A review of research into the intelligent development of the discipline of mechanical and electrical engineering

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Abstract: With Intelligent robotics is an inevitable product of human social development, the current technological progress, people's work and life in the intelligent trend is more significant. At present, China's intelligent robot manufacturing has made good achievements, and become one of the important technical support in industrial development, so the development of intelligent robot technology has great significance, greatly changing the mechanical engineering field of production and manufacturing methods, and improve production efficiency. In addition the application of intelligent robots in electromechanical engineering has played a positive role in improving electromechanical systems and increasing their operational capability. The article starts from the relationship between intelligent robotics and mechanical and electrical engineering, to understand the significance of intelligent robots applied to the field of mechanical and electrical engineering, and to study their practical applications and explore future development trends.

1. Overview of relevant theories

1.1 Prospects for intelligent robots

Since the introduction of intelligent robots, they have facilitated the productive life of society. China attaches great importance to intelligent robotics and the demand for it has increased in the development of various industries. The integration of intelligent robotics into electromechanical engineering is an important means of achieving intelligence, automation and information technology. Intelligent robotics injects vitality into the field of electromechanical engineering, improves the productivity of enterprises and promotes the production of innovative scientific and technological achievements, which is conducive to the development of intelligent robotics and can further expand its application areas.

With the advancement of artificial intelligence technology, the intelligent robotics industry is flourishing like a spring. In the long run, the trends in policy guidance, social environment and technological breakthroughs in all aspects have created a favourable situation. Smart robots are now widely used around the world and their share has increased from 19% to 57%. Now, intelligent robots are cutting-edge technology products that include sensory elements, response elements and thinking elements, and will be a must for humans to move to a higher level of development and survival. It

will not only free humans from tedious and repetitive monotonous work, but will also be able to replace them in various fields.

With the development of information technology and artificial intelligence, intelligent robots are gradually expanding into general-purpose fields and entering people's daily lives, with robots replacing tedious tasks such as household chores being the most popular. Robotics technology innovation is accelerating the digitization of the industry, and robots are playing an increasingly important role in the upgrade from Made in China to Made in China.

1.2 Internal and external advantages of intelligent robot development

(1) Guidance and support of national policies National guidance route for the robotics industry, focusing on the overall level of industry improvement. From a macro perspective, the development of stricter industry norms to promote the rational development of the robotics industry, raising the industrial threshold in terms of recommended testing and certification of robot products, enterprise qualifications and quality requirements. From the development direction, the state vigorously promotes the development of intelligent industrial, service and special robotics industries, establishes special traction for basic frontier technologies, focuses on cultivating leading enterprises, and drives the overall quality of the industry to improve.

(2) The prospects of the industry can be seen from the upgrading of the advantageous industries around the world With the introduction of the national guideline route, all cities are on the robotics industry, clear focus on the direction of industrial development and industrial scale, focus on cultivating robotics industry clusters, the Pearl River Delta cities have introduced there are preferential and supportive policies for robotics and other intelligent manufacturing enterprises, in order to allow robotics enterprises to make more vigorous scientific research results, to promote the rapid development of the industry.

(3) Core technologies such as artificial intelligence have made certain breakthroughs With the rapid development of artificial intelligence, the Internet of Things (IoT), big data and other technologies, the robotics industry has ushered in a new wave of integration and innovation development. Drawn by market demand, the intelligence level of robots is gradually improving, while the domestic market has accelerated the independent research and development of core technologies and achieved certain technological breakthroughs in core components.
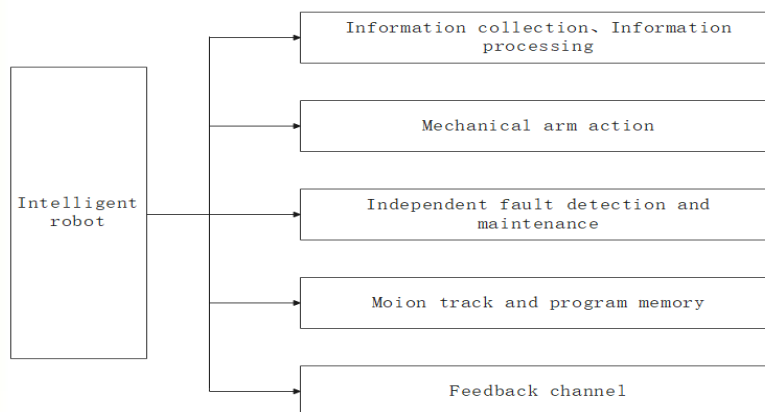
1.3 Intelligent robotics

Figure 1: Diagram of the intelligent robot system

FirstIntelligent robotics is an important artificial intelligence technology involving disciplines

such as informatics, computing, psychology and cybernetics. Intelligent robots mimic the perceptual thinking of people at work, operate according to specific requirements and produce products. Intelligent robots are a product of the development of mechanical intelligence. Initially, intelligent robots needed to be programmed with a code and then operated and produced according to the code, mainly as stationary operations. Current intelligent robots are more technologically advanced, have good self-awareness, can better adapt to the environment, and can update and learn in a timely manner, and the level of machine intelligence is further enhanced. See figure 1.

1.4 Mechatronic engineering

Mechanical and electronic engineering, also known as mechanical integration, covers the content of disciplines such as informatics, artificial intelligence, management and electronics, integrating mechanical engineering, information engineering and electronic engineering in one, with a scientific and rational configuration to harmonise and unify mechanical engineering, information engineering and electronic engineering and maximise the advantages of each module. Initially, mechatronic engineering was only a preliminary integration of emerging technologies with traditional mechanical technologies, relying on manual completion of operations, but not yet achieving a perfect and concrete integration. After a period of development, mechanical and electronic engineering can take the mode of assembly line operation due to the emergence of large-scale integrated circuits, and has now entered the integration stage, closely combined with relevant artificial intelligence technology, etc., mechanical automation can really be achieved. Mechanical and electronic engineering, the core is mechanised engineering, and combined with electronic engineering technology and information technology, to rational design to give full play to their respective roles, so there is a strong comprehensive, covering a number of theoretical systems. In its development, it has gone through three main stages, the first being the manual stage, i.e. the pre-Third Industrial Revolution, which initially integrated traditional mechanical technology and emerging electronic technology, but the degree of integration was still low for the manual stage. The second stage was followed by the 1930s to 1940s, i.e. the assembly line stage, when large-scale integrated circuit technology, computer technology and control technology emerged to further promote the development of mechanical and electronic engineering, and there are certain applications in the industrial field. The third is the integration stage, that is, the end of the 20th century, the beginning of the 21st century, at this time can be closely combined with other technologies, and gradually achieve intelligent development[1].

2. The advantages of intelligent robotics in the field of mechanical and electronic engineering and the relationship between the two

2.1 Relationship between intelligent robotics and mechanical and electrical engineering

Intelligent robotics and mechanical and electronic engineering are complementary to each other. The application of intelligent robots in the field of mechanical and electronic engineering has a positive effect on its development, and will also counteract the progress of intelligent robotics. In the field of mechanical and electronic engineering, the use of intelligent robots instead of human beings to complete complex and high-risk operations can efficiently process complex information in a short period of time, refine the management of the product production process, and make reasonable plans for production time and material use through computer programmes, ensuring production efficiency, saving production costs, and greatly improving production accuracy. The application of intelligent robotics for mechanical and electronic engineering can also improve its systems and keep them functioning well. Mechanical and electronic engineering is safer and more stable and can accurately identify objects, convert images into digital signals and store them well in the system to improve the

problems that exist in the project in time. At the same time, with the use of intelligent robots in mechanical and electronic engineering, the production of products is more flexible and can generate diversified production methods[2].

2.2 Advantages of intelligent robotics in the field of mechanical and electronic engineering

(1) Coordinating role. Mechanical and electronic engineering covers a wide range of disciplines, which intersect with each other and present a wide variety of working characteristics. The effective use of these differentiated disciplines in the field of mechanical and electronic engineering requires careful study by companies and relevant personnel. Effective integration of mechanical and electronic engineering and intelligent robotics can effectively co-ordinate the differentiated disciplines that exist, realising complementary advantages and enabling their respective roles to be brought into full play.

(2) Supervisory role. In traditional electromechanical engineering, there is a lack of adequate levels of automation, which requires close supervision by the people involved. However, under physical and psychological conditions, humans are unable to work continuously for long periods of time and cannot guarantee absolute accuracy. The application of intelligent robotics can reduce the need for human intervention, and supervising electromechanical engineering is sufficient. Production can be supervised by intelligent robots by entering the relevant instructions, significantly reducing human consumption and costs.

(3) Optimised efficiency. Intelligent robots are used in such a way that they can run well and work for long periods of time as long as they have sufficient energy, avoiding physical fatigue and errors caused by physiological and psychological factors in humans. As a result, the use of intelligent robots in electromechanical engineering offers higher efficiency and better quality.

3. The role of intelligent robotics in the field of mechanical and electronic engineering

3.1 Expansion of the mechatronic market

The application of intelligent robotics can contribute to the development of the machinery industry, promoting increased productivity and meeting market demand. In the intelligent robotics market, for example, intelligent floor sweepers and dishwashers are driving the development of various industries and greatly affecting people's daily lives. Therefore, mechanical engineering companies need to develop intelligent robot development plans flexibly according to market conditions to provide effective support for company development. Mechanical and electrical engineering technicians need to combine artificial intelligence technology with the characteristics of mechanical and electrical engineering, and make reasonable use of artificial intelligence technology on the premise of mastering mechanical operations and parameters. Some of the operating systems in intelligent robots are difficult and require targeted training of operators who can then carry out their work. The combination of the two can achieve a win-win situation.

3.2 Expansion of the mechatronic market

In the field of mechanical and electronic engineering, the application of intelligent robotics improves the efficiency of engineering work, the main performance is the information system road use function, in the transmission of information to avoid failures and errors, the amount of information transmission to improve, and to ensure the safety of mechanical and electronic engineering information system. At the same time, the application of intelligent robotics can also detect mechanical electronic engineering information systems, achieve prepared information entry and transmission, and promote the development of mechanical electronic information systems.

Mechanical information systems are not stable enough on their own and are prone to losing information, while the application of intelligent robotics effectively makes up for this problem and promotes the development of mechanical electronic engineering.

3.3 Expansion of the mechatronic market

In mechanical and electronic engineering, a major role of intelligent robots is to correct errors and maintain mechanical and electronic systems, to correct faults in them and to maintain the performance of intelligent robots, and fault detection is also more accurate, faster and easier. In practice, mechanical and electronic engineering data is entered into the operator interface, and accurate inferences can be made about the location of faults by intelligent robots, making it easier for staff to maintain them. At present, there are three main methods of intelligent robot fault detection, namely rule-based reasoning, case-based reasoning and fault diagnosis. In practice, mechanical and electronic engineering controls become unstable due to relevant factors, easily leading to information system failures and incorrect information transmission. With the use of intelligent robotics, the error generating principle can be quickly discovered and the interpreter agreed to explain the fault reasoning and basis. See figure 2.
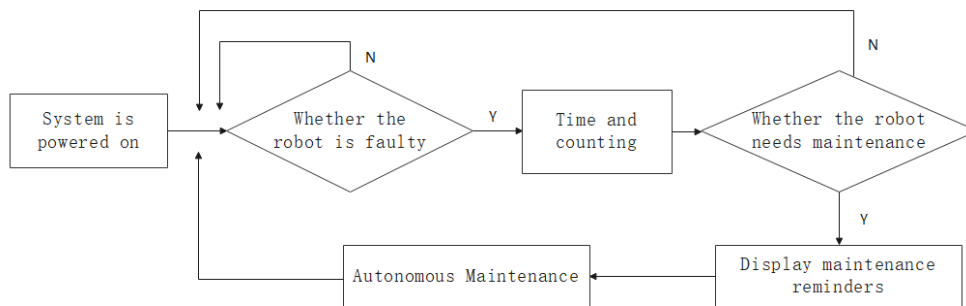

Figure 2: Flow chart of system autonomous maintenance

3.4 Neural network system applications

One of the main roles of neural network systems applications is to improve the analytical capabilities of mechanical and electrical engineering, extending and expanding them by simulating the human nervous system to form intelligent information systems. In mechanical and electronic engineering, a large number of neurons need to be constructed in order to efficiently process relevant data information and obtain results. At the same time, corresponding functional models are built to enable a deeper level of analysis. The application of neural network systems allows for a greater variety and complexity of problems in the field of mechanical and electronic engineering to be handled. The level of intelligence in mechanical and electrical engineering is increased and the ability to process and analyse problems is greatly improved.

3.5 Fuzzy reasoning system applications

Fuzzy reasoning systems are also a major application for intelligent robots. It mainly simulates the fuzzy processing of information by the human brain. Its advantages are reflected in pattern recognition, automatic control and decision analysis. Mechanical and electronic engineering can effectively solve its non-linear problems, but it should be noted that the accuracy of the data and results it obtains is poor and the functions are also fuzzy, but they can be effectively predicted and reasoned.

3.6 Job object identification

Intelligent robots can be applied to the field of object recognition in electromechanical engineering through vision sensors, laser scanning and automatic identification for effective object recognition and precise mechanical operations. Vision sensors use machine vision to detect information about objects such as distance, shape and size. The use of laser scanning technology guarantees the accuracy of the data and allows for a clear display of object-related data, but its use is more affected by dust. Automatic identification technology, on the other hand, is computer technology that controls mechanical and electronic engineering operations and issues work instructions, increasing the precision of the operation.

3.7 Production intelligence

Under the intelligent development of manufacturing processes, planning and scheduling, production coordination, equipment linkage, resource management and decision-making become more intelligent. With intelligent technology as the core, an intelligent manufacturing system is established, mainly applying intelligent technologies such as new sensing and identification systems, industrial robots and automated production lines to ensure the quality and standard of the intelligent manufacturing production base. Realising mass production while incorporating personal customisation, forming a customer-driven factory business model and adopting an O2O sales approach of online customisation orders as well as offline experience to shorten the distance between products and customers and enhance user stickiness. In addition, the integration of intelligent robots and high-end manufacturing will be promoted, and the establishment of digital workshops will improve the level of manufacturing intelligence in related industries.

3.8 Finding the best space for expression

Mechatronics manufacturing enterprises apply artificial intelligence to electromechanical engineering to find the best expression space based on data information, optimise and integrate electromechanical system data, and mine valuable data information on the basis of which senior leaders make scientific decisions and management. During the application of intelligent robots, function connections are enhanced to further promote the spatial expression of electromechanical engineering. By enhancing functional connectivity, numerical calculations with high precision and speed can be achieved. In terms of linguistic expressiveness, this spatial expression is more logical and rigorous. At the same time, the effective application of artificial intelligence function connection technology in electromechanical engineering can optimise the entire network system space and improve the control and operation of electromechanical engineering systems in a comprehensive manner.

3.9 Optimisation of electrical equipment

Intelligent robotics needs to be fully applied in the electrical engineering automation method in order to achieve the goal of optimising electrical equipment. The effective use of intelligent robots can significantly reduce optimisation times and optimise the quality of equipment. In traditional optimisation, a low level of expertise is required, with technicians needing knowledge of circuits and electromagnetic fields and some practical experience in order to complete the programme design and achieve the equipment optimisation goals. The obvious problem with this approach is the poor stability of the programme implementation. The application of intelligent robotics, however, allows the use of genetic algorithms and expert systems to eliminate the disadvantages of the traditional

approach and truly optimise electrical equipment.

4. Application of intelligent robotics in the field of mechanical and electronic engineering

4.1 Embedded system technology

To meet the individual needs of customers, embedded system technology can be used to ensure real-time, safety and reliability and good professionalism. Applied in intelligent robots can be controlled remotely, machinery automatically on the production of products accurately identify to promote production efficiency, create a safe and comfortable working rest environment, the risk factor is reduced.

4.2 Sensing technology

With the application of sensing technology, the intelligence of intelligent robots is further improved, products are processed and manufactured more efficiently and accurately, and manufacturing precision is improved. Intelligent robots are used in electromechanical engineering to read operating objects and perform targeted operations through laser scanning technology and automatic identification technology. The sensor can identify the object in time, convert the image into a digital signal that can be transmitted to the system, and the system carries out subsequent operations. Most of the current intelligent robots use fiber-optic sensors, whose stability and security are enhanced, data reliability is guaranteed and the risk of image recognition errors is reduced.

4.3 Rapid diagnostic techniques

Machinery and equipment in operation is susceptible to failure due to environmental and other factors. It is essential to diagnose and troubleshoot machinery and equipment in advance to ensure that the system operates properly. The application of rapid diagnosis technology allows the fault points of the equipment to be accurately located, the set repair procedures to be used and the repairs to be recorded. With the application of rapid diagnosis technology, time costs can be saved, diagnosis is fast and results are accurate, making up for the lack of manual testing. The technology uses system parameters, equipment databases to analyze equipment and compare data for diagnosis to obtain results and facilitate efficient fault handling.

4.4 CNC technology

CNC technology in the control of equipment operation is achieved through digital signals, the use of modular production, according to the set program to complete the work, can produce and manufacture curved shape products and precision parts. In the field of electromechanical engineering, with the application of intelligent robots, CNC technology is developing rapidly, the scale is further expanded and CNC technology is continuously improved. The technology allows multiple process operations to be carried out at once, with improved processing accuracy, shorter product changeover program times and improved resource utilization under standardized production[3] .

5. Trends and Conclusion

In the current field of mechanical and electronic engineering, intelligence has become the main trend in its development. Traditional engineering electromechanical operation and control information processing capacity, intelligence is not enough, in more areas will be effectively combined with mechanical and electronic engineering and intelligent robotics, set control hub for the

system to achieve higher precision and stability of data control, to ensure that the equipment and system practical ability is strong.

Under the continuous development of science and technology, mechanical and electronic engineering to achieve intelligent, automated development, the application of intelligent robots more mature, and positively affect the efficiency and quality of production of all links, to achieve intelligent production life, with good prospects for development.

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