

Original Paper

Development Status and Trend of Industrial Robot in China

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Abstract

With the continuous development of the times, technology is flourishing and the world is entering the era of artificial intelligence, industrial robots will replace humans as the backbone of the manufacturing industry. The continuous development and application of industrial robotics is conducive to building a new advantage for China's manufacturing, promoting the transformation and upgrading of China's industry, accelerating the construction of China's manufacturing power, and making an important contribution to China's economic development. Based on this, the article describes the current situation of industrial robots in China, the challenges faced, and the future development trend.

Keywords

industrial robots, challenges faced, development trends

1. Introduction

Robots are not only the key supporting equipment for advanced manufacturing industry, but also an important entry point to improve human life style. The research and development and industrial application of robots is one of the important symbols to measure the development level of scientific and technological innovation and high-end manufacturing of a country. At present, the robot industry technology has entered a new 2.0 era. The industrial robot for the industrial field has developed into an intelligent production machine with self-perception, self-decision-making and self-execution ability. Industrial robots play a huge role in the manufacturing industry, promote the improvement of social production level, and make important contributions to the economic development of the society, known as the "pearl on the crown of the manufacturing industry" (Zhang, 2013).

2. Introduction of Industrial Robot

The so-called robot refers to the machine device that automatically performs work, including all the machinery that simulates human behavior or thought and simulates other living things. It is an important symbol of the transformation of industrial production to modernization (Luo, Fang, & Zhao, 2015).

Industrial robot is mainly oriented to the industrial field, as a multi joint manipulator or multi degree of freedom machine device, it can rely on its own power and control ability to automatically perform work, showing a variety of functional advantages.

From the technical level, the industrial robot includes three basic components: the main body, the driving system and the control system. It is the key to ensure its automatic execution and realizes the process of intelligent control.

Among them, the main structure of industrial robot is divided into the machine base and the actuator, some of which also involve the walking mechanism; The driving system is a device for the actuator to produce corresponding actions, including the power mechanism and the traditional mechanism; The control system sends out command signals to the drive system and the actuator according to the input procedure and controls them.

Today, driven by innovative technology, the development of industrial robots is more mature, and presents the advantages of programmable, anthropomorphic, universal and other characteristics.

Its adaptability to the surrounding environment is significantly improved, which meets the demand of flexible manufacturing. Its good versatility, can perform different tasks. Its application in the industrial field, not only improves the production efficiency, reduces the labor cost, but also more refined operation, upgrades the product quality, and improves people's quality of life to a certain extent. In addition, the industrial robot itself as a product of interdisciplinary integration, including mechanics, microelectronics, is also driving the development of other technologies.

3. Development Status of Industrial Robots in China

The development of industrial robots in China starts from the downstream industry, relying on the strong market demand, and constantly introduces and develops industrial robots suitable for our own industrial needs. The development of industrial robots in China is characterized by its late start but rapid development (Chen, 2019).

Compared with the western developed countries, the research of industrial robot in China started late in the 1970s, and has roughly experienced the following five development periods: germination period (1970-1985), technology research and development period (1986-1990), prototype development period (1991-2000), preliminary industrialization period (2001-2010) and rapid development period (2011 to present). At present, due to the rapid development of the global economy and the fierce competition of the intelligent manufacturing industry, the demand and application of industrial robots in China begin to soar. At present, it has accounted for about one third of the global industrial robot market, and has

become the largest industrial robot market in the world.

At present, the application fields of industrial robots in China are mainly distributed in automobile manufacturing industry, 3C electronic and electrical industry, metal processing industry, plastic and chemical products industry and many other fields. Among them, automobile manufacturing industry accounts for about 33%, 3C electronic and electrical industry accounts for about 27%, and both occupy about 60% of the market share.

With the strong support of national policies and the continuous efforts of universities, scientific research institutes and enterprises, China's industrial robot technology has been continuously developed and its application fields have been continuously expanded. Domestic industrial robots are gradually gaining market recognition. However, the development of industrial robots in China is also facing great challenges. On the one hand, China lacks its own core technology in industrial robot controller, servo motor, reducer and other core parts, and relies heavily on imports. On the other hand, the four major international brands of industrial robots - FAUNC, YASKAWA, KUKA and ABB - occupy about 70% of the domestic industrial robot market, leaving little room for domestic brands to survive and competition is fierce.

4. Current Status of Robot Development Abroad

The world's first industrial robot was born in the United States in 1962, and after more than 50 years of development, the US has become one of the world's robotics powerhouses with strong robotics technology (Liu, S. W., 2019). Although Japan and Germany were later than the United States in the development of industrial robots, their achievements should not be underestimated, and in terms of core industrial robot technology, Japan and Germany have almost taken over the field of high-end industrial robots. Japan's FANUC, YASKAWA, KUKA and ABB are known as the "Big Four" of global industrial robots, accounting for about 50% of the global market share.

In 2011, Germany took the lead in proposing the Industry 4.0 programme. The robots of the Industry 4.0 era are no longer independent units, but are closely linked to the Internet of Things, big data, cloud computing and artificial intelligence. They need to be highly interconnected with other intelligent devices, communicate in real time, process complex information quickly, and be flexible, safe, accurate, fast and easy to operate, so that people and machines can work together in a more coordinated way.

In January 2015, Japan issued the "new robot strategy", which puts forward the new development direction of Japanese robots, including strengthening ease of use, flexibility, simplicity, autonomy, informatization and networking. In order to develop next-generation robots, Japan has also developed a series of important initiatives to create an innovative environment, strengthen application-oriented human resources, and promote the internationalisation of technologies and products. Germany's Industry 4.0 plan and Japan's new robotics strategy have a very positive significance for the development of industrial robots in China.

5. Challenges of Industrial Robots in China

5.1 National Perceptions

The current perception of robots has always been that robots are a series of programs that bring together human knowledge and ultimately express it through machines, a high-end technology that will play an important role in future development. This is a high-end technology that will occupy an important place in the future, and industrial robots are among the most advanced devices in the technology sector. To improve and innovate the independent development of industrial robots in China, we need the government and the people to have a proper understanding of industrial robots and to contribute to the development of the country.

5.2 Strategic Deployment

The development of intelligent manufacturing as a key industry in China is in line with the country's development needs. In order to achieve rapid development of industrial robots, it is important to find the right direction and not to miss any opportunity to develop the industrial machinery industry in China so that it can have an advantage in the competition with other countries for the market. At present, the development of industrial robots in China is on track, and their technology is maturing, but the main areas of application in China are not comprehensive enough, and the types of industrial robots are not perfect. So China should speed up the development of other industrial robots with advantages, break through the shackles and meet market demand in all areas of industrial robotics.

5.3 Application Technology

The constant development of the times has led to an increase in people's living standards, which means that people's requirements for products in all areas are constantly rising, so the products we make have to be more sophisticated in order to meet the needs of modern people. The development of the times is the development of technology in the final analysis. Therefore, in order to improve the development speed and quality of industrial robots in China, it is necessary to develop the relevant technology of industrial robots. Enterprises and relevant R & D institutions and departments should actively study and innovate the relevant production technology, and subdivide the robot industry, so that robots can work more conveniently, Thus, the production cycle of the robot is shortened, and the development concept of green production in China can be realized.

6. Development Trend of Industrial Robots in China

The development trend of industrial robots in China has followed the general trend of the development of industrial robots in the world, but also according to the unique characteristics of our society and national conditions with some independent trends in line with the socialist road (Liu, Y., 2019).

6.1 Relying on the Market to Take the Lead in Developing Industrial Robots

Compared to developed countries, China has significantly lagged behind in terms of research and development. Research and development require a huge investment, which is a big burden for both Chinese enterprises and the government, therefore, relying on China's huge market demand, based on

popular industries to start optimizing and research and development has good operability, such as the automotive industry, infrastructure and military industry.

The automotive industry uses a large number of industrial robots in its manufacturing process, from forging and manufacturing of billets, machining of mechanical parts, heat treatment, welding, painting, assembly and transportation, all of which are done through industrial robots. So taking industrial robots in the automotive industry as a basic model and starting to promote them to other industries through continuous design and optimisation is an important direction for the development and construction of industrial robots in China today, and it is also an important way to promote and popularise industrial robots in China in the future, which has now become an important trend in the development and upgrading of industrial robots in China with an in-depth understanding of the market.

In addition, in the military and infrastructure, also based on the current vigorous needs of China's development, to create their own industrial robots, the same industrial robots as a prototype for the promotion of upgrading, is China's unique industrial robot development upgrade road.

6.2 Relying on National Policy Support, Focus on Breaking through the Core Technologies of Industrial Robots

This is a common way for China to catch up with Europe and America. In this regard, the relevant government departments in China have been committed to investigating and researching the field of industrial robots, and on this basis, they have formulated a series of practical policies that are favourable to the development of industrial robots. This has resulted in a series of practical policies that are favourable to the development of industrial robots, such as taxation, investment and loans, and the implementation of visible support measures for the industrial robotics industry. A series of regulations have been enacted to ensure the safety and social rights of research and development personnel in this field and to address the concerns of research and development personnel.

7. Suggestions for How China Should Respond to the Development of Industrial Robots

First, we should accelerate the development of national and industry standards for the industrial robot industry, further improve China's standardization system, actively participate in international exchanges and cooperation, achieve coordination and docking with international industrial robot product standards, and strengthen the standardization of national policy support for the industrial robot industry and technological innovation. This will provide the necessary basis and support for the healthy and sustainable development of China's industrial robotics industry.

Secondly, the core technologies of industrial robots should be tackled to break through the technical bottlenecks of raw materials, reducers, controllers and servo motors, promote the localisation of core components and reduce the manufacturing costs of products. Further promote the market demand for robots and expand the application fields. At present, China's industrial robots are relatively inadequate in some special fields such as dangerous and toxic applications. Expand the application fields and promote the industrial development of industrial robots in China.

Finally, focus on the cultivation of application-oriented talents. Strengthening efforts to cultivate applied talents for industrial robots cannot rely solely on the way vocational colleges cultivate applied talents, but needs to encourage the promotion of stronger cooperation between universities, research institutes and enterprises to jointly cultivate multi-level applied talents, so as to achieve a better connection between the cultivation of talents and the needs of society. The training of talents will provide an important guarantee for the healthy and sustainable development of industrial robotics.

8. Conclusion

Although China's industrial robotics technology started late, we have made some achievements through our continuous efforts. In some aspects, due to the lack of systematic construction and research and development, these achievements appear to be very loose, and it is difficult to form a perfect and independent production and construction system. Although a number of general industrial robot manufacturers have been established one after another, the products are clearly unable to compete with the general industrial robots of mature developed countries in the marketplace, so there is still a long way to go on the road to the production and development of industrial robots in China, especially in terms of direction, what path to take and how to establish their own development model, all of which are debatable.

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