Conceptual Design of Mechatronics System Based on Intelligent Control

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Abstract. With the development of society, the research on product concept design has become more and more mature, and the conceptual design of mechatronics system has gradually become the key research and design direction in the field of mechatronics. The rapid development of modern industrial production not only provides strong support for the application and popularization of mechatronics system, but also promotes the overall improvement of industrial production efficiency and quality. Electromechanical integration is a comprehensive mechanical system in essence. Because the traditional industrial control technology can no longer meet the requirements of industrial production on the function of mechatronics system. Intensify the research and application of intelligent control technology, minimize the impact of human factors on industrial production, and promote the effective improvement of the operation performance of mechatronics system. This paper analyzes the application of intelligent control in mechatronics system, and discusses the conceptual design method of mechatronics system based on intelligent control.

Keywords: Conceptual design; Electromechanical integration; Intelligent control

1. Introduction
With the continuous development of industrial automation production, the traditional control technology has been difficult to achieve good results, unable to accurately control [1]. The continuous development of intelligent control technology has brought new opportunities to solve the control problems of mechatronics system. The components of mechatronics system mainly include actuator, information processing, power and drive, sensing test and mechanical body, etc. the mechatronics system can use information processing technology and controllable driving elements to complete the operation of mechanical system [2]. As a product of effective integration of sensor technology, mechanical technology and electronic information technology, mechatronics technology is essentially a comprehensive technology. The combination of the two can effectively reduce the occurrence probability of all kinds of errors. The mechanical products of mechatronics technology play an important role in the development of the new era, and as an important technical support of these products, machinery can be realized Intelligent products, automated mechatronics technology has become an extremely important science and technology [3-4]. In the process of continuous development, mechatronics system has been improved and matured, but there are still some problems during the operation [5]. The most typical problem is that during the operation, there are varying...
degrees of uncertainty and nonlinearity in the industrial or agricultural fields, resulting in a lot of inconvenience factors during the practical application of the mechatronics system [6].

In essence, mechatronics is a comprehensive mechanical system. In this system, information processing and control are carried out by computer technology, so as to realize the intellectualization and automation of the modern system [7]. Increasing the research and application of intelligent control technology not only reduces the impact of human factors on industrial production, but also provides a new control method for complex equipment to solve problems, and promotes the effective improvement of the operation performance of mechatronics system [8]. Relying on many technologies such as machinery, electronic information and so on, the automation control of mechanical and electrical equipment has been significantly improved, and intelligent control is playing an increasingly significant role in the mechatronics system [9]. The traditional control technology has been unable to meet the operation requirements of the mechatronics system. Only by fully implementing the intelligent control technology in the development process, solving the problems existing in the operation of the mechatronics system, and providing a new solution for it, can it meet the requirements of the current environment for the development of the mechatronics system [10]. In this case, it is necessary to analyze the application of intelligent control in mechatronics system. This paper analyzes the application of intelligent control in mechatronics system, and discusses the conceptual design method of Mechatronics System Based on intelligent control.

2. Application of intelligent control in Mechatronics System

2.1. Application of intelligent control in mechanical manufacturing

Mechanical manufacturing is the key part of mechatronics system. For the present mechanical manufacturing technology, the most widely used technology is the combination of computer technology and intelligent control technology, so that the mechanical manufacturing technology can gradually become intelligent. The development process of intelligent control technology is mainly to gradually introduce intelligent control theory from function transfer to form modern intelligent control technology, realize the processing of complex tasks, and bring a new development direction for intelligent control of mechatronics system. Mechatronics is actually what people often call mechanical and electronic engineering. This technology, which combines mechanical and microelectronic technology closely, is not only the key to the development of modern industry, but also plays a vital role in reducing the energy consumption and improving the precision of industrial production. The application of automatic control technology in the processing system is mainly reflected in the processing of knowledge, the realization of independent decision-making of numerical control equipment, the autonomous planning of the path for the products to be processed, and even the autonomous learning, which can better complete the interaction and communication between man and machine [11]. In the past development, mechatronics technology has produced many excellent theories and greatly promoted the innovative design of mechatronics engineering. However, with the advent of the information age, the knowledge explosion makes most of them focus on mechanical engineering, or when the working face with large inclination angle is used to adjust the braking torque correspondingly, the control operation is simpler, more convenient and more reliable.

Compared with the mechanical manufacturing technology at that time, mechatronics system, as the most advanced technology at present, effectively integrates computer-aided technology and intelligent control technology, thus promoting the intelligent development of mechanical manufacturing technology. The effective application of intelligent control technology in numerical control system can easily solve these problems. Intelligent control technology can be used to fuzzy control each regional module in numerical control system to achieve better control effect. The popularization and application of intelligent control technology in mechatronics system not only achieves the goal of unified deployment of industrial production process, but also closely combines all links of industrial production, meets the requirements of different product production, promotes the overall improvement of industrial product production quality and efficiency, and points out the direction for innovation and
upgrading in the field of industrial production. From the perspective of the development of robots, the development of intelligent control technology has brought great breakthroughs in the field of robots, and many ideas have gradually become reality [12]. At the same time, it is the control problems encountered by robots in the process of development that promote the progress of intelligent control technology, and they complement each other and achieve each other. The application of intelligent control in mechanical manufacturing mainly includes intelligent sensors, intelligent detection, intelligent diagnosis and intelligent learning. Therefore, it is necessary to make good use of intelligent control technology during mechanical manufacturing to improve the effect of the whole stage of mechanical manufacturing and achieve the important goal of mechanical manufacturing. Generally, the neural network system is controlled by intelligent control technology, and the actual operation situation of mechanical manufacturing is dynamically simulated. Then, the sensor fusion technology is used to process and process the collected information, and at the same time, some parameters in the control mode are modified and adjusted, integrated and then processed. The continuous application of these technologies has made the intelligent control technology better controllable and adaptable to the environment, and promoted the high intelligence of mechatronics.

2.2. The application of intelligent control in numerical control

With the continuous development of science and technology in China and the continuous improvement of market economy, it also plays a particularly significant role in the progress and development of China's mechatronics system. In this case, the demand and requirements for the application of numerical control technology are increasing. During the real operation, numerical control technology should not only accurately use many intelligent functions, but also expand simulation and extension numerical control technology to build a new type of intelligent function, which can achieve corresponding goals with the help of intelligent control. Mechanical manufacturing is an important part of mechatronics system, and with the idea of intelligent manufacturing put forward, mechatronics equipment is gradually replacing manual operation equipment and widely used in manufacturing industry. The application of frequency conversion technology can effectively restrain the fluctuation of current when the motor starts, and in this way, it can effectively reduce the mechanical shock and heat in the electromechanical system, and improve the operation efficiency and effect of belt conveyor in coal mine [13]. With the continuous development of computer software technology, computer-aided technology has been integrated with traditional mechanical design theory and processing technology, and under the intelligent control means, it has formed a new type of mechanical manufacturing technology, also known as intelligent manufacturing system.

In the mechatronics system, numerical control technology occupies a very important position and plays a decisive role in the development of the whole mechatronics system. Therefore, for the numerical control technology, always uphold the high standard direction, in order to further extend the numerical control technology. The power function module provides power for the power needed by the system to ensure the normal operation of the system. The measurement and control functions mainly collect all kinds of information needed by the system, and realize the control of the system through exchange, operation and instruction output. Nowadays, the scale of enterprises is expanding, the products produced are more and more advanced, and the cost is getting higher and higher, which makes the production process of enterprises more difficult. Intelligent control equipment can process production data more scientifically and professionally, which is more helpful for enterprises to reduce production costs, improve production efficiency and expand economic benefits, thus enhancing the core competitiveness of enterprises in the industry.

With the application of intelligent control technology, aiming at the goals achieved in actual operation, control algorithm fields and structural problems, we can provide scientific reference for NC maintenance with the help of intelligent control coefficient. Through visual behavior analysis, the actual driving process of robot motion system is obtained, and a unified visual and behavioral model is formed, as shown in Figure 1.
Figure 1 Vision and behavior model

The robot itself has many unique characteristics, such as practicality and nonlinearity, which are shown in the dynamics system of the robot. Sensor technology is a technology that must be applied in any mechatronics system. Especially with the development of measurement and control technology, the detection speed, sensitivity and accuracy of the applied sensors are required, which greatly promotes the development of sensor technology. With the help of intelligent control technology, we can analyze the faults existing in the mechanical manufacturing process, and formulate corresponding solutions, so that the whole mechanical manufacturing process can operate safely and stably. In the control parameter system, the robot also has many characteristics, such as multi task, variability and so on. The application of intelligent control during robot operation is usually embodied in controlling the robot's walking path, tracking the robot's posture and action, controlling the robot's actual motion, controlling the robot's visual processing and information fusion.

3. Conceptual design of mechatronics science and technology

With the increasing requirements of industrial production on the running speed and reliability of CNC system in the process of parts processing, the knowledge processing ability of CNC system in the process of industrial production has been further improved. For the equipment and devices in mechatronics system, the integration of intelligent control technology can promote the intelligent development of equipment and meet the needs of enterprise development under the current development background. Intelligent development has reached a new level. In actual production, the technology of applying numerical control technology to mechatronics system is quite mature, and numerical control technology is of great significance to the development of mechatronics system. Because the traditional control theory and technology can't effectively control various functional modules used in modern data system, and this multi-module control and operation mode, there is a lot of fuzzy information in the process of establishing an accurate mathematical model. Therefore, operators can easily solve all kinds of problems existing in the operation process of mechatronics system and promote the overall improvement of industrial production efficiency and quality. The function of the robot control system is to operate and control the mechanism body according to the user's instructions, and complete various actions of the operation. The basic structure of robot network is shown in Figure 2.

Figure 2 Network infrastructure

The application of intelligent control technology in robot autonomous learning, information
processing, environment adaptation, etc., has realized people’s assumption of effective control of robot operation from the perspective of robot development, but people must be deeply aware that many control problems in the process of robot development have also promoted the development and application of intelligent control theory to a certain extent. All these further illustrate that in the process of practical application, these two disciplines actually have the relationship of mutual achievement and mutual promotion. The application of intelligent control technology in equipment is mainly reflected in intelligent home equipment, which can provide an intelligent living environment for families through the connection between controllers and lines. With the continuous development and application of electronic technology in China, the complexity of AC servo system used in mechatronics system is getting higher and higher, and there are many factors that affect the stability of AC servo system, which leads to many uncontrollable parameters in the actual operation of AC servo system.

The application of intelligent control in equipment and devices can scientifically process data and information, strengthen auditing links, and fundamentally control the input of production costs. According to the actual operation situation, intelligent components are selected, and corresponding hardware and software devices are matched to build an intelligent system. Figure 3 shows the structure of agent nodes.

![Figure 3 The structure of the agent node](image1)

Considering the uncertainty of the network and the relationship between topological connection weights and the distance between agent nodes, the traditional topological graph with fixed connection weights obviously cannot truly reflect the communication quality. Figure 4 shows the consistent distributed control state of agents.

![Figure 4 The consistent distributed control state of the agent](image2)

Through the application of intelligent control system, the whole working system can be simplified,
and intelligent control machinery can be selected according to the running rules and characteristics of the specific system. The application of intelligent control technology improves the intelligent level of AC servo system, adjusts the dynamic indexes of operation, and then promotes the overall improvement of industrial production efficiency. Numerical control technology is becoming more and more important in actual production. Therefore, the requirements of production for numerical control technology are also increasing. In practical application, numerical control technology not only needs to complete various intelligent functions efficiently, but also needs to complete some new intelligent functions through expansion, extension and simulation. If the concept of intelligent control system is introduced into the mechatronics system, it will not only completely solve the problem of poor stability in the operation of AC servo system, but also greatly improve the operation efficiency of mechatronics system.

4. Conclusions
With the rapid development of market-oriented economy, the mechatronics system should pay attention to improving its contents and actively carry out transformation. Under this background, intelligent control technology also came into being. The popularization and application of intelligent control technology in mechatronics system not only promotes the overall improvement of production efficiency, safety and quality of enterprises, but also reduces the energy consumption of industrial production. The application of intelligent control technology has better promoted the development of mechatronics, made up for the problems and defects in mechatronics system, better realized the effective application of mechatronics system in complex working environment, and expanded the application scope of mechatronics system to a certain extent. When evaluating the conceptual design scheme of mechatronics system, the structural stability, manufacturability and economy should be considered comprehensively to ensure the design quality. Through the application of intelligent control technology, it can promote the intelligent development of mechatronics system, improve the operation quality, and promote the overall improvement of the production efficiency of corresponding industries. With the continuous development and progress of intelligent control technology, the application scope of this technology is bound to be wider and wider. Therefore, strengthening the application research of intelligent control technology in mechatronics system is of great significance to the long-term sustainable development of China's social economy.

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