ROBOTICSWHITE PAPER

Robotics

White Paper

ROBOTICS IS A LARGE-SCALE OPERATION PLATFORM THAT PROVIDES DIVERSIFIED SERVICES THROUGH ROBOTS

Robotics

Catalogue

1. The Development Status Of The Robot Industry

1.1 The Development Status Of Robots

In today's era of rapid evolution of science and technology, robotics, as a leading innovation field, is changing our life and production mode at an unprecedented speed. The development of global robots presents a booming scene, covering industry, services, medical care, agriculture and many other fields.

The development process of robot is divided into three eras, which are called robot 1.0, Robot 2.0 and Robot 3.0. Robot 1.0 (1960-2000), the robot has no perception of the external environment, and can only simply reproduce the human teaching action, and replace the workers for mechanical repetitive manual labor in the manufacturing field. Robot 2.0 (2000-2015), through the application of sensors and digital technology to build the sensory capabilities of robots, and simulate some human functions, not only promoted the mature application of robots in the industrial field, but also gradually began to expand the application to the commercial field. Robot 3.0 (2015-), with the iterative upgrading of perception, computing, control and other technologies and the in-depth application of new digital technologies such as image recognition, natural speech processing and deep cognitive learning in the robot field, the trend of service-oriented in the robot field is increasingly obvious and gradually penetrated into every corner of social production and life. On the basis of robot 2.0, robot 3.0 realizes the intelligent progress from perception to cognition, reasoning and decision-making.

1.2 Application Field Of Robots

1.2.1 Industrial Manufacturing Field

In industry, robots have become a mainstay of modern production. With their high precision, high speed and high endurance characteristics, the traditional industrial robots shine in the automobile manufacturing, electronic assembly and other assembly lines, greatly improving the production efficiency and the stability of product quality. The rise of collaborative robots has brought higher flexibility and the possibility of man-machine collaboration to industrial production. They are able to work side by side with workers to complete complex and delicate tasks, further expanding the application scenarios of industrial robots.

Since 2015, the market size of industrial robots is growing rapidly at an average annual rate of 12.1%, and it is expected to reach $230 billion in sales by 2025. With the rise of labor costs, the application prospect of industrial manufacturing field is good, and it will maintain the momentum of rapid growth. At the same time, industrial robots need to have higher flexibility, stronger autonomous obstacle avoidance and rapid configuration ability, to improve the ease of use and stability of the overall product.

1.2.2 Consumer Services Field

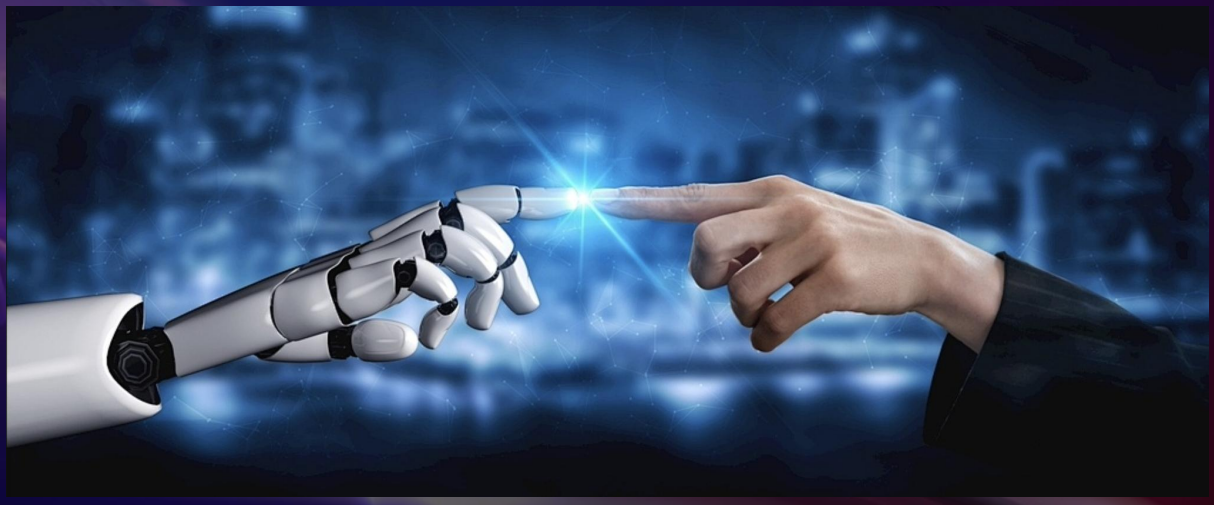
Although the overall sales of service robots is lower than that of industrial robots, it has maintained a high annual growth rate in recent years. Commercial service robots have been deployed in shopping malls, banks, hotels, airports and other application scenarios, mainly providing basic services such as navigation, inquiry and delivery. At the same time, home service robots quietly enter thousands of households, and the sales of sweeping robots account for the main share in the sales of home service robots, becoming the leading category of household robots. Due to the lack of ontology capacity, privacy and security issues, the market penetration rate of home butler robot and companion robot is low. Since 2015, the global service robot market has grown at an average annual rate of 23.5%, and is expected to grow rapidly to us $156.9 billion in 2025.

1.2.3 Medical Field

Robots in the medical field show great potential and value. With its precise operation and tiny trauma, the surgical robot brings safer and more effective treatment plans for patients. Rehabilitation robots can make personalized training plans according to the patients' rehabilitation progress and individual differences to help the patients recover their physical functions faster.

Take the Da Vinci surgical robot as an example, which provides doctors with a clear three-dimensional vision and precise operation control through tiny wounds, making the operation more detailed, less traumatic and faster recovery. Doctors can remotely operate the robotic arm from the console and perform complex surgical procedures, such as cardiac surgery, prostatectomy, etc. This minimally invasive procedure greatly reduces the risk of surgery and the pain of patients, and reduces the amount of bleeding and complications.

In terms of diagnosis, robots can assist doctors in imaging diagnosis. For example, robots can quickly analyze a large amount of medical imaging data to help doctors find lesion sites more accurately and improve the accuracy and efficiency of diagnosis. At the same time, the robot can also carry out sample collection and detection, such as automated blood sample analysis, cell detection, etc., to reduce human error and improve the reliability of detection.



1.3 Robot Commercial Pain Points

The robot industry will continue to develop rapidly, but there are still many difficulties to be solved to achieve large-scale commercial use.

First, the robot's current capabilities cannot meet users' expectations and lack critical scenarios. Thanks to the dividends brought by artificial intelligence, the robot perception ability has improved significantly in recent years, and it can conduct face recognition and voice interaction through vision. But to truly replace human labor time and do some practical work, robots should not only have perceptual ability, but also be able to understand and make decisions. Robots need to have the ability to remember and understand scenes, and have knowledge to optimize decisions, implement work independently, and carry out personalized evolution. At present, robots still lack remarkable and essential application scenarios, and most people are not very interested in having a robot at home. This ratio will remain low until robots improve their capabilities to complete specific and complex problems.

Secondly, the price is high, not the scale. The price of sensors and hardware has been falling, but the price of robots is still very high and cannot be accepted by widespread market users, without forming a market size. Due to the lower price, the sweeping robot is currently quickly entering the public home. But for most categories of robots, especially those with stronger functions, high-precision mobile chassis and robotic arms, the price is still a pain point.

Third, the privacy, security, and data protection issues need to be addressed urgently. As the application field of robots becomes more and more extensive, its physical security and user data security problems have become more prominent. In the process of interaction with the robot, the robot will constantly collect users' images, voice and action data for navigation and decision-making. Some of these data are processed locally and some in the cloud, and people have doubts about the security of these data. For service robots that can move freely and industrial robots with mechanical arms, it is also very important to ensure the physical security of the robot itself from malicious attacks and avoid personal injury.

1.4 Solutions Brought About By Blockchain Technology

In today's era of rapid development of science and technology, the robot industry, as the forefront of the field of innovation, is experiencing unprecedented changes and development. However, behind its booming development, there are also a series of pain points, limiting the further breakthroughs in the industry. Fortunately, the emergence of blockchain technology has provided brand-new ideas and possibilities for solving these problems.

One notable issue facing the robotics industry is data security and privacy protection. The robot will generate a lot of data during the process of operation, including the user's personal information, operation habits, running track, etc. Once these data is leaked, it will not only violate users' privacy, but also may be used by criminals, causing serious consequences. The decentralization and encryption nature of blockchain technology can ensure data security and privacy. The data is stored on multiple nodes and encrypted, only authorized users can access and modify, greatly reducing the risk of data leakage.

Trust issue is also a major obstacle to the development of the robotics industry. In the manufacturing, sales and use of robots, multiple participants are involved, such as manufacturers, suppliers, users, etc. Due to the information asymmetry, the trust between the parties is difficult to build. The imtamability and traceability of blockchain technology can provide credible records for the full life cycle of a robot. From the purchase of raw materials to the production process, to sales and after-sales maintenance, all information is truthfully recorded on the blockchain, which all parties can consult at any time, thus enhancing the trust between each other.

Intellectual property protection is another key pain point in the robotics industry. Innovative robot technology and design are often easy to be copied and imitated, which damages the interests of developers and strikes the enthusiasm of innovation. Using blockchain technology, im-proof digital copyright certificates can be created for robot technology and design. Once registered on the blockchain, the ownership and circulation of its intellectual property rights can be clearly checked, effectively protecting the rights and interests of innovators.

In addition, the collaboration between the robots also faces challenges. When different manufacturers and different types of robots work together, they are prone to confusion and errors due to the lack of unified standards and an effective coordination mechanism. Blockchain can serve as a distributed ledger, providing consistent rules and consensus mechanisms for interaction and collaboration between robots, ensuring that they can perform tasks efficiently and accurately.

Blockchain technology provides practical solutions to many pain points in the robotics industry. With the continuous development of technology and the deepening of its application, blockchain technology will play an increasingly important role in the robot industry, promote the robot industry to a new stage of safer, more credible, innovative and collaborative development, and bring more convenience and progress to the human society.

2. About Robotics

2.1 Robotics Introduction

In today's era of deep integration of digitalization and intelligence, Robotics platform arises at the historic moment, with innovative blockchain technology as the cornerstone, opening up a new development path for the commercial field of robots.

The Robotics platform aims to solve a series of key problems in the commercial process of robots, and to build an efficient, safe, transparent and sustainable ecosystem. By leveraging core features such as blockchain tamper-proof, decentralization and smart contracts, Robotics provides unprecedented solutions for all aspects of the robot industry chain.

In terms of data management, Robotics ensures the security and integrity of the huge amount of data generated by the robot during its operation and interaction. The data is encrypted and stored on the blockchain, preventing the data from being maliciously tampered with or stolen, while protecting user privacy. Whether the performance data, operation records or users' preferences of the robot can be accurately and reliably recorded and protected.

For the robot trading and rental market, the Robotics platform provides a transparent and fair environment. With the help of the blockchain's decentralized ledger, all transaction and lease information is publicly recorded, eliminating information asymmetry and potential fraud. The application of smart contract also realizes the automation of the transaction and lease process, reduces the intermediate links and human intervention, reduces the cost, and improves the efficiency.

In intellectual property protection, Robotics plays an important role. Blockchain technology provides an imtamable digital certificate for the technological innovation and design achievements of robots, clarifies the ownership of intellectual property rights, stimulates the enthusiasm of developers for innovation, and provides a strong guarantee for the continuous progress of the industry.

In addition, the Robotics platform promotes collaboration between different vendors and developers. By sharing data and technical standards on the blockchain, all parties can be more easy to realize resource integration and collaborative innovation, and jointly promote the development and application expansion of robotics technology.

In terms of supply chain management, Robotics has realized the traceability and monitoring of the whole process of robot parts procurement, manufacturing, logistics and distribution. This not only improves the efficiency and transparency of the supply chain, but also helps to find and solve potential quality problems in time, and improves the quality level of the whole industry.

Driven by blockchain technology, the Robotics platform has brought about comprehensive and profound changes to the commercial use of robots. It not only provides more reliable technical support and business opportunities for industry participants, but also brings better quality and more intelligent robot service experience to the majority of users, and is expected to lead the commercial field of robots into a new brilliant era.

2.2 And The Robotics Foundation

Robotics The platform is jointly initiated by Robotics Foundation, Innovation and Technology Capital (Innovative Technology Capital), Digital Future Fund (Digital Future Fund), Intelligent Industry Investment Alliance (Intelligent Industry Investment Alliance) and Star Capital (Star Capital), The upfront investment amount was us $150 million, Will, through strong capital and channel resources, Open up a new day for the commercial use of robots.

The Robotics Foundation is a non-profit organization dedicated to promoting the development and application of robotics technology. Founded in 2023, the Foundation brings together scientists, engineers, entrepreneurs, investors, and social activists from around the world to shape the future of robotics.

Robotics The mission of the Foundation is to accelerate innovation in robotics, address major challenges in the real world, and create more value for human society through financial support, technology research and development, education, and industry cooperation.

In terms of financial support, the Robotics Foundation actively provides the necessary start-up funding and ongoing R & D funding for potential start-ups and research projects. At the same time, the foundation has also set up special awards to recognize individuals and teams who have made outstanding achievements in the field of robotics, and encourage more innovators to participate in this field full of challenges and opportunities.

The foundation will cooperate with top scientific research institutions and enterprises to jointly carry out cutting-edge research and explore the application scenarios and solutions of robots in intelligent manufacturing, health care, agriculture, logistics and other fields.

In the future, the Robotics Foundation will continue to adhere to the concept of innovation, cooperation and sharing, to promote the progress and application of robotics technology, and to provide more diversified services for human society.

2.3 Commercial Scenarios Of Robotics

Robotics By combining the efficient execution ability of robots with the trusted data management of blockchain, it creates higher value for enterprises and promotes various industries to move towards the direction of intelligence, efficiency and credibility. With the continuous progress of technology and the further expansion of application, Robotics will play a more important role in the future business world, opening a new era of intelligent business.

2.3 .1 Logistics And Supply Chain

In the logistics and supply chain areas, Robotics will play a key role. Robotics Robots can efficiently move, sort, and store goods in large warehouses, while blockchain technology provides a tamper-proof record of the entire supply chain process. From the purchase of raw materials to the delivery of the final products, every link is accurately recorded on the blockchain, ensuring that the source of the goods is traceable and clear. This not only enhances the transparency of the supply chain, but also can quickly locate and solve the possible problems, effectively reducing the logistics costs and risks.

2.3 .2 Manufacturing

Manufacturing will also change with the emergence of Robotics platforms. The robots on the production line accurately perform complex tasks such as component assembly, while the blockchain records the detailed production data of each product, including the materials used, process parameters, quality inspection results, etc. This makes product quality traceability become easy, once the quality problems, can quickly find the root cause and take measures. In addition, the smart contract system of the Robotics platform can also automatically trigger the parts procurement, production scheduling and other processes, which further improves the production efficiency and the intelligent level of management.

2.3.3 Medical Field

Robotics The robot can assist medical staff in the accurate delivery of drugs and the cleaning and disinfection of wards. Platform block chain system to ensure the security and privacy of patient medical data, at the same time realize the whole life cycle of medical equipment and drug management, from production, circulation to use of every link is documented, effectively eliminate the emergence of fake and inferior drugs and equipment, improve the quality and security of medical services.

2.3.4 Financial Sector

In the field of financial services, the Robotics system also has a broad application prospect. Robots using Robotics systems can handle and store cash in the vault, while blockchain ensures a safe and accurate recording of every financial transaction. With blockchain's distributed ledger and encryption technology, financial institutions can better prevent fraud and risk, while improving the efficiency of audit and compliance.

2.3.5 Agricultural Field

In the field of agriculture, robots using the Robotics system will participate in agricultural activities such as sowing, fertilizing and picking, improving the efficiency and accuracy of agricultural production. At the same time, a credible traceability system will be established for agricultural products, so that consumers can clearly understand the growth environment, planting process and quality testing information of agricultural products, and enhance their confidence in food safety.

To sum up, Robotics has shown great potential in many commercial scenarios. By combining the efficient execution ability of robots with the trusted data management of blockchain, it creates higher value for enterprises and promotes various industries towards the direction of intelligence, efficient and credible. With the continuous progress of technology and the further expansion of the application, we believe that Robotics will play a more important role in the future business world, opening up a new era of intelligent business.

2.4 Advantages Of The Robotics System

2.4.1 The Continuous Improvement Of Intelligence And Autonomy

With the vigorous development of intelligent algorithm and deep learning technology, Robotics technology system has more powerful autonomous learning and decision-making ability. Robots using Robotics systems can constantly optimize their behavior patterns and adapt to a complex and changeable environment by analyzing and processing large amounts of data. Instead of just performing tasks with preset procedures, they make flexible judgments and adjustments to real-time situations, an autonomous capability enabling robots to work more efficiently in a variety of application scenarios.

2.4.2 Deepening Of Man-Machine Collaboration

Traditionally, robots and human workers are often isolated from each other. Today, however, the trend is moving towards human-machine collaboration. Robots using Robotics systems can sense the existence and movements of humans and work safely and harmoniously with humans. This collaboration mode can not only give full play to the advantages of high precision and high repetition, but also achieve more complex and challenging tasks with the help of human intelligence, creativity and flexibility. In manufacturing, for example, robots can assist workers in heavy handling, while workers focus on links that require fine manipulation and judgment.

2.4.3 The Fusion Of Multimodal Sensing Technologies

To more accurately understand the surroundings, Robotics is incorporating several perceptual technologies, such as visual, auditory, touch and even olfactory perception. With advanced sensors and sensing algorithms, robots can gain access to more comprehensive and accurate environmental information. This allows them to move freely in unstructured environments and interact with different objects, greatly expanding the scope of robot applications, from home services to detecting dangerous environments.

2.4.4 Miniaturand Lightweight

With advances in materials science and manufacturing processes, robots are moving towards miniaturization and lightweight. Robotics We will cooperate with technology companies to launch advanced microrobots and nanorobots, bringing new breakthroughs in medical, electronics and other fields. For example, in the medical field, Robotics microbots can enter the human body through blood vessels for disease diagnosis and treatment, while in the electronics industry, Robotics miniaturized robots can play an important role in fine operations such as chip manufacturing.

2.4.5 Change From A Single Function To A Multifunction

Robots using Robotics systems are no longer limited to single tasks, but move towards multi-functional integration. A robot can perform a variety of different types of work by changing tools or performing different programs. This versatility improves the efficiency and economy of the robot, enabling it to better meet the diverse needs of the market.

2.4.6 The Combination Of Cloud Robot And Edge Computing

Robotics Cloud computing functions will be introduced to provide powerful computing resources and data storage capabilities for robots, enabling robots to share and acquire a large amount of knowledge and experience. At the same time, the development of edge computing enables robots to conduct real-time data processing and making decisions locally, reducing their dependence on network delays. This cloud-edge collaboration mode will further improve the performance and intelligence level of the robot.

With the continuous maturity of technology and the reduction of cost, Robotics technology will continue to expand in the application field of robots, penetrating into all aspects of people's lives. Robotics Firmly believe that the future of robots will be more intelligent, flexible, collaborative, diversified and universal. These trends will not only promote the rapid development of the robot industry, but also bring profound changes and great value to the human society.

3. Analysis Of Key Technologies In Robotics

The Robotics system will provide new technical solutions for the commercial use of robots. A series of key technologies are used in the Robotics system, such as cloud brain, cloud edge integration, knowledge graph, edge computing, blockchain technology, etc. These key technologies will be analyzed below.

3.1 Cloud Brain

Robotics The cloud brain function will be launched to achieve the advantages of robot integration of infrastructure and shared services through cloud computing, cloud storage and other cloud technologies. Compared with the independent robot body, the robot using Robotics system to connect the cloud brain has the following four core advantages.

Information and knowledge-sharing:

A cloud brain can control many robots. The cloud brain can collect visual, voice and environmental information from all connected robots, and the data and information after intelligent analysis and processing by the cloud brain can be used by all connected robots. Using the cloud server, the information obtained and processed by each robot ontology can be kept up-to-date and backed up safely.

Balancing computing load: Some robot functions require high computing power. Using the cloud to balance computing load can reduce the hardware requirements of the robot body, while ensuring the capability, making the robot lighter, smaller and cheaper.

Cooperation: Through the cloud brain, the robot body no longer works independently. Multiple robots can work together, such as carrying goods together and completing a complete set of workflow together.

Independent of the ontology, continuous upgrade: with the help of the cloud brain, the robot can continuously upgrade independently of the ontology, no longer relying on the ontology hardware equipment.

3.1.1 Improvement Of Robot Services Provided By Edge Computing

Robotics Use edge computing to bring new solutions to robot performance improvements. The proposal of edge computing began in the 4G era. The deployment of computing and storage resources to the edge of the network can not only reduce the traffic on the core network and the Internet, but also significantly reduce the transmission delay and improve the network reliability.

Services with low latency require the end-to-end guarantee of terminals, mobile cellular network (access network and core network), Internet, and data center. The current test results show that the data path delay of 5G mobile phones and base stations can reach 4 milliseconds, and in URLLC mode, the delay of mobile phones and base stations can reach less than 1 millisecond, about 20 times more than the 20 milliseconds of 4G. For the delay of the Internet and data center, the geographical location can be between tens and hundreds of milliseconds from the core gateway to the Internet data center and not optimized for low delay. In 5G, the core network introduces a distributed gateway. The gateway can sink near the base station, and the edge server can be directly connected to the distributed gateway, greatly reducing the end-to-end delay of the network.

In the Robotics system, the introduction of edge computing will solve the problem of limited terminal capability and the real-time response of cloud computing, and enhance the real-time response ability of the robot cloud brain. Such as real-time reasoning, scene understanding, manipulation, and so on. Robotics Through the combination of edge computing and cloud computing, will break through the limitation of terminal computing power and storage, improve the AI algorithm training and reasoning ability, at the same time, most of the robot intelligence deployment at the edge and the cloud, through collaboration and continuous training, continuously improve the robot intelligence, such as through edge computing can better support real-time collaboration, support real-time knowledge map extraction, understanding and decision-making, continuously improve the intelligence of the robot.

Robotics The edge computing and cloud computing functions can also solve the difficulties of upgrading and maintaining the robot terminal, continuously upgrade in the life cycle of the robot ontology, improve the ability of the robot, enhance data security and privacy protection, and make full use of the performance improvement brought by Moore's Law.

3.1.2 Support Of Cloud-Edge-End Integration For The Robot System

Robotics Through cloud-edge-end integration, a large-scale operation platform providing diversified services through robots. Among them, the service robot ontology is the implementer of the service, while the actual functions are seamlessly distributed and coordinated between the terminal computing (robot ontology), edge computing and cloud computing according to the needs of the service. Robotic systems are similar to various APPs on smartphones today, focusing on how to achieve cost-effective multi-modal perception fusion, adaptive interaction and real-time secure computing.

Multimodal perception fusion: In order to support the movement, obstacle avoidance, interaction and operation of the robot, the robot system must be equipped with a variety of sensors (such as cameras, microphone array, lidar, ultrasonic, etc.). At the same time, the sensors in the environment can complement the limitations of the robot's physical space. Most of the data needs to be processed in time synchronization, and algorithm modules of different complexity (such as SLAM, image processing, human and object recognition, etc.) are called. Robotic hardware systems and edge computing require collaboration to support multi-sensor data (possibly from multiple robots) synchronization and computational acceleration, so heterogeneous computing platforms that flexibly combine CPU, FPGA and DSA (Domain-Specific Accelerator) should be adopted. The other part of the perceptual tasks (such as recognition of human behavior, scene recognition, etc.) can be supported by cloud computing.

Adaptive Interaction:

In order to support the personalized service and continuous learning ability of the robot, it is necessary to combine the output of the perception module with the knowledge graph to fully understand the environment and people, and gradually extract and accumulate the personalized knowledge related to the service scene and individuals. General knowledge and less changing domain knowledge should be stored in the cloud, while knowledge related to geographic and personalized services should be stored in the edge or terminal. No matter where the knowledge is stored, there should be a unified call interface in the robot system and can guarantee real-time communication. A software system framework covering the terminal and network side based on ROS 2 can meet future needs.

Real-time security computing: future service robot applications will have a lot of situations that require real-time response (such as voice interaction, collaborative operation, etc.), so the corresponding accelerated hardware needs to be deployed on the edge server. At the same time, the robot will also process a large amount of private data (such as videos, images, conversations, etc.).

3.1.3 Seamless Collaborative Computing Between Cloud, Edge And End

Restricted by the restriction of network bandwidth and delay, the vast majority of current robot systems are based on robot ontology computing, supplemented by non-real-time and large computing tasks. The main tasks of the robot can be simply divided into three parts: perception, reasoning and execution. In order to accurately sense and understand the environment to serve the human-computer interaction, the robot system usually integrates a large number of sensors, so that the robot system generates a large amount of data. For example, robots with sensors such as HD cameras, depth cameras, microphone array and lidar can generate more than 250MB of data per second. It is neither realistic nor efficient to transfer all huge amounts of data to the cloud. Therefore, the data processing needs to be reasonably distributed on the cloud-edge-end.

On the other hand, the AI algorithms that complete perception and understanding are also very complex. The AI algorithm used by robots usually requires strong computing power. For example, Faster RCNN algorithm can reach the processing capacity of 5 fps on GPU, but the power consumption of GPU reaches more than 200W, which is difficult for the robot body to bear and is also very expensive in terms of calculation cost. Although the computing power of the robot ontology computing platform is still improving, the demand relative to AI algorithms is still limited. In order to complete the computing requirements of the robot, it is necessary to provide computing power support in the cloud and edge side to realize more effective and economical computing power deployment in large-scale robot application scenarios.

With the deployment of 5G and edge computing, the robot end-to-base station delay can reach milliseconds, enabling the edge of the 5G network to well support the real-time applications of robots. At the same time, the edge server can process the data generated by the robot at the edge of the network and very close to the robot, reducing the dependence on cloud processing, and forming an efficient data processing architecture.

Robotics Cloud-edge-end integrated robot system is a top system for large-scale robots. Information processing and knowledge generation and application also need to be distributed on the cloud-edge-end processing. For example, pooling visual, voice and environmental information from all connected robots, analyzed or reconstructed, and applied by all connected robots.

Therefore, under normal circumstances, the cloud side can provide high-performance computing and general knowledge storage, the edge side can be more effectively process data, provide computing power support, and realize collaboration and sharing within the edge range, and the robot terminal can complete real-time operation and processing and other basic robot functions. However, due to the various business requirements of robots, the deployment of collaborative computing in Robotics system is not fixed. It will support the dynamic task migration mechanism, and reasonably migrate different tasks to the cloud-edge-end according to the business requirements, and realize the seamless collaborative computing of cloud-edge-end.

3.2 Knowledge Graph

1.Dynamic and personalized knowledge is required. Robots using Robotics systems often need a deeper understanding of the environment and people to provide better services, and not just in the current situation, but also in the past. Therefore, the robot needs to record the people and things at different times in the environment, events and other relevant information, which cannot be provided by the general knowledge map in advance, and must be obtained in the environment. These dynamic personalized knowledge can provide personalized services to people. For example, through the observation of a user, the robot can observe some preferences of the user, or some behavior patterns, and these information can help to provide better services to the user.

2. The knowledge graph of Robotics will be closely combined with perception and decision-making, and help to achieve more advanced continuous learning skills. From the history of the development of artificial intelligence, it is difficult for a single method to completely solve the AI problem. The previous introduction also mentioned that both symbolic methods and statistical methods have shown bottlenecks. Moreover, there is no good method to solve these bottlenecks in a single method, and the AI system combining multiple methods is needed in the future. Judging from the research progress in recent years, this is also the only way for further breakthroughs in artificial intelligence in the future. Therefore, different from the previous statistical methods such as the knowledge graph and computer vision, which basically operate independently, the knowledge graph must be more deeply and organically combined with the perceptual decision-making.

Specifically, the information of the knowledge graph in the Robotics system is obtained from perception. Through the basic perception and scene understanding, the information obtained can be stored in the knowledge graph, and then the knowledge can be further mined for patterns (such as temporal and spatial related patterns) to obtain higher-level knowledge. Robotics Some knowledge of the knowledge graph can be provided as the environmental context information to the perception algorithm for continuous learning, so as to realize the adaptive perception algorithm. In a sense, this is no longer the knowledge graph of pure symbolic methods in the traditional sense, but a hybrid knowledge graph, which is the knowledge graph of the combination of symbolic methods and statistical methods. This is also an important direction for Robotics to make breakthroughs in the field of robotics applications.

Due to the need for cloud-edge-end fusion in the Robotics system, the knowledge graph of Robotics will be stored on the robot side, edge side and cloud side respectively, and its interface can adopt a unified interface to facilitate the system's unified call to the knowledge graph. Due to the need of collaborative learning and real-time processing, knowledge and other relevant information (such as data, models, etc.) can also be shared through the cloud side and edge side, and achieve higher real-time performance through certain redundant backup. This is similar to the cache mechanism (Cache) in the computer architecture, such as some knowledge stored in the cloud is often called, which can be cached to the edge or the robot end to improve its access speed. In 5G network, delay itself is not a big problem, mainly considering to fully use the computing power of the edge and robot end to achieve the optimal utilization of the overall resources.

3.2.1 Scene Adaptation

Robotics With continuous learning and knowledge graph, the robustness of the system in perception is greatly improved, and the system also obtains rich information in the scene analysis and exists in the Robotics knowledge graph, which enables the robot to act accordingly according to the current scene.

Scene adaptive technology mainly through the 3 D semantic understanding of the scene, actively observe the changes of people and things in the scene, and predicts the possible events, so as to produce action suggestions related to the development of the scene. For example, in the pension / helping the elderly application, when the elderly carries a bowl of soup to the refrigerator, the robot can predict through the past experience or knowledge that the elderly will open the refrigerator to put things, and can help the elderly open the refrigerator. For example, when the robot sees a piece of peel on the ground and predicts that the elderly may fall, then the robot can actively pick up the peel (the robot is equipped with arm control) or stand by the skin and warn the elderly.

The key technique in this part is the scene prediction capability of Robotics. Scenario prediction is to summarize some personal preferences or behavior patterns through long-term observation of people, things and behavior in the scene, combined with relevant knowledge and statistical models, and accordingly to predict the events to occur in the current scene. In the past, the framework and script representation of AI symbols can be used as the form of knowledge expression here, but more importantly, it is necessary to combine the symbol method with statistical methods, so as to solve the problems that could not be solved by the symbolic method alone in the past (such as lack of learning ability).

Robotics The research on this part is still in the early stage, but the Robotics team believes that there will be a big breakthrough in the next few years based on the full combination of continuous learning and knowledge mapping technologies. Finally, the closed-loop system of the whole robot, namely perception-cognition-action, becomes more intelligent and human.

3.2.2 Data Security

Because the robot using Robotics system is equipped with a variety of sensors, a lot of information can be collected in the process of work, including visual data, voice data, location data, etc., these important privacy data need to be protected. In the environment where the robot is in the cloud-edge-end fusion, the data processing will occur on the robot side, edge side or cloud side according to the requirements. In the case that the network is attacked, it becomes especially important to protect the security of users' private data.

On the one hand, Robotics will eliminate privacy through data desensitization; fundamentally, the cloud-edge-end converged robot system requires a complete data security mechanism, which needs to ensure end-to-end transmission and storage on the server. On the robot side, it is especially important to safely transmit the sensor data to the trusted computing unit and the control command to the execution unit. Only by ensuring the security of input and output can the robot ensure the correct execution in the case of network attack. Therefore, Robotics builds a trusted transmission channel from the sensor and the actuator to the trusted computing unit.

In addition to the original privacy data, the personalized knowledge obtained through the user data reasoning also contains the user's privacy information, which also needs to be secure. In the Robotics cloud-edge-end fusion environment, the data security requirements of the edge side and the cloud side are different, so different security guarantee mechanisms are needed. In terms of robot ontology, it is necessary to ensure the physical security of important privacy data and the code security of security-related applications. On the network side and the edge end, it should protect the user data and the privacy information obtained according to the reasoning of user data, and only the authorized users can get the access right. Try to avoid sensitive data uploading to the cloud, and the data stored in the cloud needs to provide a secure storage identification mechanism.

3.3 The Robotics Edge System

3.3.1 Edge Calculation

Robotics Will use the network computing resources, the knowledge mirror modeling and knowledge mining, formed in the network layer of entity mirror symmetry model and big data environment, through the entity run historical data correlation and logic to mining, can support decision manufacturing knowledge, focusing on the data insight into support decision-making knowledge, form the knowledge base. Edge computing equipment, as the output end of edge equipment, needs high real-time performance and scalability. In the face of complex IT and OT devices, Robotics has protocols to prioritize events, such as TSN. As the input of the cloud, it needs high stability. Robotics Edge computing equipment needs to be redundancy to avoid the entire production line out of control, such as distributed architecture. Its own edge intelligence requires strong floating-point computing power for intelligent analysis and decision-making, such as the use of a dedicated accelerator chip.

3.3.2 Edge Intelligence

Robotics Deploy edge intelligence on edge computing devices. With the terminal device, the TSN hardware protocol and OPC application protocol can maximize the real-time communication performance and efficiency between IT and OT. As with cloud devices, TCP is used to transmit data and RPC for remote call, which ensures the security and stability of data transmission, reduces the difficulty of communication development between the cloud and the side end, and improves the stability and scalability of the system.

1. Intelligent analysis. Robotics Hidden problems explicit, through the intelligent analysis, accurately evaluate the equipment real health status (safety, reliability, real-time and economic dimensions) and future trends, and to potential failure and hidden problems and positioning, for equipment use, maintenance and management of intelligent decision to provide important decision support basis, the focus is to "useful data" into "useful information".

2. Intelligent decision-making. Robotics State identification and decision, optimization, coordination as the core means, based on the equipment real health state and decline trend, combined with the user decision customized requirements, provide the optimal decision support of equipment use, maintenance and management, and achieve the best matching task activities and equipment status, to ensure the continuous and stable operation of the production system (nearly zero fault operation), the useful information into the optimal decision.

3.3.3 Edge Applications

Robotics Continuous dynamic optimization and reconstruction of the intelligent system, and synchronize the intelligent optimized decision into the execution system of the device operation and enterprise resource operation, so as to realize the closed loop of decision-making and value.

1. Optimize the production line process flow. For the production line in the robot collaborative operation time inconsistent, path conflict, based on the robot collaborative process optimization method, mining multidimensional process parameters and the implied relationship between the operation efficiency, beat, optimal production efficiency and path as the goal, implementation based on group intelligent more robot collaborative operation process parameters and trajectory optimization.

2. Improve the operation and management data of production to provide a data basis for better decision-making. Robotics According to the robot design process and application process, conduct trajectory planning, accessibility analysis and interference inspection simulation of the robot in three-dimensional environment; realize the evaluation and optimization of the process scheme through the robot operation efficiency analysis. According to the robot production line process planning, more machine collaborative operation planning, scheduling and logistics control scheme, drive 3 d model for production process simulation, based on the simulation results of the application of robot process design and unit or optimization process calibration and evaluation, robot production line operation efficiency, beat balance target optimization. Feedback the simulation analysis results to the design and application links for verification; update the robot process design knowledge base to realize the process operation transparency and process independent optimization.

In conclusion, the edge computing of Robotics is the best way to extend the individual intelligence of robots. In the future multi-robot cooperation process, the predictive maintenance of robots and the intelligent production scheduling of production lines are also the important application directions of Robotics robot system in edge intelligence. Robotics The edge of the intelligent technology through collaborative robot equipment and edge server, using deep learning model optimization, deep learning computing migration method, make the use of the robot in the future, can better independent decision-making, but also make production line become more intelligent, can support production plan flexible to adapt to the change of production line resources, finally make the production line become flexible, personalized, intelligent, realize the upgrade of intelligent manufacturing.

3.4 Application Of Robotics's Blockchain Technology

3.4.1 Distributed Ledger Technology

Robotics Distributed ledger technology in systems is one of his core foundations. In Robotics's robot system, it can realize the distributed storage and synchronous update of the robot operation data, operation records, maintenance history and other information. This means that multiple nodes jointly own and maintain the same copy of the ledger, eliminating the risk of a single point of failure. For example, on an industrial production line composed of multiple robots, the data of the working status, production quantity, fault report and so on are recorded in the distributed ledger in real time. No matter which node has a problem, other nodes can still ensure the integrity and availability of the data.

3.4.2 Encryption Technology

The application of encryption technology in the blockchain provides a strong security guarantee for the Robotics robot system. Communication between the robots, data exchange with the control center, and sensitive information stored in the blockchain are all encrypted through encryption algorithms. This not only prevents external attackers from stealing and tampering with data, but also protects trade secrets and user privacy. For example, the key instructions received by a robot when performing a specific task are encrypted during the transmission process, and only the legitimate receiver (the robot) with the corresponding decryption key can correctly interpret and execute them.

3.4.3 Smart Contracts

Smart contracts are an important innovation in blockchain technology. In Robotics systems, smart contracts can realize automated rule execution and business logic processing. Assuming a logistics distribution scenario, after the robot completes the goods handling task, the smart contract will automatically trigger the reward payment process according to the pre-set conditions. Or in a complex robot collaboration environment, when a robot reaches the threshold, the smart contract will automatically allocate the resources of other robots to supplement it to ensure the efficient operation of the whole system.

3.4.4 Data Traceability

Data traceability and verification function are crucial for the quality control and troubleshooting of the Robotics robot system. Using the immutable characteristics of the blockchain, every piece of data related to the robot, from the production and manufacturing parts information to the performance parameters in the operation process, can be accurately recorded and cannot be changed at will. This makes quality problems or failures, can be quickly traced to the source, accurately identify the problem. For example, in the manufacturing process of the robot, the batch of each component, the manufacturer, the quality inspection results and other information are recorded on the blockchain. Once the robot fails in the use process, it can quickly locate which component has quality problems by inquiring the blockchain data.

3. 4.5 Decentralized Identity Management

Robotics The decentralized identity management system used gives robots and related devices a unique and secure digital identity. This identity information is stored on the blockchain, ensuring the uniqueness and forgery of identity. In a multi-robot collaboration scenario, each robot can be safely authenticated and authorized by its decentralized identity to interact with other robots or systems. This not only improves the system security, but also simplifies the complexity of identity management.

3.4.6 Supply Chain Management

In terms of supply chain management, the key blockchain technology used by Robotics can track and record the whole process of parts procurement, transportation, inventory and other links involved in robot manufacturing. From the extraction of raw materials, to the flow of parts between different suppliers, to the final entry into the robot assembly plant, everything is clearly visible. This helps to ensure the quality and compliance of the parts, and avoid the mixing of fake and inferior products, while optimizing the efficiency and cost of the supply chain.

Blockchain technology has brought various improvements to Robotics robot systems, from data security and management, to automation and optimization of business processes, to reliability and traceability of the entire system.

4. Token Economics

4.1 Introduction Of ROTS

ROTS is a digital token issued by Robotics, an aerospace information blockchain platform, aiming to provide an efficient, safe and convenient medium of exchange of value for various transactions and interactions within the platform. The total amount of ROTS issued is 1 billion and will never be issued.

Token name: ROTS

Total tokens: 2 billion pieces

4.1.1 Token allocation plan

IDO:15%

Technology: 10%

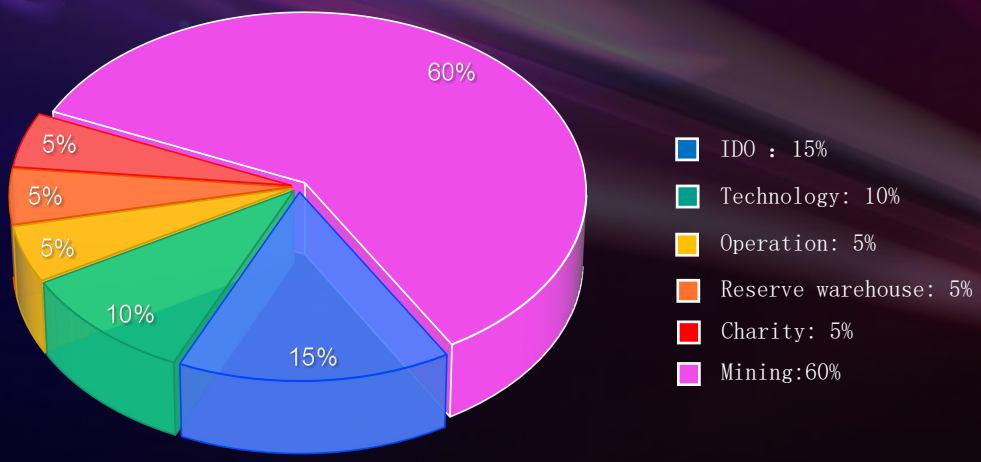
Operation: 5%

Reserve warehouse: 5%

Charity: 5%

Mining: 60%

The Token Allocation is As Shown Below:



5. Team Introduction

5.1 Team Introduction

The successful advancement of the ROTS token project is attributed to a team composed of seasoned experts in the fields of finance and technology. These members have extensive professional knowledge and experience in their respective domains and have played critical roles in achieving key project milestones.

Hudson CEO

Hudson graduated from IBSI Business School with a Master's degree in Business Administration. He has great foresight in game creativity, game direction, project management, and large-scale interactive design, and has 12 years of experience in the gaming industry. Hudson was introduced to blockchain technology in 2014 and firmly believes that this technology will bring tremendous changes to the gaming industry.

Shah Hussain CTO

Shah graduated from the University of Damascus and has extensive experience in software development. He met Hudson at an Internet technology summit, and was attracted by the concept of Robotics and became a co-founder.

Jhonny CMO

Jhonny graduated from the University of S ã o Paulo in Brazil and has eight years of marketing and operational experience in the gaming industry. I have worked in the overseas operations department of Nintendo, a well-known gaming company, and participated in the Nordic market operations of well-known games such as SD Gundam and Three Kingdoms Warriors series. Jhonny is currently the Chief Operating Officer of HELIX FARM, responsible for the market operations of the project, utilizing rich industry resources to seek strong cooperation for Robotics.

Alexey Development Engineer

Alexey is a seasoned gamer and also a perfectionist who places great emphasis on smoothness, fluency, and user experience during the development process. He has developed many large-scale applications that are used by millions of users from gaming companies such as Blizzard and Sony. I am currently mainly responsible for the technical development of the project.

6. Disclaimer

6.1 Disclaimer

This document is used only for the purposes of conveying information and does not constitute any investment advice, investment intention or abetting of investment. This document is not set nor is it understood to provide for any sale, or any invitation to buy or sell any form of securities, nor is it any contract or commitment of any kind.

Robotics It is clear that the relevant in ROTS ested users have clearly understood the risks of the Robotics project. Once the investors participate in the investment, they will understand and accept the risks of the project, and are willing to bear all the corresponding results or consequences personally.

Robotics It clearly states that it will not bear any direct or indirect losses (including but not limited to) caused by its participation in Robotics projects:

(1) The economic losses caused by the user trading operation;

(2) Any error, negligence or inaccurate information generated by personal understanding;

(3) losses caused by personal transactions of various blockchain digital assets and any resulting behaviors;

(4) Violating the anti-money laundering, anti-ROTS rorist financing or other regulatory requirements of any country when participating in Robotics projects;

(5)Having violated any representations, warranties, obligations, commitments or other requirements specified in this White Paper while participating in the Robotics project.

About ROTS

The ROTS is the official digital token used by the ROTS project and all of its products.

ROTS is not an investment, and we cannot guarantee that Robotics will increase value, and in some cases. People who do not use their ROTS correctly may lose the right to use the DPROTEIN and may even lose their ROTS.Robotics is not a kind of ownership or control, and holdingRobotics does not represent ownership of the Robotics project or Robotics application, and ROTS does not grant any individual any participation, control, or any Robotics project or Robotics application of decisions unless theRobotics is expressly authorized.

6.2 Risk Warning

- **Safety:**

Many financial credit investigation platforms have stopped operating because of security issues. We attach great importance to security and have reached strategic partnerships with the industry's top security team and the company, but there is no absolute 100% security in the world, such as various losses caused by force majeure. We commit to doing everything possible to keep your transaction safe.

- **Competition:**

We know that the field of blockchain credit investigation is a field with broad space but fierce competition. There are thousands of teams that are planning and developing payment tokens. The competition will be cruel, but in this era, any good concept, startup or even mature company will face the risk of such competition. But for us, these competitions are the impetus in the development process.