

# *Research on the Application of Industrial Robots in Automation Control*

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**Keywords:** Industrial robot, Automatic control, System analysis, Application research

**Abstract:** In the process of development and application of industrial robots, rational application of modern high-tech, such as human-computer interaction technology, intelligent algorithm technology, etc., realizes industrial robots. Automated control applications in different fields and gives full play to the application value and advantages of industrial robots. In the actual application process, automation control applications are mainly carried out in the following fields, such as the medical field, material handling, casting field, plastic field, automobile field, etc. Through the effective promotion and popularization of industrial robot equipment technology, China's industrial production level can be effectively upgraded. This article analyzes and studies the practical application of industrial robots in automation control.

## **1. Introduction**

As a symbol of the development of modern industrial production, industrial robots reflect the development level and production capacity of modern industry. Through the analysis of the automation control system of industrial robots, it can be known that the composition, structure, function, and algorithm of the system have certain characteristics. In the actual application process, it cannot be blindly quoted. The industrial robot must be fully evaluated and analyzed, so that we can choose the appropriate industrial robot and give full play to the efficiency of the industrial robot's automation control work.

## **2. Overview of Industrial Robots**

### **2.1 Basic Definition**

As a product of modern science and technology, robots have gradually entered people's daily lives, which can provide people with convenience in life and improve work quality and efficiency, such as industrial robots, military robots, agricultural robots, underwater robots, etc. Industrial robots, as a new source of power for high-quality industrial development, should conduct in-depth research and analysis of industrial robots to bring out the greater application value of industrial robots. Under the promotion of my country's "863" plan, my country's industrial robots have been effectively developed and helped my country's industrial production reach a new level. In the actual application process of industrial robots, through automated control operations, they can exert certain

effects in different fields, reflecting the social effectiveness of industrial robot research and development applications [1].

## **2.2 Basic Features**

### **2.2.1 Path Optimization**

In the application process of industrial robots, it can operate according to the set programming path to achieve the expected industrial production purpose. In the actual production operation process, industrial robots can make independent judgments and analyze rapidly through massive data. So they can select the optimal working technology path, effectively improving the efficiency and safety of industrial robot operation.

### **2.2.2 High Degree of Liberalization**

Through the analysis of the operation of the industrial robot, it can be seen that the equipment has a very strong ability of control. In order to ensure the quality and effect of the expected work, other equipment should be assisted to effectively improve the operation of the industrial robot. The freedom of the auxiliary operating mechanism of the industrial robot is high. That can ensure that the industrial robot has a high degree of freedom and can adapt to different working scenarios, and effectively exert the application value of the equipment. When some complex products are processed, the degree of freedom of industrial robots has exceeded 100, which can meet the relevant technical requirements of product production and improve quality and efficiency of the product.

### **2.2.3 Computerization**

The actual operation of industrial robots is mainly based on the computer system. Under the path design and parameter setting of the computer system, the operating efficiency of the computer system can be effectively improved. And the overall operating safety and reliability of the industrial robot can be guaranteed.

## **2.3 Development History**

The first-generation teaching robot is relatively simple. It mainly stores the written program in the data box and analyze the relevant data of the data box. Then it drives the robot to operate. During the operation of this type of robot, point-to-point operations are mainly carried out, which can pave the way for the development and application of subsequent industrial robots.

The second generation is offline programming robots. When this type of robot is running, it is mainly based on offline programming to construct an intelligent algorithm environment for the robot. So the robot can still complete the operation according to the preset path in the offline state and improve the safety and reliability of the robot operation.

The third generation of intelligent robots is a product of modern science. Intelligent robots effectively integrate the advantages of teaching robots and offline programming robots, and add more sensors, perception systems, intelligent algorithms, etc. It can complete the perception of the external environment, effectively adapt to the external environment and improve the overall reliability of industrial robots.

## **3. Research on Automation Control of Industrial Robots**

### **3.1 System Composition**

Mechanical components, sensors, and control units are the core components of the automation control system. Through the analysis of modern industrial robots, it can be known that joint mechanical structures are mainly adopted. Each independent joint can control the motor hydraulic system to realize the control of the robot Effective control.

### **3.2 Human-Computer Interaction**

As the core of automation control, the human-computer interaction system can build an operating communication platform for personnel and machines to improve the operating level of industrial robots. For example, the operation of a given mode of instructions is given by the staff, and the robot completes specific operations according to the instructions, or completes the instruction through information interaction on the display screen to ensure the effectiveness of industrial robot human-machine interaction.

### **3.3 System Structure**

In order to ensure the overall safety and stability of the robot, it is necessary to ensure that the coordinates of the robot are reasonably transformed. In addition, it's necessary to have a certain degree of freedom and can execute operating instructions. It can actively adapt to the external environment, and actively learn functions. So the reasonable and perfect system structure can be guaranteed.

### **3.4 System Function**

In the configuration of system functions, the teaching operation function and motion control function should be highlighted to ensure that the staff can demonstrate the path set by the system. And it can effectively control the actual movement of the robot to avoid incorrect operation of the robot and affect the quality and safety of production.

### **3.5 System Characteristics**

Through effective analysis of industrial robots, it can be known that the application of relevant equipment and instruments can effectively liberate labor, solve industrial production work problems, and improve the overall industrial production level. When the robot is automatically controlled, the data analysis of the computer system is highlighted to complete the intelligent control of the robot.

## **4. Application of Industrial Robots in Automation Control**

### **4.1 Control Method in Actual Application**

#### **4.1.1 Intelligent Control**

When an industrial robot performs intelligent control, in order to achieve the expected effect of intelligent control, a large number of sensors are mainly used to collect information about surrounding things. And then it assist the intelligent control system to complete automatic control. In intelligent automatic control, the central processing system can process and analyze a large amount of collected data. So it can make judgments based on the results of data analysis and issue operating instructions to the robot. In the case of intelligent automation control, the system can perform autonomous learning and actively adapt to the surrounding environment to give full play to the maximum work effectiveness of industrial robots.

### **4.1.2 Force Control**

In force control, the main purpose is to reasonably control the operating force of the industrial robot to avoid excessive or small force that cannot achieve the expected operating results. Because industrial robots cannot effectively perceive the target objects and directly execute operating instructions when they are running, the accuracy of force control instructions directly affects the operational safety and reliability of industrial robots. For example, when processing special parts, in order to ensure the effectiveness and safety of force control, the operating torque of industrial robots should be reasonably controlled to meet the expected technical requirements for operation.

### **4.1.3 Trajectory Control**

When the industrial robot is operating, continuous trajectory control can be performed on the robot so that the industrial robot can perform continuous operations and improve the efficiency and quality of robot operation. In the modern industrial production process, in order to give full play to the operational value of industrial robots, the operation process of industrial robots needs to be refined, so that industrial robots can operate continuously and accurately meet the expected production requirements.

### **4.1.4 Potential Control**

Potential control is a commonly used operation control method for industrial robots. When this control mode is running, it mainly controls the operating terminal execution equipment of the industrial robot to ensure that the robot completes industrial production with high efficiency. With the continuous development of modern industrial robot operation technology, the level of potential control continues to improve which can realize precise operation and effectively exert the application value of industrial robots.

## **4.2 Specific Application Areas of Industrial Robots**

### **4.2.1 Medical Field**

In the development of modern medical industry, industrial robots have played a certain value and effectively improved the level of medical treatment. They solved many medical problems. For example, in the remote consultation and operation of patients, industrial robots can be used to assist and improve remote consultation. The efficiency guarantees the safety and reliability of telemedicine operations. With the continuous increase of successful cases, the application of industrial robots in the medical field has been effectively promoted and the development of medical intelligent robots has been accelerated.

In the future development of medical undertakings, industrial robots should be rationally used to upgrade the level and quality of medical services. And it's necessary to provide people with high-level medical services, such as patient rehabilitation, surgical treatment, clinical care, psychological counseling, and patient transportation Etc. All theses can effectively improve the quality and effectiveness of medical work. When introducing industrial robots in the medical field, in order to avoid the occurrence of medical accidents, the imported medical industrial robots should be comprehensively inspected and evaluated. And the safety, reliability, and stability of the use of industrial robots should be analyzed to ensure that they can meet the requirements of medical work standards. We need to give full play to the application value of industrial robots and promote the high-quality development of China's medical industry.

### 4.2.2 Material Handling

Industrial robots have outstanding application advantages, which can effectively solve the problems encountered by workers and improve the efficiency and quality of industrial production. For example, when handling heavy materials, multiple workers cannot complete the handling requirements. But under the operation of the robotic arm of the industrial robot, they can quickly complete the material handling. At the same time, during the material handling work, traditional workers need to take shift rest. With the application of industrial robots, they can achieve 24-hour uninterrupted operation under the guarantee of daily maintenance, which effectively improves the efficiency and safety of material handling .

Under the application of industrial robots, workers can be freed from the boring and repetitive work environment and engage in more valuable and creative jobs. When the boring and repetitive work of classification, filing, and transportation is carried out, it can be reasonable. We can give full play to the application advantages of industrial robots and complete work requirements accurately. In addition, we can ensure the overall safety and quality of industrial production. In the future, when industrial robots are used in automation control, they can free the “hands” of operators and improve the quality and efficiency of basic assembly production.

### 4.2.3 Foundry Field

In the production process of the foundry industry, high-strength forging treatment is required to make the material reach the expected strength and hardness. Through the analysis of the production environment of the foundry workshop, it can be known that high temperature, dust, and noise are flooding the workshop, which has a huge impact on the body and mind of the staff. In the context of Industry 4.0 planning, in order to comprehensively upgrade the level of industrial production in China, it is necessary to apply high-tech and equipment, promote high-quality industrial development and promote the construction of a powerful socialist country.

In order to comprehensively upgrade the production level of the foundry industry, industrial robot technology and equipment can be introduced. And traditional manual operations can be replaced by industrial robots to ease the labor intensity of the staff. In high-temperature and high-risk front-line operations, industrial robots can be used for operation control to improve the quality and safety of casting production. In the process of using industrial robots, the connection between industrial robots and manual operations should be promoted to effectively improve the overall production efficiency of the foundry workshop.

### 4.2.4 Plastic Field

In the production of modern rubber and plastics, polymer materials are mainly used to improve the performance of the materials and the comprehensive utilization efficiency of resources. Rubber and plastic products are widely used in daily life to meet the needs of people's daily life and work. They are also well used in some high-precision fields, such as manned aerospace, transportation, and mobile communications. With the continuous enrichment of modern rubber products and plastic products, people's demand for products continues to increase. In order to produce high-quality rubber and plastic products, it is necessary to promote innovation and reform of production processes, introduce modern industrial robot production technology and upgrade the production of rubber and plastics.

In the past, when industrial production in the plastics field was carried out, manual equipment operation was mainly adopted, which not only could not guarantee the qualified rate of products, but also caused great harm to the human body due to the high temperature pollution environment. In order to effectively improve the quality and efficiency of plastic production, industrial robot

technology can be reasonably applied. Through the application of industrial robots, operations can be carried out in high-temperature and high-risk environments, effectively improving the quality and efficiency of plastic product production. In the future, in the development of China's plastics industry, it is not only necessary to introduce advanced industrial robot equipment and technology, but also to formulate scientific and standardized production environmental protection indicators. What's more, we need to strictly control the pollution of plastic production, and ensure the sustainable green development of my country's plastics industry.

#### 4.2.5 Automotive Industry

In modern automobile production, a large number of industrial robot equipment technology should be used to realize automatic production and processing, which effectively improves the quality and efficiency of automobile production. For example, when welding automobile components, welding industrial robots can be used reasonably to perform high-efficiency welding on automobile bodies, effectively ensuring welding quality and production efficiency. In order to give full play to the application advantages of welding industrial robots, technicians need to scientifically set the welding process, parameters, trajectory, etc., and effectively prepare welding materials to ensure the effectiveness and safety of the overall welding work. After welding, non-destructive testing should be carried out on the welding quality to ensure the quality and safety of the welding of the body structure.

In order to improve the quality and effect of arc welding of industrial robots during arc welding of automobile bodies, the welding process can be carried out in the way of entering the line. So the arc welding and linear welding processes are efficiently combined, and the welding accuracy and quality of industrial robots are effectively improved. In order to avoid welding errors in industrial robots, smart sensors should be configured to monitor the operating trajectory of automotive welding industrial robots. It can help us find hidden dangers in welding quality in time, and adjust and optimize the operating system of industrial welding robots in time to ensure the quality and safety of automotive welding .

### 5. Conclusion

In summary, the article describes the application of industrial robots in different fields, and analyzes the automation control system to illustrate the basic principles and main components of industrial robots. From the above discussion, we can see that industrial robots have application advantages in the field of automation control, which can effectively improve the efficiency and safety of different industries and promote the improvement of China's industrial production. In the future, during the implementation of China's Industry 4.0 strategy, the promotion of industrial robot technology should be strengthened, China's industrial structure and system should be continuously upgraded, and industrial comprehensive strength should be enhanced.

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