Intelligent corrosion assessment technology for weathering steel based on multi-image feature segmentation

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Abstract: With the development of artificial intelligence, AI-assisted detection can improve safety, reduce costs, provide objective classification, and integrate with digital asset management systems. Therefore, corrosion assessment using image segmentation technology has become a research direction that has attracted much attention. Deep learning methods have advantages in strong learning ability, adaptability to complex scenarios, end-to-end training, and strong transferability, and are suitable for processing complex corrosion images of WS. Traditional methods have advantages in high computational efficiency, strong interpretability, friendliness to small sample data, and easy deployment, and are suitable for scenarios with high real-time requirements and low data volume.

At present, most of the existing corrosion research based on image recognition focuses on identifying and calculating local corrosion areas, and the detection targets are mainly limited to locating and quantifying corrosion areas. Modeling and analysis of uniform corrosion and surface rust evolution of WS are still rare. Therefore, in this study, a large amount of corrosion image data was quickly collected through dry-wet cycle experiments, and the corrosion surface of weathering steel was simulated and modeled by combining image segmentation with machine learning. The model interpretability was verified and enhanced through a series of microstructural characterizations, providing new directions and promising results for the prediction and non-destructive monitoring of atmospheric corrosion of weathering steel.

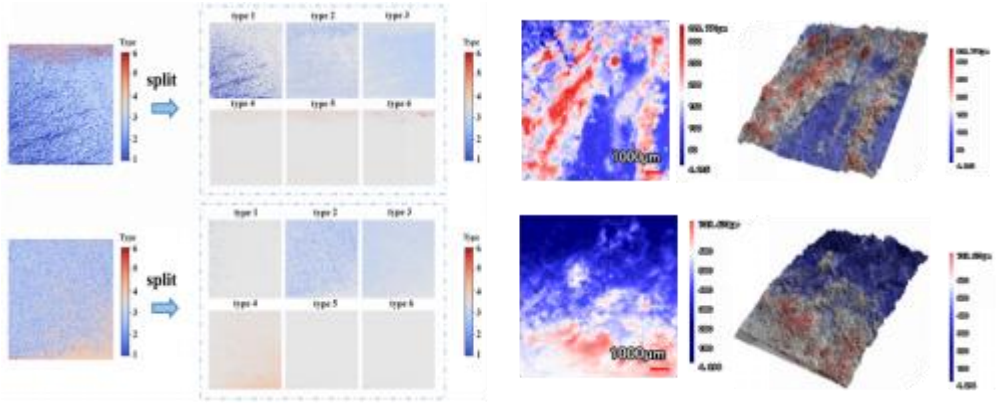

Figure 1. Schematic diagram of model calculation results of corrosion image

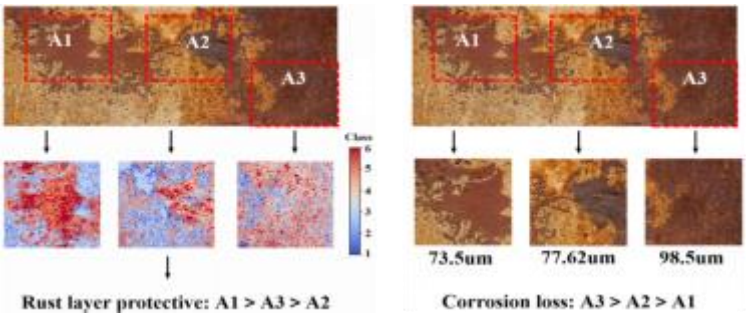

Figure 2. Example of model calculation of outdoor WS bridge corrosion image