

"14th Five-Year Plan" for the development of the robotics industry

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Robots are known as the "crown jewel of manufacturing".

Application is an important indicator to measure a country's scientific and technological innovation and high-end manufacturing level.

At present, the robotics industry is booming and is greatly changing the way people produce and live.

In order to accelerate the development of the robot industry Quality development, in accordance with the Fourteenth

Five-year plans and 2035 This plan is formulated in accordance with the "Outline of the 2020 Vision and Long-Term Objectives".

I. Current Situation and Situation

Since the 13th Five-Year Plan, my country's robots have

The industry is showing a good development momentum. The industry scale is growing rapidly, with an average annual compound growth rate of

about 15%, 2020 Annual operating income of the robot industry exceeded 1000 billion yuan, industrial machinery

Robot production reached 21.21 million units (sets). The technical level continues to improve, motion control,

Key technologies and components such as high-performance servo drives and high-precision reducers are accelerating breakthroughs.

The functions and performance of the whole machine are significantly enhanced. The integrated applications are greatly expanded. 2020 Manufacturing industry

Robot density reaches 246 Taiwan/10,000 people, which is nearly the global average 2 times, service

Robots and special robots are used in warehousing and logistics, education and entertainment, cleaning services, security,

Large-scale application has been achieved in areas such as inspection, medical rehabilitation, etc.

The new round of scientific and technological revolution and industrial transformation is accelerating, and the new generation of information technology

Technology, biotechnology, new energy, new materials and other technologies are deeply integrated with robotics technology.

The robot industry has entered a window period of upgrading and leapfrogging development.

Developed countries have all made robots the forefront and focus of competition in the technology industry, stepping up efforts to

my country has entered a stage of high-quality development and is building a modern economic system.

Building a new picture of a better life urgently requires strong support from emerging industries and technologies.

As an important carrier of emerging technologies and key equipment in modern industries, robots are leading

The digital development and intelligent upgrading of industries are constantly giving birth to new industries, new models and new business formats.

Robots are an important tool for human production and life and an effective tool for coping with population aging.

Assistant, continuously promote the improvement of production level and quality of life, and effectively promote the economy

Social sustainable development.

Facing new situations and new requirements, the future 5 years or even longer period of time, is my country's

The robot industry is in a period of strategic opportunity for self-reliance and upgrading. We must seize the opportunity.

Face the challenges head-on and speed up the solution of insufficient technology accumulation, weak industrial foundation and high-end supply.

Lack of problems and other issues will push the robotics industry towards the middle and high-end.

II. Overall requirements

(1) Guiding ideology

Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, we will fully implement

The spirit of the 19th CPC National Congress and the Second, Third, Fourth, Fifth and Sixth Plenary Sessions of the 19th CPC Central Committee,

Based on the new development stage, we should fully, accurately and comprehensively implement the new development concept and build a new

Development pattern, coordinate development and security, take high-end intelligent development as the orientation, face

In response to the needs of industrial transformation and consumption upgrade, we adhere to the principle of "innovation-driven, application-driven, and basic

"Infrastructure improvement, integrated development", focusing on breakthroughs in core technologies, consolidating the industrial foundation,

Focus on increasing effective supply, expanding market applications, and improving the stability of the industrial chain and supply chain

qualitative and competitive, continuously improve the industrial development ecology, and promote the high-quality development of the robotics industry

Mass development provides a strong foundation for building a strong manufacturing country, a healthy China, and creating a better life.

support.

(2) Development goals

arrive2025In 2018, my country became the global source of innovation in robotics technology and the

Create a new highland for clustering and integrated application. A number of core robotics technologies and high-end products

A breakthrough was achieved, the comprehensive indicators of the whole machine reached the international advanced level, and the performance of key components

The robot industry's operating income has increased by an average of

Speed exceeding20%. Form a group of leading enterprises with international competitiveness and a large number of innovative enterprises

A specialized and innovative "little giant" enterprise with strong new capabilities and good growth potential has been established.3~5individual

An industrial cluster with international influence. The density of manufacturing robots has doubled.

arrive2035In 2017, the comprehensive strength of my country's robotics industry reached the international leading level.

Robots have become an important part of economic development, people's lives, and social governance.

III. Main Tasks

(1) Improving industrial innovation capabilities

Strengthen core technology research. Focus on national strategies and industrial development needs, and make breakthroughs

Common technologies such as robot system development and operating systems. Grasp the development of robot technology

Trend, research and develop cutting-edge technologies such as bionic perception and cognition, bio-mechanical and electrical integration.

Artificial Intelligence,5G, big data, cloud computing and other new technologies to improve the robot

Improve the level of intelligence and networking, and strengthen functional safety, network security and data security.

Establish and improve the innovation system. Give full play to the key laboratories of robotics, engineering (technology)

The role of research centers, innovation centers and other R&D institutions to strengthen cutting-edge and common technologies

Research, accelerate the transfer and transformation of innovative achievements, and build an effective industrial technology innovation chain.

Encourage key enterprises to jointly carry out collaborative research and development of robots and promote software and hardware system standards

Support enterprises to strengthen the construction of technology centers

Establish and carry out the development of key technologies and applied technologies.

Column1Robot core technology research action	
01	<p>Common technologies</p> <p>Robot system development technology, robot modularization and reconstruction technology, robot operating system technology, robot lightweight design technology, information perception and navigation technology, multi-task planning and intelligent control technology, human-computer interaction and autonomous programming technology, robot cloud-edge-end technology, robot safety and reliability technology, rapid calibration and precision maintenance technology, multi-robot collaborative operation technology, robot self-diagnosis technology, etc.</p> <p>02 cutting-edge technology</p> <p>Robot bionic perception and cognition technology, electronic skin technology, robot biomechanical and electrical fusion technology, human-computer natural interaction technology, emotion recognition technology, skill learning and developmental evolution technology, material structure and function integration technology, micro-nano operation technology, soft robot technology, robot cluster technology, etc.</p>

(2) Strengthening the foundation for industrial development

Make up for the shortcomings of industrial development. Promote the joint research of industry, academia and research to make up for the shortcomings of sp

Improve the quality of key robot parts by eliminating shortcomings in materials, core components, and processing technology.

function, performance and reliability; develop robot control software, core algorithms, etc.

High functionality and intelligence level of robot control system.

Strengthen the construction of the standard system. Establish a national robot standardization organization to better develop

Play the role of national technical standard innovation base (robot) in technical standard innovation,

Continue to promote robot standardization. Improve the robot standard system and accelerate the development of urgently needed standards.

Research and formulate standards, carry out the revision of standards for robot functions, performance, safety, etc.,

Strengthen the transformation of scientific and technological achievements into standards and the promotion of standard application. Actively participate in international

Work.

Improve testing and certification capabilities. Encourage enterprises to strengthen testing and verification capabilities, strengthen

Automated product testing to improve quality and reliability. Enhanced robotic testing and assessment center

Testing capabilities to meet the testing and certification service needs of enterprises. Promote China Robot Certification

System construction.

Column2Action to Improve Key Robotic Foundations	
01	High-performance reducer Develop advanced manufacturing technologies and processes for RV and harmonic reducers to improve their accuracy retention (lifespan) and reliability, reduce noise, and achieve large-scale production. Research the fundamental theories of new, high-performance precision gear transmissions, achieve breakthroughs in precision/ultra-precision manufacturing technologies and assembly processes, and develop new, high-performance precision reducers.
02	High-performance servo drive system Optimize high-performance servo drive control, servo motor structure design, manufacturing process, self-tuning and other technologies, and develop core components such as high-precision, high-power density robot-specific servo motors and high-performance motor brakes.
03	Intelligent controller Develop controller hardware systems with high real-time performance, high reliability, and multi-processor parallel operation or multi-core processors, achieving standardization, modularization, and networking. Achieve breakthroughs in multi-joint high-precision motion calculation, motion control, and intelligent motion planning algorithms, enhancing the intelligence level, safety, reliability, and ease of use of control systems.
04	Intelligent integrated joint Develop integrated mechanism/drive/perception/control, modular robot joints, and develop servo motor drive, high-precision harmonic drive dynamic compensation, high-precision real-time data fusion of composite sensors, modular integrated integration and other technologies to achieve high-speed real-time communication, joint force/torque protection and other functions.
05	New sensors Develop products such as three-dimensional vision sensors, six-dimensional force sensors and joint torque sensors, large-field-of-view single-line and multi-line lidars, intelligent auditory sensors, and high-precision encoders to meet the needs of intelligent development of robots.
06	Intelligent end effector Develop intelligent and dexterous end-effectors that can realize functions such as intelligent grasping, flexible assembly, and rapid replacement to meet the diverse operational needs of robots.

(3) Increasing the supply of high-end products

For industries such as manufacturing, mining, construction, agriculture, and home services

services, public services, medical care, elderly care and disability assistance, special environment operations and other fields need

Focus on promoting industrial robots, service robots, special robots,

Research and application of key robot products, expand robot product series, improve performance

energy, quality and safety, and promote the high-end and intelligent development of products.

Column3Robot Innovation Product Development Action	
01 industrial robots	<p>Develop high-precision, high-reliability welding robots for the automotive, aerospace, rail transit and other fields; vacuum (clean) robots such as automatic handling, intelligent movement and storage for the semiconductor industry; explosion-proof robots for the production of civil explosives; AGVs, unmanned forklifts, sorting, packaging and other logistics robots; large-load, lightweight, flexible, dual-arm, mobile and other collaborative robots for the 3C, automotive parts and other fields; mobile operating robots that can move to any position in the work area such as transfer, grinding, and assembly, and can reach any position and posture in space, with flexible grasping and operation capabilities.</p>
02 service robots	<p>Develop agricultural robots for orchard weeding, precision plant protection, fruit and vegetable pruning, picking and harvesting, and sorting, as well as feeding, inspection, silt removal, net attachment removal, and disinfection for livestock and poultry farming; mining robots for excavation, support, drilling, inspection, and heavy-load auxiliary transportation; construction robots for intelligent production of building components, measurement, material distribution, steel bar processing, concrete pouring, floor and wall decoration and renovation, component installation, and welding; medical rehabilitation robots for surgery, nursing, inspection, rehabilitation, consultation, and distribution; elderly care and disability assistance robots for walking assistance, bathing assistance, item delivery, emotional companionship, and intelligent prostheses; household service robots for housework, education, entertainment, and safety supervision; and public service robots for explanation and guidance, catering, distribution, and transportation. Special robots</p>
03	<p>Develop underwater robots for underwater detection, monitoring, operation, and deep-sea mineral resource development; security robots for security patrol, anti-smuggling security inspection, anti-terrorism and riot prevention, investigation and evidence collection, traffic management, border management, and public security control; robots for operations in hazardous environments such as firefighting, emergency rescue, safety inspection, nuclear industry operations, and marine fishing; and health and epidemic prevention robots for inspection and sampling, disinfection and cleaning, indoor delivery, assisted transfer, assisted medical rounds, and assisted critical care operations.</p>

(IV) Expanding the depth and breadth of applications

Encourage user units and robot companies to jointly carry out technical tests and verifications, and support

Robot manufacturers implement key component verification and enhance public technology service platforms

Test and verification capabilities. Promote robot system integrators to focus on specific scenarios in niche areas

and production processes, and develop advanced, applicable and easy-to-promote system solutions.

Build a robot application promotion platform and organize accurate matching of production and demand.

Use scenario development and product demonstration and promotion. Accelerate the development of medical care, elderly care, electricity, mining,

Establish access standards for robots in construction and other fields, and certify or register products. Encourage enterprises

Establish product experience centers to accelerate family services, education and entertainment, explanation and guidance, and distribution

Promote the promotion of robots such as food delivery. Explore the establishment of new rental service platforms to encourage the development of

New business models such as intelligent cloud services.

Column4 ""Robot+"" application action	
01	Deeply cultivate industry applications In areas where large-scale applications have already been formed, such as automobiles, electronics, machinery, light industry, textiles, building materials, medicine, public services, warehousing and logistics, smart homes, education and entertainment, we will focus on developing and promoting new robot products, exploring high-end application markets, and deeply promoting intelligent manufacturing and smart life.
02	Expanding emerging applications In areas of initial application and potential demand, such as mining, petroleum, chemical industry, agriculture, electricity, construction, aviation, aerospace, shipping, railways, nuclear industry, ports, public safety, emergency rescue, medical rehabilitation, elderly care and assistance for the disabled, we will develop robot products and solutions based on specific scenarios, carry out pilot demonstrations, and expand application space.
03	Strengthening featured applications In specific sub-scenarios, links and fields, such as sanitary ware, ceramics, photovoltaics, smelting, casting, sheet metal, hardware, furniture and other sub-sectors, glazing, blank repair, polishing, grinding, welding, spraying, handling, stacking and other key links, professional and customized solutions are formed and replicated and promoted to create distinctive service brands and form new competitive advantages.

(V) Optimizing the industrial organizational structure

Cultivate and strengthen high-quality enterprises. Encourage key enterprises to establish

Through cooperation and other means, we can cultivate leading robot companies with ecological dominance and core competitiveness.

Promote enterprises to deeply cultivate sub-industries, strengthen professional and differentiated development, and

In the fields of complete robots, parts and system integration, we will create a group of specialized and innovative "small Giant enterprises and single champion enterprises.

Promote the strengthening, consolidation and stabilization of supply chains. Encourage key enterprises to focus on key components and high-end

The weak links of the whole machine products, cooperate with supporting enterprises to speed up the development of precision gears, lubricating grease,

R&D, engineering verification and iterative upgrade of encoders and core software.

Collaborative innovation in the middle and lower reaches of the chain, integrated development of large, medium and small enterprises, and building a good industrial eco

Strengthen international industrial security cooperation and promote the diversification of the robotics industry chain and supply chain.

Create advantageous and distinctive clusters. Promote reasonable regional layout and guide resources and innovation.

Factors gather in regions with good industrial foundation and great development potential, and cultivate strong innovation ability and

Advantageous clusters with good industrial environment. Support clusters to strengthen technological innovation and focus on subdivided fields.

Provide professional robotics products and system solutions to improve technology transfer

Provide public services such as informatization, inspection and testing, and talent training to cultivate distinctive cluster brands.

IV. Safeguard Measures

(1) Strengthen overall coordination and promotion

Coordinate the resources and strength of industry management, science and technology, finance, and other departments,

Strengthen policy coordination with user departments to support the innovation and development of the robotics industry.

Formulate targeted policies and measures, coordinate solutions to major issues in the robotics industry, and provide guidance

Enterprises should do a good job in production safety and environmental protection.

The role of the bridge is to strengthen the dynamic monitoring of the robot industry and provide timely feedback on the implementation of the plan.

problems encountered in the process and make suggestions.

(2) Increase fiscal, tax and financial support

Strengthen the research and development of robots in major national science and technology projects and national key R&D plans.

Optimize the insurance compensation mechanism for the first major technical equipment

Focus on work, give full play to the role of government procurement, and promote the application of innovative robot products.

Improve tax policies such as additional deductions for R&D expenses. Promote the active investment of various industrial funds.

Support qualified enterprises to go public. Encourage pilot cities for industrial and financial cooperation to increase investment in machinery

Guiding financial institutions to innovate accounts receivable financing and supply chain financing

etc. service modes.

(3) Creating a favorable market environment

Improve the "Industrial Robot Industry Standard Conditions" and increase implementation and adoption efforts.

Support the capacity building of third-party testing and certification agencies to enhance market recognition and international influence

Strengthen intellectual property protection and increase penalties for intellectual property infringement.

Standardize market bidding and procurement, and prohibit discriminatory clauses.

Research on ethics and laws and regulations.

(IV) Improve the talent support system

Strengthen the training of robotics technology talents and support colleges and research institutes to cultivate professional

Technical and compound high-end talents. Promote the construction of new engineering disciplines and encourage joint development of schools and enterprises

Industry-university cooperation and collaborative education projects, jointly build a number of modern industrial colleges, and promote order-based training

Implement vocational skills training, modern apprenticeship and other models to cultivate talents urgently needed for industrial development.

Capacity improvement actions are implemented to support the skills improvement and job transfer training of enterprise employees.

Support the holding of various robot competitions. Increase the efforts of popular science work and enhance the robot skills of young people.

People's technological literacy.

(V) Deepen international exchanges and cooperation

Support enterprises, academic institutions, industry organizations, etc. to carry out technology, standards, and testing

International exchanges and cooperation in certification, intellectual property, talent training, etc. Encourage foreign companies

Cooperate with institutions to set up R&D institutions, education and training centers in China. Support domestic enterprises in

Developed countries have set up R&D institutions, strengthened international technological cooperation, and accelerated the development of robots in the country.

Make full use of the multilateral and bilateral cooperation mechanisms to promote the development of robotics products.

and solutions to “go global” and achieve win-win cooperation.