Innovation and Practice of Talent Training Model for Robot Engineering under the Background of Intelligent Manufacturing

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Abstract: As a cutting-edge technology in the new era, the field of robotics engineering is increasingly receiving global attention. Chinese universities are actively exploring the construction of robot engineering majors, combining their own characteristics and market demand to form diverse teaching models. Practical teaching has become the key to cultivating students' professional skills and innovative abilities. By constructing a comprehensive practical curriculum system, various universities have provided students with rich practical opportunities. However, the development of robotics engineering still faces many challenges, such as the combination of theory and practice, the cultivation of innovation ability, and adapting to market demand. Therefore, universities need to continuously innovate teaching models, pay attention to the integration of practical teaching and market demand, and cultivate robot engineering talents with high quality and innovative spirit. At the same time, the government and all sectors of society should also provide more support to jointly promote the healthy development of the robotics engineering profession. Looking ahead to the future, the field of robotics engineering will continue to deepen its development, its application areas will be further expanded, and technological innovation will continue to emerge. With the integration of technologies such as artificial intelligence and the Internet of Things, robot engineering will achieve a higher degree of intelligence and autonomy, bringing more possibilities to the development of human society.

1. Introduction

In the wave of globalization, the manufacturing industry, as an important pillar of economic development in various countries, has become a common focus of attention for its transformation and upgrading[1]. With the continuous progress of science and technology, intelligent engineering construction has achieved significant achievements on a global scale, providing a solid foundation for the in-depth development of robot engineering technology[2].

The rise of robotics engineering technology has brought unprecedented opportunities for the transformation and upgrading of the manufacturing industry. By introducing robot technology, the manufacturing industry can achieve automation, intelligence, and efficiency in the production process, improve production efficiency, reduce production costs, and enhance product quality[3]. Therefore, countries are increasing their research and application efforts in robot engineering technology to promote the transformation and upgrading of the manufacturing industry.

Compared to foreign countries, there is still a certain gap in the development of robot engineering technology in China supported by the background of intelligent manufacturing. Although China has made significant progress in robot engineering technology in recent years, compared with developed countries, there is still room for improvement in technology research and development, application promotion, and talent cultivation[4].

In order to accelerate the transformation and upgrading of China's manufacturing industry, we

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need to further strengthen research and innovation in robot engineering technology, and enhance our independent innovation capabilities[5]. At the same time, it is necessary to increase investment in robot engineering technology and support the development and growth of related enterprises. In addition, it is necessary to strengthen international cooperation and exchanges, learn from and draw on advanced international experiences and technologies, and promote the development of robotics engineering technology in China.

The robot engineering under modern intelligent manufacturing is of great significance for the transformation and upgrading of a country's manufacturing industry. We should fully recognize the important role of robot engineering technology in the transformation and upgrading of the manufacturing industry, strengthen technology research and development, and promote its application to promote China's manufacturing industry to a higher level[6].

2. Training needs for professionals in robotics engineering

With the rapid development of technology, it has not only spawned numerous new industries, but also triggered profound social changes[7]. In this era, responding to the technological industry revolution and challenges, enhancing national competitiveness, has become a major issue before us. The development of innovation driven manufacturing is the core call of this era.

The emerging field of robotics engineering, as an important field of technological innovation, has broad development prospects, but at the same time, it also faces many challenges. High technology, high-end professional talents, and high investment support are the three pillars for the normal development of robotics engineering. However, currently in this field, the technological level of many enterprises in China is still at a low level, which undoubtedly restricts the rapid development of robotics engineering [8].

Faced with such a situation, universities, as the cradle of talent cultivation, shoulder an important mission. Universities should closely integrate the development of artificial intelligence and robotics technology into their daily teaching, combining the characteristics of each major, so that students can be exposed to the latest technological knowledge, cultivate their innovative spirit and practical abilities. At the same time, universities should also combine their professional positioning and talent training program characteristics to carry out professional talent training in the development of robotics engineering, providing a continuous source of talent support for the country's scientific and technological progress and industrial development.

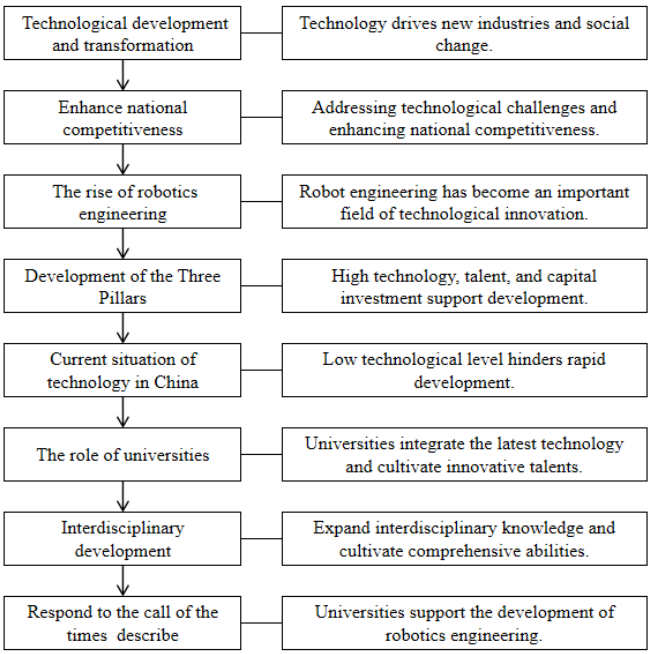

Figure 1 Development process of talent cultivation in robotics engineering

On the basis of traditional engineering education, universities should be guided by their majors and socio-economic industries, and develop towards interdisciplinary fields[9]. This means that we should not only cultivate students' professional knowledge, but also focus on cultivating their interdisciplinary thinking and ability to solve complex problems. This educational model not only meets the new standards for talent cultivation in the new era, but also poses new requirements for professional engineering and technical talents.

The development of robotics engineering cannot be separated from the support of high-tech, the cultivation of high-end talents, and high investment of funds. As an important base for talent cultivation, universities should actively respond to the call of the times and contribute their efforts to the development of robotics engineering. Figure 1 clearly illustrates the development process of talent cultivation in the field of robotics engineering.

3. Talent training models for robotics engineering professionals both domestically and internationally

3.1. Training mode for foreign robot engineering professionals

With the rapid development of technology, many countries such as the United States, Japan, and the European Union have turned their attention to the development of robotics engineering technology[10]. These countries are widely promoting the research and application of artificial intelligence and robotics technology, striving to deeply integrate these emerging technologies into the national development industry, thereby promoting the transformation and upgrading of the national manufacturing industry.

As a leader in the field of technology, the United States has proposed a strategy of "returning to manufacturing" and vigorously developing artificial intelligence and robotics technology. This not only brings revolutionary changes to the manufacturing industry, but also improves production efficiency and reduces production costs. The European Union followed closely behind and proposed the concept of the "New Industrial Revolution", using emerging industries such as robotics and artificial intelligence technology as important engines to drive economic development.

At the same time, Japan and South Korea also consider robotics technology as a future strategic emerging technology and have formulated detailed development plans. These countries are well aware that the development of robotics engineering technology is of great significance for enhancing national competitiveness and promoting industrial upgrading.

In terms of robot education, both the United States and Japan have shown unique advantages. The robot education in the United States has diverse forms and evaluation methods, providing students with broad opportunities for independent development. Its curriculum has a distinct interdisciplinary nature, involving the latest achievements in robotics technology, providing students with cutting-edge knowledge and skills. Japan is also a world leader in robotics education and culture, with almost every university possessing high-level robotics research and teaching content. The annual robot design and production competition attracts a large number of students to participate.

The development of robotics engineering technology has become a global consensus and trend. Various countries are actively promoting research and application in this field, striving to take the lead in the new round of technological revolution and industrial transformation.

3.2. Training mode for domestic robot engineering professionals

Compared to international pioneers, China's robotics engineering major started slightly later in universities. However, this has not stopped us from catching up and surpassing. Southeast University, as a leader in domestic robotics engineering education, took the lead in opening the robotics engineering major in 2016, injecting new vitality into the field of robotics engineering in China.

Southeast University not only focuses on imparting theoretical knowledge, but also emphasizes the cultivation of practical abilities in the construction of its robotics engineering program. At

present, the school has completed the construction and pilot of nine core courses, and students have begun to deepen their professional learning, forming a unique intelligent robot talent training system. This system is based on multiple disciplines, starting from robot automation and characterized by practice, showing a spiral upward trend, providing solid support for the comprehensive development of students.

In order to meet the needs of social reality, Southeast University is constantly improving its professional talent training program for intelligent robots for engineering types. The school has established a comprehensive teaching curriculum system, formed a professional intelligent robot talent training team, relied on computer network technology, built excellent network resources, and combined them with textbook resources to jointly promote the implementation of the intelligent robot professional talent training plan.

The efforts and achievements of Southeast University in the field of robotics engineering not only lay a solid foundation for the development of China's robotics engineering field, but also provide strong support for cultivating more high-quality and high-level robotics engineering talents. Table 1 clearly shows the comparison of talent cultivation models in robotics engineering between China and foreign countries.

Table 1 Comparison of Talent Training Models in Robot Engineering between China and Foreign Countries

Comparative dimension	Foreign situation	Domestic situation
Development background and strategic positioning	Early recognition of the importance of robotics technology, as part of the national development strategy, extensive promotion of research and application	Starting slightly later, but accelerating to catch up, universities are starting to offer majors in robotics engineering
Educational methods and curriculum content	There are various forms of education and evaluation methods, and the curriculum has a distinct interdisciplinary nature, involving the latest achievements	Emphasize the combination of theory and practice, continuously improve the teaching curriculum system, and rely on modern network technology to construct teaching resources
Robot culture and social environment	Robot education and culture have a profound accumulation, such as Japan's achievements in robot design and production	The robot culture needs further development and popularization, and more social participation and support are needed
Policy support and investment	The government's investment and support in robotics technology are high, such as billions of dollars in investment from the United States	The government's attention and investment in robotics technology still need to be increased, and efforts are being intensified to promote it
Technology research and innovation	High level of research and development in sensors, control systems, mechanical structures, etc., with strong innovation capabilities	There is still a certain gap in technological research and development, and efforts are being made to catch up and strengthen innovation capabilities
Enterprise Cooperation and Industrial Application	Enterprises and universities cooperate closely, and robot technology is widely applied in various fields	Enterprise cooperation and industrial applications are mainly concentrated in the field of industrial manufacturing, while other areas need to be expanded

4. Construction of Course System for Robot Engineering

In today's society, the coexistence of challenges and opportunities has had a profound impact on the development of various fields. As an emerging technological field, the field of robotics engineering also faces such a dual challenge. However, precisely because of its unique technological advantages and broad application prospects, the development of the robotics engineering profession has also become particularly remarkable.

Due to factors such as regional resources, urban development level, and the scientific research strength of different universities, the development of robotics engineering majors in different universities has shown diversified characteristics. This diversity is not only reflected in curriculum design, but also in the cultivation of students' professional skills and innovative abilities.

The importance of practical courses as a key link in enhancing students' professional skills is self-evident. At present, the practical curriculum system in universities mainly includes three categories: comprehensive skill training, professional skill training, and innovation ability cultivation. These practical courses aim to enable students to apply their knowledge to solve practical problems and enhance their practical abilities while mastering basic knowledge.

Practical teaching plays a crucial role in the teaching of robotics engineering. It can not only help students combine theoretical knowledge with practical operations, but also cultivate their innovative thinking and comprehensive literacy. Therefore, in the development process of robotics engineering, universities should attach great importance to the role of practical teaching, continuously improve the practical teaching system, and enhance the quality of practical teaching.

The development of robotics engineering majors in universities still needs to be market-oriented, adhere to innovative development, and promote sustainable teaching development. In practical teaching, attention should be paid to the cultivation of students' professional cognition and innovative consciousness, and at the same time, attention should also be paid to the cultivation of students' practical and hands-on abilities, allowing them to continuously grow and progress in practice.

The development of the robotics engineering major requires universities to continuously innovate and improve their teaching models, pay attention to practical teaching and the cultivation of innovative abilities, in order to adapt to the changes in social development and market demand, and cultivate more high-quality and high-level robotics engineering talents.

5. Conclusions

As an emerging field in today's era, the field of robotics engineering is facing unprecedented development opportunities and challenges. From a global perspective, countries are actively promoting the research and application of robotics technology, in order to take the lead in the new round of technological revolution. At the same time, China has also made significant progress in this field, especially in higher education where the field of robotics engineering is gradually emerging.

Different universities have formed distinctive teaching models in the development of robotics engineering majors, combining their own regional resources, scientific research capabilities, and market demands. Practical teaching, as a key link in enhancing students' professional skills and innovative abilities, has received increasing attention. The establishment of practical course systems such as comprehensive skill training, professional skill training, and innovation ability cultivation provides students with rich practical opportunities, which helps them improve their practical operation ability while mastering theoretical knowledge.

We should also recognize that the development of robotics engineering still faces many challenges. How to better integrate theory with practice, cultivate students' innovative thinking and comprehensive literacy, and adapt to changes in market demand are all issues that universities need to deeply consider in the development of robotics engineering majors.

Universities should adhere to market demand orientation, continuously innovate and improve teaching models, focus on practical teaching and innovative ability cultivation, and cultivate more high-quality and high-level professional talents in the field of robotics engineering. At the same time, the government and all sectors of society should also give more attention and support, jointly promote the healthy development of the robotics engineering profession, and contribute to China's greater achievements in the new round of technological revolution.

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