

Research on the Application of Automatic Control Technology in Agricultural Machinery

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Abstract: With the continuous development of society and the continuous increase in the number of people, agriculture has also achieved great development. In today's society, how to improve the quality of agricultural products and the quantity of agricultural products has become an urgent problem to be solved. At the same time, with the rapid advancement of technology and technology, agricultural production equipment has begun to develop towards automation. The use of automatic control technology in agricultural machinery can not only increase the yield of crops, but also reduce the workload of farmers. Based on this, this paper will analyze how to use automatic control technology in agricultural machinery to help agriculture achieve better development.

1. Introduction

With the development of agricultural economy, the realization of automatic control technology is the key to improving the quality of agricultural products and reducing environmental pollution [1]. At present, some areas of rural areas have begun to implement automatic control technology, and automated mechanical design can meet some of the needs of rural areas, but further development is needed [2].

In recent years, American agricultural companies have been working to integrate GPS systems with agricultural machinery, and strive to make their agricultural development more refined [3]. At the same time, Japan, as a large agricultural country, has also devoted a lot of efforts to the development of agriculture, and has introduced mechanical automation devices in time to upgrade its agricultural production technology, and even applied it to other industries [4]. In addition, other countries in Europe have begun to pay attention to the development of mechanical automation technology, and rationally apply it to their own agricultural development, and put the use of this technology on the craze [5]. In contrast, although it is impossible to compare with agriculture, the importance of mechanical automatic control technology has been recognized and widely promoted [6].

Agricultural machinery automation is the basic demand and inevitable trend of agricultural development. The application of this automatic control technology in agricultural machinery design has become the research focus. At present, the level of automation of agricultural machinery is constantly improving, but there is a certain space in design and application. Therefore, the author applies the current application status of automatic control technology in agricultural machinery, and analyzes its specific application strategy to ensure the improvement of agricultural mechanization level.

2. Characteristics of agricultural machinery automatic control technology

2.1 Real-time control

The basis of the development and design of the automatic control technology applied to agricultural machinery is electrical control [7]. It has the advantages of fast speed and short time in signal transmission. Based on such advantages, the automatic control technology is applied to the safety protection of agricultural machinery control devices. Real-time control of multiple or multiple categories of agricultural machinery can be achieved [8].

2.2 Reliable

In the control of agricultural machinery, all I/O signals are isolated by optoelectronics, which makes the internal circuit of the controller and the external circuit of the machine have an isolated electrical system [9]. It is only necessary to install filters at each input, so that it will not operate due to interference even in a harsh working environment [10].

2.3 Automatic fault diagnosis

Automated agricultural machinery usually uses various sensors. If the automated machinery fails in a harsh environment, the sensor can transmit the collected abnormal signals to the main system to realize the first-time automatic fault diagnosis, and then the mechanical user can arrange the work [11]. Personnel go to the repair, or use a more advanced and advanced fault automatic processing system to remotely repair the fault [12].

3. Application analysis of agricultural machinery automatic control technology

3.1 Partial automation of agricultural machinery

Among modern agricultural machinery, some of them are automated devices that are provided by the machine itself. For example, the hydraulic three-point suspension is one of the automatic control devices. At the same time, such devices are also included in tractors commonly used in agriculture. When the tractor is working, due to its own shaking, it will drive the friction of the part bracket, which will cause the tractor's body to generate heat, which may eventually cause a fire. In modern tractors, there is usually an automatic device that senses that the temperature of the tractor's body is too high. The tractor's work is automatically controlled, forcing it to stop, thereby reducing the chance of an accident.

3.2 Application analysis of automatic control technology in irrigation system

As we all know, the development of agriculture is naturally inseparable from the irrigation of water sources. In traditional agricultural production, irrigation is usually carried out in a manual manner. The specific operation is that a specialist is responsible for a piece of agricultural land and is irrigated on time every day. But this approach has drawbacks to some extent. First of all, this method will waste a lot of manpower, otherwise it will give the staff tremendous pressure. Secondly, this kind of irrigation will make the staff feel slack, and because of the moderate amount, it is easy to mix the already irrigated land and unirrigated land, in turn, have an impact on overall tillage work. Therefore, in the process of modernization, staff can use automatic control technology to carry out watering work. First, the staff can plan all the farmland and rationally divide the area, and then quantitatively install automatic irrigation equipment for the area, such as one device per two zones or one device per three zones. Next, the staff can set up the practice for the automation equipment, requiring it to carry out irrigation work after every practice. This method can not only effectively reduce the workload of the workload staff, but also reduce the waste of water resources, and thus achieve the principle of sustainable development.

3.3 Application analysis of automatic control technology in refined agriculture

The so-called refined agriculture is to implement a refined management model in agricultural management. Under this model, agricultural production and agricultural management can effectively improve the quality of agriculture and the quantity of agricultural products, and promote the development of agriculture. In general, the main source of refined agriculture is the greenhouse, because the agricultural seeds in this model are more excellent than ordinary seeds, so their resistance is relatively weak. In the production of refined agriculture, the tools used by technicians are pumping stations and canals. Therefore, under normal circumstances, technicians must not only manage and analyze the growth status of agricultural products, but also manage and maintain the equipment. It can be seen that the workload of technicians is extremely large. In addition, since refined agriculture

is a means of agricultural production that has just been introduced in recent years, there are not many professional technicians, and there are few technicians who can participate in practical work. Therefore, professional and refined agricultural production will be affected to a certain extent. At this point, technicians can use automated control technology to carry out refined agricultural management measures, while reducing their own workload, but also improve their own work efficiency.

First, the technician can input the measured control data into the mechanized automatic control system through the computer system, and then the technician can turn on the equipment for automated management and automated production. However, it is worth noting here that in the initial stage of the production method, technicians should regularly check the site to prevent the mechanical equipment from being stuck due to inflexibility. The block diagram of the electronically controlled fertilization control system is shown in Figure 1.

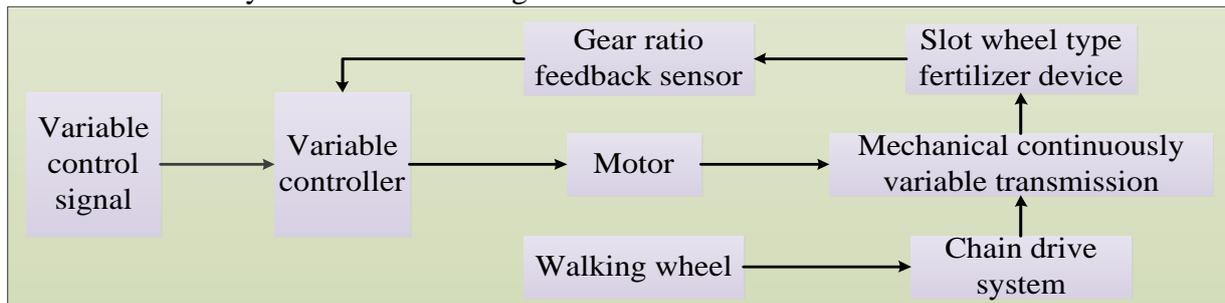


Figure 1 Block diagram of the electronically controlled fertilization control system

3.4 Application of visual recognition technology

Based on the difference in light demand of different vegetables, for vegetable greenhouses where many types of vegetables are grown, farmers need to adjust the light intensity according to the growth cycle of different vegetables. Therefore, this is not only difficult for farmers to grasp, but also a large amount of labor. The automatic control technology adds a visual recognition system to such vegetable greenhouses, distinguishes the vegetables inside the greenhouse, adjusts the rotation of the motor of the automatic shading system according to the change in appearance of the growth cycle, thereby controlling the change of the illumination intensity without Human participation. However, it should be noted here that the visual recognition system is costly to use, and is more suitable for some high value-added vegetable types. The common vegetable greenhouse has not popularized this technology in the transformation of automatic control systems.

3.5 Automatic picking technology

With the development of science and technology, modern control technology has been able to complete the automatic picking process of various vegetables. Through the preset travel route, the required vegetable index is input into the terminal computer, and the computer sends the control command to the automatic picking device. In the process of picking equipment moving along a fixed line, the equipment can summarize and analyze various indicators of vegetables by means of various types of sensors, and finally determine whether the picking conditions are satisfied, and picking vegetables satisfying the conditions.

This technology is suitable for fully automated vegetable greenhouses, and requires a certain computer operation basis to set different picking indicators according to different vegetable types. The application of automatic picking technology reduces the difficulty of human identification in the traditional picking process, and reduces the waste caused by the widespread use of uniform picking equipment. The automatic picking car system plan diagram is shown in Figure 2.

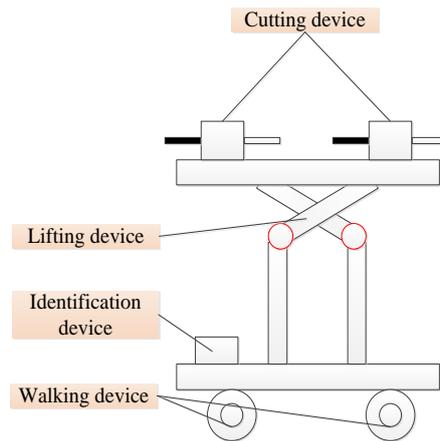


Figure 2 Automatic picking car system plan

3.6 Space temperature and humidity automatic control technology

For greenhouse vegetable cultivation, although the anti-season vegetables can bring higher profits to the farmers, because the anti-season vegetables have special requirements on the living environment temperature and humidity, it is necessary for the farmers in the traditional greenhouse vegetable cultivation process to carry out uninterrupted supervision. To this end, the researchers in the process of designing automated vegetable greenhouses, cleverly integrated the temperature and humidity sensor, installed multiple temperature and humidity sensors in the fixed position of the greenhouse, 24 hours to collect temperature and humidity information, and upload information to the central computer. The central computer will control the ventilation, drying, humidification and other mechanical equipment according to the preset threshold to keep the temperature and humidity in the greenhouse within a certain range. The overall structural block diagram of the temperature monitoring system is shown in Figure 3.

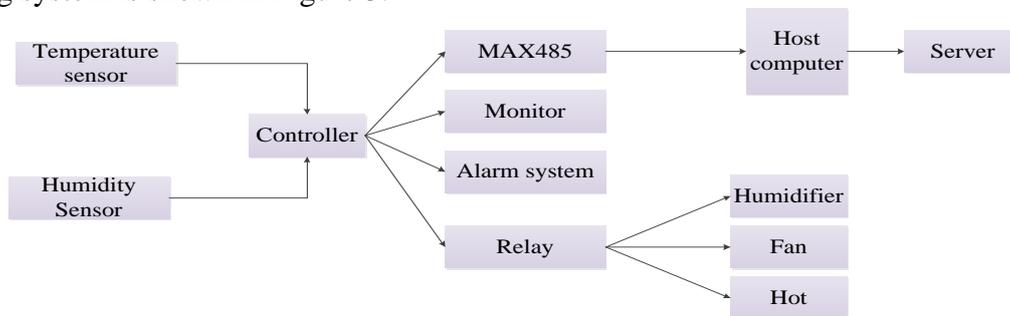


Figure 3 block diagram of the overall temperature monitoring system

4. Conclusion

In summary, with the continuous development of technology, the installation of automatic control devices in traditional agricultural machinery has become the inevitable development of the times. This kind of production machinery can not only reduce the workload of the staff, increase the output of agricultural products, but also solve the problem of people's food and clothing, and promote economic development. Therefore, the relevant staff must update their work concepts and work attitudes in a timely manner, and master the new planting skills, and then promote the development of agriculture.

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