Applied Research of Industrial Robots in Automotive Intelligent Manufacturing Production Line

Weizheng Wang*

1College of Humanities & Information Changchun University of Technology, Chang Chun, Ji Lin, 130122, China

*18599661@qq.com

Abstract: In recent years, most Chinese car manufacturers have seen the use in industrial robots as the key to intelligent transformation in the car manufacturing industry. Industrial robots consist of several major divisions of labor, with the technical advantages of a small footprint and high availability, which can improve the work efficiency of the automobile manufacturing industry. Therefore, it is fully utilized in various fields of intelligent manufacturing production lines for automobiles, such as material mixing, car body painting, car body welding, and vehicle assembly. This article introduces the application status and characteristics of industrial robots and describes industrial robot applications in the intelligent manufacturing line of automobiles.

1. Introduction
In recent years, the market demand of the Chinese automobile industry has increased rapidly, and the sales of various types of cars have increased significantly. At present, the Chinese automobile industry is in the stage of rapid development, and the market competition is very fierce. Car reform and innovation are changing day by day. Various types of vehicles, choice of humanized configurations, and low-cost capital investment have brought the car manufacturing industry to new heights. For this reason, industrial robots are widely used in the intelligent production line of automobiles.

2. Usage status of industrial robots

2.1 Reasons for the promotion of industrial robots
First, it can reduce labor costs. Because the salary of automobile manufacturing workers is gradually increasing with the working years, the input of industrial robots is almost once and for all, so that the economic nature of the two can be clearly compared. Second, industrial robots have a stronger working ability and a wider range of work. Part of the work has a certain risk type, and using the robot to work can ensure safety. Some working environments are harsh, and the human body is working in such an environment for a long time, which is easy to be healthy and overloaded, but industrial robots can avoid such a phenomenon. At the same time, industrial robots are more adaptable to different types of work than staff, and a set of procedures can solve all the work problems. Third, the work of the automobile manufacturing production line is the same, and the staff will inevitably produce boredom and slackness, which is not conducive to the high efficiency of the work. However, industrial robots do not have the subjective consciousness of human beings. [1]They only mechanically repeat the programmed work and avoid the work errors caused by manual negligence. Fourth, China's industrial robots have not been used for a long time in the automotive intelligent manufacturing
production line. They are still in the stage of exploration and development, but they have made certain progress in work, such as reducing the cost of production work and improving the efficiency of manufacturing work. Quality of work, improvement of the working environment, etc. At the same time, the application of industrial robots in the automobile manufacturing industry has largely broken through the bottleneck period of China's traditional automobile manufacturing industry and accelerated the development of intelligent development of China's automobile manufacturing industry. It can be seen that industrial robots can work more reliably than humans and realize the liberation of human hands.

2.2 Advantages of industrial robot applications
Industrial robots can be used in different production activities on different single product lines or on different production scales, often on flexible production lines. Applying industrial robots to these production lines not only increases production efficiency, but also improves the work environment and ensures worker safety. The work of industrial robots is very safe and reliable, reducing raw material losses and reducing industrial costs from sources.

3. Technical features of industrial robots

3.1 High flexibility
Industrial robots can be widely used in a variety of production operations, but can participate in the work with minor adjustments and changes. Traditional car manufacturing industry mainly uses welding machines compared to the degree of modification of industrial robots. More flexibility. Normally, one type of welder can only be used for the production of fixed type vehicles, and industrial robots can realize the production and processing of various types of cars by changing the program and operating tools. It can be seen that industrial robots can very well replace the work of welders and can facilitate the scientific and efficient development of production in the automobile manufacturing industry.[2]

3.2 High efficiency
The main technical advantage of industrial robots is to compensate for various deficiencies in traditional automotive manufacturing operations. For example, the volume and weight of automobile parts is large, the efficiency of manual operation is low, and it is easy to damage components, but the maximum load of industrial robots reaches 1 ton, which completely solves this problem. At the same time, as long as charging work is performed in advance, industrial robots can operate continuously for a long time without overload, greatly improving the production efficiency of the automobile manufacturing industry.

4. Industrial robots in the automobile industry

4.1 Parts handling work
Handling car parts is the most basic task of the car manufacturing process. The specific use of industrial robots in this work is the handling and assembly of automotive parts. Handling tools suitable for industrial robots such as flange pick-and-place tools can be installed, and robots can accept commands to specified locations and carry auto parts. [3] During handling operations, the robot can complete work quickly and accurately without damaging the components. Staff can also select different types of robot grab tools for different car parts, so industrial robots can handle different car handling and assembly tasks, and promote parts handling and installation efficiency.

4.2 Welding work for the entire vehicle
Industrial robots are also widely used for welding of entire automobiles. The two welding techniques used throughout the welding operation are electric welding and arc welding, which are the main
components of the body welding operation. The quality of the finish is directly related to the overall work quality of the welding operation. In the body welding process, it is especially important to rationally plan the wiring for the welding operation. You can describe a set of execution procedures for welding operations, add them to the entire industrial robot system, and install the appropriate welding tools on the industrial robot. Industrial robots can complete the welding work themselves. When performing industrial spot welding, industrial robots can perform spot welding operations better, improve work accuracy, and avoid major errors. When performing arc welding work, you can install smart sensors and program the robot according to the program the standard set is to perform standard arc welding work. Industrial robots can also use human circular and linear interpolation techniques to combine direct and arc welding techniques to facilitate high quality welding operations.

4.3 Exterior car painting and bonding
The main application of industrial robots for painting external vehicles is to paint the entire exterior of the vehicle and coat the connection points of the car body. One is to write a special painting procedure, add it to the whole industrial robot system and install professional painting tools for industrial robots. Industrial robots paint cars according to programmed standards. Different models are converted. The use of industrial robots for painting external vehicles improves the work quality and efficiency of the painting work, enables the painting to be completed more accurately, and the coating thickness of the car outside the car is uneven or obvious. Avoid mistakes caused by manual error such as non-uniformity. In addition, by installing painting tools suitable for industrial robots such as spray guns and paint spray pumps, the robot can complete the adhesive application at the joints of the car body. The car body material and specific performance are also determined in order to select the right car. Apply glue and apply moderately.

4.4 Overall assembly work of the car
Industrial robots are also fully utilized in the assembly work of the entire automobile. Compared to other industrial robots, assembly robots have a higher level of expertise, higher work accuracy, more achievable work goals and can adapt to different work environments. In recent years, the automobile manufacturing industry has been developing more and more rapidly, so the professional requirements for automobile manufacturing have also increased. Automobiles are composed of various parts, the functions are complex, but the volume is small, the number of parts is increasing, and simple manual assembly is difficult to meet the exact requirements of assembly work. The overall car assembly process includes the assembly of car parts such as car seats, interior batteries, car lighting, car windows, interior fixtures, doors, and car engine equipment. The application of assembly robots increases the efficiency of assembly work and promotes effective implementation of the entire assembly work.

4.5 Acceptance work before leaving the factory
The main processes of car production are the production of various parts of the car, welding of the whole car body, external painting work and certain assembly work. A series of processes basically completes the manufacture of the car. But there is a very important job before the car actually goes to market for sale. Although automobiles are manufactured, their safety performance and quality levels are not scientifically accepted and there is no guarantee of safety. Therefore, it is necessary to perform necessary vehicle inspection and acceptance work mainly to inspect the safety performance of automobiles. This is a high risk factor, so reduce manual input and avoid accidental injuries. For example, a KUKA type industrial robot has two functions when inspecting and receiving automobiles. One is a test control function and the other is an image sensing function. The two functions work together to first collect image information for test objects and then perform intelligent comparative analysis with standard components to achieve component safety performance detection. In addition, collision robots in charge of industrial robot crash tests can perform tests that simulate accidental car impacts. [4] In this process, the robot intelligently adjusts the vehicle speed with macro control to find
ways to minimize damage if the vehicle is accidentally impacted. It also intuitively records the specific state of the car when subjected to varying degrees of impact, analyzes and integrates this information, and makes the necessary adjustments to the car's performance to promote car safety performance.

5. conclusion
In summary, modern society is undergoing rapid economic development, people's demand for automobiles is increasing, and market demand for automobiles is increasing. The effective application of industrial robots in automotive intelligent manufacturing production line can meet the market demand of the automotive industry. Process robots use advanced manufacturing techniques and intelligent control functions to facilitate the completion of various processes in automobile manufacturing. The wide application of industrial robots in the automobile manufacturing industry will further improve the quality of work in the automobile manufacturing industry, promote the market competitiveness of the automobile manufacturing industry, and further promote the development and progress of the Chinese automobile manufacturing industry I understand that.

reference
[1] Peng Guan. (2019) Application of Industrial Robots in Intelligent Manufacturing[J]. Metallurgy & Materials, 39 (03): 163-164.
[2] Xin Wang. (2019) The application of industrial robots in intelligent manufacturing [J]. Shandong Industrial Technology, (10): 67.
[3] Zhongshun Dai. (2019) The application of mechatronics technology in intelligent manufacturing [J]. Southern Agricultural Machinery, 50 (03): 34.
[4] Zhonghai Wu, Chaobo Li, Jianlong Li, Huipeng Zhang. (2019) Analysis of the application of robot in automobile intelligent manufacturing[J]. Internal Combustion Engines and Fittings, (02): 176-177.