

Gas Porosity Grade Evaluation Method in Castings X-rays Based on Deep Learning

XingJie Li¹, Han Yu¹, Bingcun Pan², Long Yang³, Xinyue Li¹

¹State Key Laboratory of Light Alloy Casting Technology for High-end Equipment, Shenyang Research Institute of Foundry Co., Ltd, China, ¹School of Mechanical Engineering and Automation, Northeastern University, China, ¹Industrial Products, iRay Technology Company Limited, China

Due to the particularity of the casting process, there are almost no completely defect-free castings. Therefore, according to the severity of the defects, accurately determine the grade of defects, so as to retain some castings that meet the quality requirements can effectively reduce the production cost. Some kinds of defects can be evaluated according to their area in X-rays. However, for gas porosity, the current method is to manually compare defects with grade reference images provided by standards, such as ASTM. In view of this, we propose a deep learning-based evaluation method for castings gas porosity defect grade to realize the automatic evaluation of grade. Firstly, a Faster-RCNN based defect localization method is trained to help locate the gas porosity defect and cut out the minimum external rectangle for each defect. Secondly, the minimum external rectangle of the image is input into a feature extraction network pre-trained in the imageNet, such as VGG, ResNet18/50/101. The resulting feature map is then fed into the SPP module to keep the output feature map size constant. Finally, the obtained feature map is input into the classifier composed of two full connection layers with Dropout to get the grade result. The experimental results show that the method can accurately evaluate the grade of defects.