Retraction

Retraction: Research on Automatic Welding of Marine Steel Plate Based on Artificial Intelligence (J. Phys.: Conf. Ser. 1744 022041)

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The authors of the article have been given opportunity to present evidence that they were the original and genuine creators of the work, however at the time of publication of this notice, IOP Publishing has not received any response. IOP Publishing has analysed the article and agrees there are enough indicators to cause serious doubts over the legitimacy of the work and agree this article should be retracted. The authors are encouraged to contact IOP Publishing Limited if they have any comments on this retraction.

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Research on Automatic Welding of Marine Steel Plate Based on Artificial Intelligence

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Abstract. As one of the diversified means of transportation for human beings, at present, the effects of ships in the transportation industry are also very high-quality. However, in the early years, various accidents occurred frequently due to the instability of the welding quality of its own steel plates when ships sailed. These examples have attracted the attention of experts. It was at that time that the technology of welding steel plates for ships was formally studied and widely used[1]. Moreover, under the leadership of artificial intelligence technology, the process of automatic welding of steel plates through the recognition of machine vision control robots is also in the process of development. The error of the manual welding method of the previous marine steel plate is very large. Fortunately, the welding error of the automatic welding technology of the marine steel plate using artificial intelligence is very small.

Keywords: Artificial Intelligence, Ship, Steel Plate, Automatic Welding

1. Introduction

As the world's leading heavy industry, the progress of the shipbuilding industry in some countries near lakes and oceans is still relatively good. At present, my country is the country with the largest shipbuilding volume recognized by the world economic system. However, compared with foreign technology, our country is not yet a highly developed power for shipbuilding[2]. If we do not need to consider other physical technologies in the shipbuilding industry, the welding process of our steel plates is not up to standard. Because we generally use manual welding to connect marine steel plates. However, the error of this welding method is relatively large. From the side, it is also difficult for ships to improve the toughness and robustness of steel plates through manual welding.

As a key production process in the manufacture of steel plates for ships in my country, the welding of steel plates will also greatly affect the use and life cycle of ships in my country to some extent. Even the cost before leaving the factory. Due to the great error of manual welding, the sales of ships will also decrease. In order to effectively alleviate this phenomenon, experts have proposed an automatic welding process for marine steel plates supported by artificial intelligence. Now the upgrading of the shipbuilding industry in our country is very fast. Therefore, the consumption of steel plates for our ships and the demand for welding technicians are also extremely high. Then, the
automatic welding of marine steel plates based on artificial intelligence must also be advanced as soon as possible.

2. Research on steel plate welding based on artificial intelligence recognition techniques

2.1. Introduction to our domestic research
Those who have studied engineering will know that the skills of artificial intelligence recognition not only need the help of a computer, but also the support of hardware devices such as sensors. At present, my country can use mobile wheeled robots for automatic linear welding and curvature welding of steel plates. In addition, we can set the welding form of simple robots such as flat welding and horizontal welding to automatically search for steel plate welds and automatic welding (see Figure 1).

![Figure 1. Automatic welding based on intelligent robot.](image)

2.2. Research conclusions of foreign scholars
American scholars have studied the automatic tracking and welding of right-angle welds based on flow holes. However, the reliability of this welding method is not good. At the same time, its accuracy is also very poor. On this basis, welding seam tracking based on structured light has also been proposed. Compared with the former, the latter requires a certain degree of visual sensor. Fortunately, the welding error of the latter is much smaller than that of the former.

2.3. Similarities between domestic and foreign research
According to the analysis of a large number of documents, we found that a large number of researches at home and abroad are based on the tracking of welds by computer-recognized structured light, laser and rotating arc to realize automatic welding. Moreover, these automatic welding technologies can only be completed on the basis of the use of mobile robots. At present, welding robots are generally designed on the basis of 6 degrees of freedom.

2.4. Differences in research at home and abroad
According to literature research, we find that foreign research is more inclined to non-artificial intelligence creation mode. The research object in our country tends to cooperate with artificial and electronic intelligent manufacturing. I think the reason for this difference is that the development stages of skills in our country and abroad are different. We are in the initial stage, and foreign countries are in the middle stage.

3. Analysis of robots for automatic welding of marine steel plates based on artificial intelligence
3.1. Technology update based on automatic welding robot

We know that a ship is a relatively large object. In the whole ship, we often encounter the welding of welds with asymmetrical spatial positions. And sometimes we will encounter welding of special-shaped structures. In our country's welding technology, these must use the form of manual welding. However, the quality and accuracy of manual welding are very poor. Therefore, the author believes that the future welding of special-shaped structures will use artificial intelligence automatic welding technology.

3.2. The impact of automatic welding on the market economy of the shipbuilding industry

At present, the emergence of welding robots has turned the automatic welding technology we imagined into reality. Moreover, the difference in quality and accuracy between machine welding and manual welding is also very large. Although automatic welding may cost the shipbuilding industry more, it has greatly improved the quality of China's ship steel plates. In the economic development of the market, experts predict that automatic welding techniques will greatly improve the competitiveness of ship steel plates in the market.

3.3. The impact of automatic welding on the social needs of the shipbuilding industry

No one wants to recreate the Titanic incident. Because it is a sad and cruel story. However, the dominant factor in this matter is the poor quality of the marine steel plates. Automatic welding can increase the bearing capacity of the steel plate, and it can improve the quality of the steel plate and some related mechanical parameters. For the needs of marine transportation, this can also meet the standards for the use of ships.

3.4. Accuracy requirements of automatic welding robots

Perhaps for logistics professional handling robots, the accuracy requirements of automatic welding robots may be higher. Because this kind of robot needs to penetrate into the special-shaped structure and curved material shape. Therefore, its accuracy requirements are relatively high. In addition, automatic welding robots are generally made of robotic arms with more than 6 degrees of freedom.

4. Types of tracking sensors for automatic welding of marine steel plates based on artificial intelligence

4.1. Contact the sensor with a mechanically driven probe

The working principle of this kind of sensor is to use the metal wire to transfer the position of the molten pool to the probe capable of position identification. On this basis, the probe can slowly find the position of the weld in accordance with the behavior given by the computer. This kind of sensor mainly relies on the setting of the position of the wire. Therefore, it is more suitable for single-layer welding of long and straight welds of steel plates of ships. If it is used for bending welding, it may cause errors.

| Species               | Appropriate types                        |
|-----------------------|------------------------------------------|
| Mechanical sensor     | Long and straight welding form           |
| Electrode sensor      | Strong materials are not available       |
| Ultrasonic sensor     | Vibration of steel plate is not applicable|
| Electrode-mechanical sensor | Fast welding form                     |

4.2. Contact sensor supported by electrodes

Compared with the previous sensors, this type of sensor is more dependent on the changes in the voltage and current trends when the machine-conscious welding rod is in contact with the steel plate. Therefore, it is also called a current change sensor of the welding wire. Unfortunately, this sensor cannot be used in hard materials. In other words, the welding of steel plates of ships is not suitable for
the purpose of this sensor (see Table 1).

4.3. Non-contact sensors with ultrasonic support
This kind of sensor can be made successfully by using the characteristics of ultrasonic. Its working principle is mainly to use the reflection of sound transmission inside the steel plate and the stroke when it is incident to determine the position of the weld. However, its use is very limited. Due to the great vibration during welding of marine steel plates, the position of ultrasonic reflection and refraction will also change accordingly.

4.4. Mechanical touch sensing using electrode control
Compared with computer control, the sensitivity of electrode control may be higher at the current level of technology in our country. Therefore, after the emergence of mechanical touch sensors, what we need is to separate them from computer control and use the direct control of electrodes. This guarantees both the sensitivity and the functionality of the mechanical sensor.

5. Skill classification of seam tracking control for automatic welding of marine steel plates based on artificial intelligence

5.1. Traditional form of control
As the traditional simple form of seam tracking, the control methods at that time were all based on the establishment of mathematical models. However, the tracking form of this mathematical theory has great limitations. Since the steel plate undergoes many chemical changes during welding, sometimes the position of the weld seam will change momentarily with the change of the material properties of the steel plate. This is also impossible to determine by mathematical formulas.

5.2. Weld tracking control based on ES
This form of seam tracking is mainly based on computer visual recognition. For now, it is also the most effective and most popular control form of sensor tracking supported by artificial intelligence. The only thing it needs is the establishment of an internal database\[4\]. Of course, the internal information of the database includes knowledge production, knowledge extraction and data mining. In other words, this technology completely relies on computer artificial intelligence recognition to find the location of the weld.

5.3. Commonly used forms of compound control
The concept of compound control actually refers to the integrated control theory of traditional control and ES control. Because both traditional control and ES control have certain limitations. So, if we add the two to the same steel plate welding process at the same time, they may learn from each other's strengths.

5.4. The form of manual tracking using mechanical devices
Compared with the above seam tracking technology, this manual technology is more troublesome. However, many excellent masters like to use this method for welding. This is due to its simplicity and intuitiveness. However, due to the relatively large error of manual operation and the large error of the tracking performance of the mechanical device, many people do not like this method.

6. Practicability of research on automatic welding of marine steel plates based on artificial intelligence

6.1. It can ensure the safety of ships
What is the most important thing in life? The answer everyone will answer is definitely life. As a vehicle traveling in ocean traffic, if we cannot guarantee the quality of its basic steel plate, then we cannot guarantee the safety of passengers.
6.2. It can ensure the competitiveness of domestic ships in the world market
In the world, it can be said that the competitiveness of my country's shipbuilding industry is very poor. In fact, there is no high-end technology that can match those outside the United States in the production of Chinese ships\(^5\). If we can successfully research the automatic welding process of the basic ship steel plate, this will also ensure the competitiveness of domestic ships in the world market. At the same time, it can also ensure the reputation of our ships.

6.3. It combines artificial intelligence and welding technology well
As the originator of the engineering industry, manufacturing innovation has always been difficult for my country to break through. Various technologies based on artificial intelligence can be implemented smoothly abroad. However, in our country, these can only be theoretical skills. The use of artificial intelligence in the automatic welding of marine steel plates is an innovative combination of engineering industry and humanized intelligent identification. The author believes that this can also be called an emerging force in traditional manufacturing.

7. Conclusion
This article studies the automatic welding process of marine steel plates. I think that the future shipbuilding industry will inevitably shift from the current rough automation to the tall and intelligent process\(^6\). The technology supported by artificial intelligence is an innovative series of technologies that can lead the times. The research of automatic welding of marine steel plates based on artificial intelligence can also be a historical process in the future.

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