whole system will be hit by unimaginable problems. The design of the hardware system should meet the realization value of the whole system, expand the space for the later upgrade function, and expand the space for the experimental interface. When choosing the right hardware, consider all aspects, cost and environment. The price of the hardware used in this article is not high, using GPRS and CMOS cameras [2].

2.3. Laser Module and Anomaly Detection Module

Whether the whole infrared system can run normally is mainly to look at the laser module, the whole system is composed of three parts: infrared receiving, infrared storage circuit and transmitting circuit. First the infrared receives the signal, then processes the signal, after receiving the letter, sends the coded information to the receiver. This is the simplified flow of the entire running process. The anomaly detection module is established for the purpose of safety and protection. It is composed of image sensor and compression module.

2.4. Host Design

The host control board used in this paper is Italian company, our inner structure is easy to operate, and the integration is relatively high, which has good value in some fields. Such a system can optimize power consumption mechanism, power supply means and so on. The processor core of this system is that LQEP144, use eight timers, five US-ART and other hardware resources. It can be said that the hardware resources used by this system are very rich and complex [3].

Figure 2 Intelligent control of laser sensor-operated robot

3. System Software Design

3.1. Structural Design

The system in this paper is actually an embedded operating system, which needs a lot of late design to realize the complete system. The whole process is more complex, mainly includes four parts, external programming, API standardization, visual operation interface and GUI programming, as well as building file data block system.

First of all, we need to do a good job of the peripheral hardware of the system, including some touch screens and control boards, in fact, they are very basic foundation, as long as we ensure the

perfection of these hardware, we can ensure the normal operation and operation of the intelligent system. Next is the driver, when the user changes the underlying hardware, the application is invariant, prevents the contradiction when carries on the multiple tasks, we can take the joint way to carry on the control to the system, uses the mailbox signal form to prevent the contradiction long life, carries on the related reconciliation work. Function design should be carried out when the user standardizes the interface, and the application should follow the standard of API function module, which is helpful to upgrade the system.[4].

In addition, the user's own application should also be built up, develop their own tasks, achieve multiple aspects of communication, and optimize the graphical interface, so that the tasks to be completed can be presented on the interface.

3.2. Intelligent Control Module

Some buildings in the sensor can be solved by sensing information, and valuable information can be obtained by combining the new identification of data, and the preservation of data is the main part and the part of strengthening supervision and research. Energy saving scheme is also a key part of monitoring system, knowledge and experience and feedback information can be reflected in it, these work is conducive to the development of intelligent energy saving system.

3.3. Design of Laser Infrared Control Module

Laser infrared control can realize the control of sensing signal, based on the performance requirements to develop some control programs and acceptance programs, laser infrared control system and high and low level pulse matching can complete the control of all electrical appliances. Thus receiving signals from a collection or other device gives the module the ability to learn and save. Infrared programming is greatly reduced, the speed of operation has been greatly improved.

When the laser infrared receives the signal, it initializes the infrared module, first downloads the program to enter the infrared system, then Jirong power supply, when the state indicator lights up, the remote control is aligned, always pressed, when the lamp 1 flashes, it represents the normal study work, the chip storage work is saved, stored in the study area to go [5].

3.4. Environmental Anomaly Judgment

In order to grasp the overall environment, timely detection of abnormal conditions and so on, it is necessary to calculate the alarm factor, so that it is within a reasonable range. Both the monitoring environment and the location of the camera will affect the abnormal situation, thus affecting the factors. Therefore, we quantify the alarm step, set the alarm factor as a, when the a is smaller than 0.01, at this time it is in the normal interval, there is no abnormal phenomenon, when the a is between 0.01 and 0.45, this time the degree of danger is insufficient, but to make an early warning, and then in the next step of observation, if the a is greater than 0.45, then the risk factor is higher at this time, the system will determine the danger, the user needs to alarm at this time, or make some measures to act as a shock target.

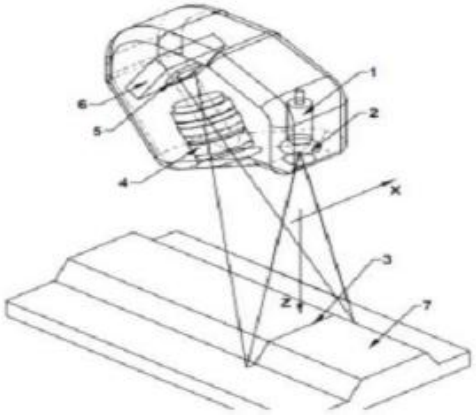

Figure 3 Laser QR code sensor

4. Experimental Experiments

4.1. System Performance Experiment

The experimental results show that the system performance of this paper is good, and the test result is passed. The system runs very well and is a good intelligent control system.

4.2. Reliability Tests at Different Distances

Compared with the traditional system, the system can detect the communication situation at different distances. By adjusting the distance of the remote control, the communication distance is set to quantitative, the transportation distance is variable, the stability test of different distances is carried out, the fixed distance between the infrared node and the equipment is set to two meters, and the communication distance between the system and the infrared node is constantly changed, and the reaction of the equipment is observed. The experimental results based on the data show that the system can convey the information well at 400 meters. But the system is still significantly better than the traditional system. and the average success rate is much higher than that of the traditional system.

4.3. Energy Conservation Test

The experimental temperature is 17 degrees Celsius and the light intensity is 150. The data obtained by the sensor show that the energy saving effect of the system is very good, and there is a good agreement between the system and the energy saving control, which can ensure the system to achieve the best energy saving effect within a reasonable range.

5. Concluding Remarks

above all, our intelligent control laser sensor system based on STM32 processor has realized the design of control board, and through a series of experimental comparisons, as well as subsequent performance tests and so on, the experimental results all show that the system has a good operation effect, and can also achieve good communication at long distance, and most importantly, it has excellent energy saving effect.

References

[1] Zhang, Yuzhe. Application and Development of Electrical Automation Control in Factory. Tianjin Electronic Industry Association. Proceedings of Tianjin Electronic Industry Association 2020 Annual Meeting. Tianjin Electronic Industry Association: Tianjin Electronic Industry Association, pp. 36-39, 2020.

[2] Feng, Hong. Application of Intelligent Technology in Power System Automation Control. China Equipment Engineering, no. 12, pp. 20-21, 2020.

[3] Huang, Guangpeng. Application of Intelligent Sunshade System Construction Technology in High-rise Office Building. Guangdong Civil and Construction, vol. 27, no. 06, pp. 80-82, 2020.

[4] Jiyi., Wang, Juan. Vibration Signal Detection System of Mechanical Equipment Based on Laser Sensor. Laser Journal, vol. 41, no. 02, pp. 186-189, 2020.