Exploration of the Application of Artificial Intelligence Technology in Mechatronics Technology Based on

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Abstract. With the development of industrial control software technology, more and more control technology is practiced and landed, which also makes a lot of modern processing mode and means can be shaped, together with non-standard mechanical structure design, in many processing stations, can achieve subversion of the traditional efficient processing mode. With the emergence and development of artificial intelligence, the combination of the two has become a natural fit, bringing a boon to many manufacturing enterprises. In this context, this paper discusses the application of AI-based technology in mechatronics technology.

Keywords: Artificial Intelligence Technology, Mechatronics Technology, Applications

1. Introduction

Many processes in the traditional manufacturing enterprises that rely on workers' skills and experience to ensure quality can be completed by advanced mechatronics equipment instead of manual labor, with higher efficiency, better quality and lower cost. Especially when the perfect combination of artificial intelligence and mechatronics technology, the traditional technology will gradually be reduced to the processing and production of the helper and scheduler, they are no longer the determinants of product quality, they are more in the role of resource allocation and coordination, is an auxiliary identity in the emergence.

2. The basic content of mechatronics in today's society

According to the advanced science and technology of the new era, China's mechanical and electrical enterprises have taken a leap towards intelligence, thus realizing automated means of operation. In today's electromechanical engineering construction field, electromechanical integration electronic information technology, through the computer control, its development is mainly driven by the advanced science and technology of today's era, and combined with computer software and hardware constitutes
an intelligent system. The emergence of electromechanical integration system, on the one hand, electromechanical construction projects to achieve scientific and standardized management, in addition, to the new era of mechanical and electrical enterprises to create greater economic value, compared with the traditional mechanical and electrical construction project management, electromechanical integration is more reliable and safer, the development of China's mechanical and electrical enterprises in the future is of great significance [1].

3. The development history of mechatronics towards artificial intelligence

![Figure 1. Development history](image)

3.1. **CNC machine tools**

Compared with the western developed countries, China's mechanical and electrical enterprises appeared late, with the continuous expansion of China's construction industry, the development of mechanical and electrical enterprises is to ensure the realization of high-quality construction projects is an inevitable requirement. The emergence of mechatronics in China, at first by the influence of CNC machine tool technology, in the middle of the 20th century, people's daily life began to touch the electronic application equipment, electronic application equipment is to promote the inevitable development of mechanical products needs, due to the actual operation of electronic application equipment at that time is limited, the quality of its mechanized products can not be guaranteed, therefore, the operation of mechatronics can not be widely used in China's mechanical and electrical enterprises [2,3].

3.2. **Microelectronics technology**

In the middle of the 20th century, mechatronics application of CNC machine tool technology field has a large problem, can not meet the specific requirements of today's era of mechanical and electrical engineering construction, so, still need to use other technologies to further realize mechatronics. The emergence of microelectronics science and technology has brought new hope to the development of mechatronics, as the scale of China's mechanical and electrical engineering continues to expand, the
requirements for its construction technology is also increasing, this era of mechatronics application of microelectronics technology, promote the smooth implementation of mechatronics, the emergence of microelectronics technology, China's mechanical and electrical engineering to a new field of development, the common operation of its technologies to promote The normal operation of mechatronics technology.

3.3. The emergence of programmable controllers

In the middle and late 20th century, the development of mechatronics technology has moved to a more mature stage, although the previous microelectronics technology can to a certain extent for the development of mechatronics technology.

With the development of the new era, the actual application areas of mechatronics technology are more and more, microelectronics technology can not fully meet the mechatronics technology in any case to solve all the problems, therefore, in this period, the emergence of programmable controller, the main function of the controller is to make it automatic operation through the characteristics of the programmable, the first country to apply the controller is the United States The United States automotive industry, the controller will be applied to the full. With the continuous maturity of electromechanical controller technology, in the process of China's electromechanical construction of a large number of applications of the controller, the technology continues to mature, and through a large number of practical applications of the new era of the development of a new electromechanical controller into the production process. With the maturity of this technology, the state has made a lot of management regulations about this field of technology in order to better control the new electromechanical controller developed in the new era. In the function of mechatronics technology, it not only realizes the automatic mechatronics technology, but also gives intelligent features to mechatronics technology. In today's era, mechatronics technology has a remote control operator, which makes the new mechatronics technology realize convenient conversion, and through the remote control terminal information is quickly conveyed to each receiver, and the receiver receives information in the first time through the new era information processing technology rapid screening and collation, the new era of mechatronics technology in the field of research and development is more inclined to its practical application value, forming a new era of Mechatronics system [4,5].

3.4. Laser optoelectronics technology

With the continuous improvement of the level of science and technology in the new era society, the scale of mechatronics is expanding, the controllable programmer can not fully meet the development of the new era mechatronics enterprises, in order to better cater to the contemporary mechatronics enterprises can better advance towards intelligence, the emergence of laser optoelectronics technology, mechatronics intelligence to the highest point, the use of the very advanced laser technology at present, borrowing optoelectronics in Laser, and optoelectronics technology can be based on programmable manipulation, can further optimize all previous technologies used in mechatronics, improve the entire intelligent process, fundamentally change the intelligent development of mechatronics many interference factors, get rid of the impact of unnecessary factors, to ensure that under the support of laser optoelectronics technology, more quickly and efficiently realize the intelligent development of mechatronics In a word, the use of the current very high In a word, using the current very advanced laser technology, China's mechanical and electrical enterprises can seize this advantage, photonics under the
support of laser technology, can make the integration of mechanical and electrical enterprises to achieve the goal of intelligent advancement faster, mechanical and electrical enterprises should be based on the trend of the development of today's social mechanical and electrical industry, and always pay attention to the current advanced science and technology, the use of new era of advanced science and technology and mechatronics enterprise The development of the trend of the development of the dynamics, and according to the development trend of their own enterprises in the process of social development, mechatronics and the new era of advanced science and technology cleverly integrated together, the development of more advanced mechatronics technology to meet the trend of the new era of social development, focusing on the study of mechatronics to the intelligent development of which prerequisites are needed, and according to the advantages of the development of their own mechanical and electrical enterprises, strengthen the mechanical and electrical According to the advantages of the development of their own electromechanical enterprises, strengthen the research of electromechanical integration related technology, develop advanced technology of high quality and high efficiency electromechanical integration to intelligent development, in order to ensure that China's electromechanical enterprises in the future development can always be at the forefront of the world [6,7].

4. Application of artificial intelligence technology in mechatronics technology

Artificial intelligence for mechatronics is one of the directions of mechatronics development. This kind of intelligence is mainly designed and realized through control technology, i.e., the control system in mechatronics system is specifically realized. An intelligent system should be able to imitate human behavior. It should be able to learn various kinds of inherent information and knowledge about a process or its environment, and use the acquired knowledge for estimation, analysis, decision making and control, so that the system is in an optimal state. When it encounters something that has not been learned, it has the ability to give appropriate treatment. The system can continue to work when there is a local failure, and even to analyze and repair the failure. The system has considerable flexibility and initiative, can take the initiative within the scope of the task requirements, when the task has a conflict, the controller can be directed to solve, etc. Expert systems, fuzzy logic, neural network control, learning control and hierarchical progression are currently the main areas of artificial intelligence research, their respective development, and interpenetration, towards a combination. Among them, the first three fields are the more mature areas of the current electromechanical systems to achieve intelligence.

![Diagram](image)

**Figure 2.** Application of artificial intelligence technology in mechatronics technology

4.1. Expert system
Expert system is a kind of computer software, which has a considerable amount and authoritative knowledge, which is expressed in some way and composed into a database, and can provide expert-level consultation and answer to the problems in a specialized field by reasoning accordingly with this knowledge. Since the first expert system was introduced in 1968, after more than 30 years of development, expert systems have become the most active field of artificial intelligence applications. From the initial application in medical, science and technology fields, it has expanded to finance, finance, insurance, business and law, and the following applications related to mechatronics are discussed [8].

First, the application in assembly and manufacturing. The production of products is always constructed with parts, and the assembly of different parts together into a new product is called configuration task. Expert systems applied to assembly and manufacturing can achieve considerable economic benefits. For example, DEC's expert system XCON, is the first expert system applied to the computer configuration, and now profits $150 million per year for DEC.

Second, the application in the equipment fault diagnosis. Expert system for equipment fault diagnosis, especially for large structures, complex fault diagnosis, can find the fault as soon as possible, greatly shorten the maintenance time, there are many successful examples, such as the United States Westinghouse Electric Company developed GEN- AID expert system, has been successfully applied to diagnose the fault of the turbine engine. IBM has also been equipped with an IBM ATPC machine IBM has also equipped its IBM ATPC with an expert system for pinpointing system faults.

Third, the application in control. Expert systems can play a role in the control of mechatronics equipment, in the servo control, CNC machine tools, machining centers and other control areas, has made progress. Successful examples in this area, such as AT&T for the control of robots, developed on a single chip to implement the expert system. The earliest chips included a 16-rule ROM, a controller, and a reasoning machine to process the data and rules. Working with a 2.5um line width CMOS, which initially used only a quarter of the chip area, it could accommodate 256 rules after switching to a 1.5um line width and using fuzzy logic to establish the rules, and could execute at a speed of 80,000 LISP, which was 1000 times faster than conventional expert systems. Although the cost of large expert systems is very expensive, but its economic benefits are large, usually within a year to pay for the cost of therefore, the application of expert systems in mechatronics is very promising.

4.2. Fuzzy logic and control

All objects belonging to a fuzzy concept are called fuzzy sets. For example, say: "xx is a young person." This young person is the fuzzy set. The logic and control based on fuzzy set is called fuzzy logic and control. It can deliver enough information with less cost, and can make efficient judgments and processing of complex things. Its applications are as follows.

1) When the mathematical model of the process does not exist, or exists but is very difficult to encode, or when the controller composition is too complex in order to meet the fast enough timing control, or when too much storage space is needed to use a general microprocessor, fuzzy control can be considered [9].

2) When the need to reduce production costs, the use of inexpensive sensors and low-performance microprocessors, the use of fuzzy control can achieve a fairly good control system. Usually with 4 or 8-
bit microprocessors, the interpolation capability of fuzzy logic is already very good. Fuzzy control first made a breakthrough in the field of household appliances, and has been very successful.

3) Because of the characteristics of fuzzy control, it can be applied to the occasion of high environmental noise.

4) Fuzzy control cleverly integrates intuitive experience and can achieve more satisfactory control in nonlinear uncertain distributed parameter systems with pure hysteresis, large inertia and large parameter drift. Therefore, fuzzy control is more suitable for mechatronic systems with the above characteristics.

5) Fuzzy control is insensitive to certain parameter changes. Since the decision of fuzzy controller often has to be made according to a dozen or even dozens of rules, if some rules fail due to the failure of sensors or components, other rules can play a compensating role, so that the output remains continuous and smooth [10]. Therefore, fuzzy control is more suitable for some requirements of good robustness in mechatronic systems.

4.3. Neural network control

Artificial neural network can simulate the high connection of a large number of human brain cells, when there is an input signal to activate the neurons, through the neural circuit to produce output. The neural network has learning ability and associative memory, it can produce the expected output after the input signal. If an information circuit has not been learned, it can also produce a reasonable output.

Artificial neural networks have made significant progress in mechatronic system applications, and the combination with expert systems and fuzzy logic is a key development direction.

Fieldbus LON WORKS for mechatronic systems whose core technology is the use of neuron chip (nuron chtp). This chip is equipped with three internal microprocessors: MAC processor to complete the media access control; network processor to complete the ISO/OSI reference model of the 3-6 layer network protocol; application processor to complete the user field control applications. Data is passed between them via common memory. The neuron chip also has a variety of V0 and time calculator, etc.. A small neuron chip, not only has a powerful communication function, but also combines control and data in one. In some cases, this chip, together with some other devices, can assume the task of an independent control unit in a distributed control system [11].

In short, expert systems, fuzzy logic and artificial neural networks, not only play their unique roles, but also increasingly on the integrated formation of a new technology to further improve the level of intelligence of mechatronic systems, and continue to expand its application level [12,13].

5. Thinking about the development of mechatronics to intelligence in the new era

In today's era, the rapid development of society has led to the continuous development of all walks of life in China. The development trend of mechatronics intelligence is the inevitable requirement of our country's new era to comply with the development of society, and the development of mechatronics in the new era is a system organization that controls the field of electromechanics with its intelligent existence advantage, relying on the new era microelectronics technology, in the process of making
mechatronics equipment, its digital management system. The realization of the process using microelectronic controllers more simply solve the problem. In today's era, CNC machine tool technology is maturing and computer application system is developing rapidly, which has laid the foundation for the digital system of new era mechatronics technology and realized virtualization management and integrated management through advanced computer technology. In the development of China's mechanical and electrical industry, mechatronics technology is an important means to achieve the digital properties of mechanical and electrical products. At the end of the 20th century, the first countries to push mechatronics into intelligence were many developed countries in the West, and the intelligent advancement of mechatronics not only created huge economic value for these developed countries, but also pushed the great intelligent achievement of mechatronics to the forefront of the world. For example: like many programmable controllers can promote mechatronics to the intelligent advancement of the production of mechanical and electrical products have digital management system, today's era, electronic information technology is particularly developed in the digital management system of mechatronics, more powerful to enhance the digital creation of mechatronics digital management system. In the new era, mechatronics has advanced to intelligence, and as time goes by, the pace of mechatronics to intelligence is affecting our country in a subtle way [14].

6. Conclusion
For the vigorous promotion and application of artificial intelligence in mechatronics, mechatronics is gradually developing in a more intelligent direction, and is about to truly overturn our entire manufacturing production model, which is no longer a mere trend, but an undeniable fact.

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