**AN AUTOMATIC DETECTION AND IDENTIFICATION METHOD OF WELD BEADS BASED ON DEEP NEURAL NETWORK**

**ABSTRACT**

Welding quality is an important factor to affect the performance, quality and strength of products, and it will affect the safe production. Therefore, welding quality detection is a key process of industrial production. And the detection and identification of weld beads are the premise of welding quality detection, which could reduce the quality detection range and improve the detection accuracy and precision. Meanwhile, weld bead identification is also important for providing information for automatic control of welding process. Faced with the complex characteristics of industrial environment, such as weak texture, weak contrast and rust, we propose a detection and identification method of weld beads based on deep neural network. Firstly, aimed at weld beads with a small number of samples, combined with image processing and Generative Adversarial Network (GAN), the high-quality training samples are generated. Secondly, the updating mechanism of training samples is established to guarantee that the deep neural network model could cover all samples. Finally, the detection and identification of weld beads are realized by the deep neural network which could avoid the handcrafted features of conventional machine learning methods. Experiments show that the proposed method could quickly and efficiently finish the detection and identification of weld beads. Meanwhile, the proposed method could well solve the detection and identification problems of complex industrial environment.

**INDEX TERMS** Weld beads, detection, identification, GAN, deep neural network.