Research on Optimization of Orthogonal Welding Process Parameters for Pipes Based on Deep Learning

1st Li Shuai
School of Mechanical Engineering
Zhengzhou University of Aeronautics
Zhengzhou, China
ls15993381210@163.com

2nd Chen Jinping
School of Mechanical Engineering
Zhengzhou University of Aeronautics
Zhengzhou, China
nnsfcjp@zua.edu.cn

3rd Tu Yiliu
Department of Mechanical and Manufacturing Engineering
University of Calgary
Calgary, Canada
paultu@ucalgary.ca

4th Guo Shiyi
School of Mechanical Engineering
Zhengzhou University of Aeronautics
Zhengzhou, China
2590204499@qq.com

5th Wan Xinyuan
School of Mechanical Engineering
Zhengzhou University of Aeronautics
Zhengzhou, China
1563683538@qq.com

6th Cui Yanmei
School of Mechanical Engineering
Shanghai Dianji University
Shanghai, China
cuiym@sdju.edu.com

***Abstract*—With the rapid advancement of intelligent manufacturing, the field of robotic welding has become a hot research area. Domestic and foreign scholars have achieved fruitful results in the optimization of welding processes. However, the optimization of robotic orthogonal welding process parameters for pipes still mainly relies on experience and multiple experiments at present. This method is not only inefficient but also difficult to adapt to complex environments. Therefore, the method fails to guarantee the welding quality. In order to optimize the process parameters of orthogonal welding for pipes and improve welding quality and stability, this paper proposes an innovative optimization method based on the deep learning method and combined with the characteristics of the orthogonal welding process for pipes. This method takes the Deep Neural Network (DNN) as the core and constructs a nonlinear mapping relationship between process parameters and welding quality. Through the training of the DNN model, accurate prediction of welding quality is achieved. And combined with the backpropagation algorithm and optimization strategies, the process parameters are dynamically adjusted, so as to achieve the goal of optimizing the welding quality. The experimental results demonstrate that the method proposed in this paper can effectively improve the quality and stability of orthogonal welding for pipes.**

***Keywords*—Intelligent manufacturing , Robotic orthogonal welding , Deep learning , Process parameter ,**

Welding quality