Application of Artificial Intelligence Algorithm in Visual Guidance of Industrial Robot

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Abstract. With the rapid development of science and technology and manufacturing industry, the position of industrial robots in the advanced manufacturing industry is also improving, the application of industrial robots has been expanding. Visual guidance technology can help industrial robots to complete the production work with high flexibility and high intelligence, and promote the fine development of industrial robot technology. The purpose of this paper is to realize the good application of artificial intelligence algorithm in the visual guidance of industrial robots and promote the continuous improvement of its visual guidance system. This paper first discusses the concepts of artificial intelligence, industrial robots and visual guidance, then analyzes the specific application of artificial intelligence algorithm in visual guidance system based on Apriori algorithm, and detects the visual guidance system under artificial intelligence algorithm through simulation experiments. The experimental results show that the industrial robot vision system based on artificial intelligence algorithm in this paper has a great advantage in calibration accuracy and calibration time.

Keywords: Artificial Intelligence, Industrial Robots, Visual guidance, Apriori Algorithm

1. Introduction

In the last century, the concept of artificial intelligence has been produced, and then derived artificial intelligence algorithm. Due to a variety of factors such as the overall operation, storage capacity and the algorithm itself, artificial intelligence algorithm is also continuously improved; Especially since the beginning of this century, artificial intelligence algorithm has played an important role in the research of industrial robots, especially in visual guidance and speech recognition and other aspects of great achievements, promoting the continuous development of the manufacturing industry towards the direction of personalized and intelligent. Among them, visual guidance technology can promote the good application of industrial robots in the production line of high flexibility and high intelligence.

The visual guidance technology of industrial robots is the basis of the overall control technology of robots and the important practical technology foundation for the wide application of industrial robots. In literature [1], the author first discusses the specific composition of its visual guidance system, and
focuses on the specific calibration of industrial robot visual guidance from the perspectives of calibration camera, calibration method and calibration algorithm, and studies the practical application of visual guidance around the core. In literature [2], the author studied the visual products of different types of industrial robots, analyzed and studied the actual working principle of the visual system based on the practical application, and explored the coordinate system operation with the calibration of the visual guidance system as the research focus. In the literature [3], the author takes the industrial robot to realize the target recognition and grasp as the main target, and proposes a major way to solve the defects of the visual guidance system in 3D data model and computer algorithm technology, which can realize the effective recognition and acquisition of the target position.

Artificial intelligence algorithm is one of the commonly used algorithms in modern research. In order to promote the continuous improvement of the algorithm, domestic and foreign scholars have conducted a series of researches on its development and practical application. In literature [4], the author takes the basic theory of artificial intelligence algorithm as the focus, based on which common artificial intelligence algorithms are introduced in detail, and the corresponding fields of each algorithm are introduced, which facilitates people's clear understanding of artificial intelligence algorithm. In literature [5], the author tried to apply artificial intelligence algorithm to the field of wireless technology, and based on this, established the risk assessment model of wireless technology.

To sum up, few existing researches have applied artificial intelligence algorithm to visual guidance of industrial robots. In order to promote the continuous improvement of the industrial robot visual guidance system, this article first to include artificial intelligence, industrial robots and visual guide discusses relevant concepts, then analyzes the algorithm of artificial intelligence in the application of visual guide system, and through the simulation of artificial intelligence algorithm under the visual guide system tested [6, 7].

2. Method

2.1 Related Concepts
Artificial intelligence is to simulate human activities with the help of relevant intelligent algorithms supported by computer technology and mediated by machines or platforms [8]. Artificial intelligence algorithm is developed on the basis of its, have evolved since the 1950 s, probability and statistics, space geometry and set theory are the important theory basis of the established artificial algorithm, the commonly used classical artificial intelligence algorithms including the naive bayes algorithm, Apriori algorithm and K - means algorithm, different algorithms corresponding key is also different. Industrial robot is a type of robot that serves industrial production and can effectively promote the continuous improvement of industrial production efficiency [9-10]. At present, due to the changing market demand, industrial robots are constantly improving their technology, making progress in reliability design, robot manufacturing and other specific aspects, and industrial robots are gradually developing towards the high-end direction. The visual guidance technology of industrial robot is based on the non-contact measurement of the target and continuously updates and determines the real-time status of the target with the help of intelligent recognition and other technologies. Among them, calibration technology is the core of industrial robot visual guidance technology. Applying artificial intelligence algorithm to the field of visual guidance can achieve accurate positioning of the target and promote the improvement and application of this technology [11, 12].

2.2 Apriori Algorithm
Combined with the conceptual characteristics of visual guidance technology and the research data in the first step, the author finds that Apriori algorithm in the artificial intelligence algorithm can realize the effective mining of target data, which meets the working requirements of visual guidance technology. The algorithm is described in detail in the following paper: Apriori algorithm is a relatively common data mining algorithm, which can realize the effective correlation and deep mining of data, and realize the accurate positioning of the target with mining data as the reference. Apriori
algorithm can use data mining to obtain frequent item sets based on candidate sets and detect the frequent item sets accurately. Through in-depth mining and analysis of data relevance, we can explore the specific role of data in decision making. Since the calibration technology of industrial robot visual guidance involves the processing and analysis of various types of data, including target state, position and production data, etc., it is necessary to establish the correlation among various types of data with the help of Apriori algorithm. The specific algorithm formula of this algorithm is as follows:

$$Apriori_j = \sum_{i=1}^{k} \frac{set_i}{set_{max}}$$

Where, j represents the JTH row attribute set, k represents the number of contained attributes, Seti represents the support degree of attributes, and Setmax represents the maximum support degree in the attribute list. On this basis, relevant scholars further improved the Apriori algorithm to adapt to the data characteristics of industrial robot visual guidance technology, and the improved algorithm carried out calibration operation with the help of vectors. The operation practice shows that the overall operation effect of the improved algorithm has been greatly improved, and relevant departments can realize the accurate positioning of products by virtue of the relevance of data mining. The improved formula is as follows:

$$Apriori_j = \sum_{i=1}^{k} \frac{set_i}{set_{max}} + cw$$

In the formula, c and w represent error rate and data loss probability respectively. By adding these two data into the algorithm, the accuracy of visual guidance technology can reach the highest.

3. Visual Guidance System for Industrial Robots

The industrial robot visual guidance system is composed of several internal structures which are relatively complex. Its working principle is to use non-contact sensing form in the system to provide specific guidance for the actual calibration of robots, so that industrial robots according to the working instructions, the production of parts for positioning, and its dynamic real-time monitoring. In detail, the commonly used technical structures of industrial visual guidance robots include 2D, 2.5d and 3D technologies. Based on traditional machines such as cameras, 2D visual guidance technology collects the audit model information of the workpiece, so as to realize the accurate positioning of the product position information, and then realize the recognition and positioning of the plane position of the workpiece. Among them, the accuracy of 2D visual guidance system is closely related to the selection of feature points. 2.5d visual guidance system not only contains the functions of 2D system, but also can accurately identify the specific height and displacement of the target object in different directions. Its working principle is basically the same as that of 2D system. The main carrier of 3D visual guidance system is a series of relevant tools for data collection represented by cameras. This system can achieve the maximum freedom of information collection of objects, and it is highly professional and relatively complex to operate. However, compared with the above two systems, the visual guidance system can realize multi-angle positioning of space objects, with higher overall performance and higher accuracy.

4. Discuss

4.1 Application of Artificial Intelligence Algorithm in Visual Guidance of Industrial Robot

With the rapid development of automation technology and information technology, industrial robot visual guidance system in workpiece measurement, parameter, packaging product classification and sorting, has been widely used in such aspects as visual guidance system as the core of the industrial robot has gradually become an important direction of future industrial robot manufacturing. The Apriori algorithm instruction of artificial intelligence algorithm is input in this system in advance,
which can realize the effective mining and correlation of target data, so as to effectively combine vision and intelligent control technology. Under the vision guidance technology of industrial robot based on artificial intelligence algorithm, it can optimize the control of industrial products and promote the continuous improvement of control accuracy. This technology has the detection and recognition function similar to human eyes, and tends to be more flexible and intelligent in the calibration process. The specific application of artificial intelligence algorithm in the visual guidance system is shown as follows: first, the application in the calibration mode; As mentioned above, the improved Apriori algorithm can lock the target with the help of vector space, and its application to the visual guidance system is conducive to the establishment of the camera on the target space vector, so as to establish the vector data information about the target position and achieve a clear grasp of the current position. Secondly, the application of object tracking and positioning. The core of the visual guidance system is the positioning and tracking of the target object. With the instruction of Apriori algorithm, the mining and analysis of the position data can effectively predict the next movement of the target, and the accurate description of the target image features can be achieved by the operation formula. In general, the application of artificial intelligence algorithm in industrial robot visual guidance system can effectively improve the accuracy and work efficiency of the technology.

4.2 Simulation Experiment of Industrial Robot Visual Guidance System

In order to ensure the good practical application of industrial robot visual guidance system under artificial intelligence Apriori algorithm, the author carries out the simulation test of visual guidance system with the help of computer software. Through the simulation experiment, the following experimental data are obtained in this paper. The specific experimental data are shown in table 1 and figure 1. The data in the chart are the results of the author's experimental arrangement.

| Project                  | Data and information | Comprehensive score |
|--------------------------|----------------------|---------------------|
| Elapsed time             | 2.4s                 |                     |
| Operation efficiency     | 98.74%               | 97.19               |

*Data came from the in-depth analysis of financial data in the experiment*

![Figure 1](image.png)

Figure 1. Comparison of visual guidance systems under different algorithms

The data in table 1 shows that the single operation time of the visual guidance system for industrial robots under the Apriori algorithm is only 2.4s, and the calibration accuracy is up to 98.74%, close to 100%. The comprehensive score of the system is 97.19. The data in figure 1 shows that, compared
with the visual guidance system under the traditional algorithm, the operating speed of artificial intelligence Apriori algorithm is improved by about 27%, and the operating efficiency is improved by about 21%. Thus, the visual guidance system of industrial robot under artificial intelligence algorithm is scientific and feasible.

5. Conclusion
Industrial robot visual guidance system involves many aspects of the content, has a strong professional. At present, the technology development of this aspect is still relatively backward in China. According to the basic requirements of industrial production at the present stage, the visual guidance system of industrial robots is studied to promote the continuous improvement of the system, which is not only conducive to its good application in the industrial field, but also can effectively promote the rapid improvement of industrial efficiency in China. Based on the artificial intelligence algorithm, this paper studies its application in the visual guidance system, which not only has guiding significance for the improvement of the visual guidance system, but also lays a theoretical foundation for the future research in related aspects.

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