

Radar Target Recognition Based on Electromagnetic Scattering Characteristics and Simulated Echo Data

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Abstract—In complex electromagnetic environments, noise, rough-surface scattering, and clutter severely degrade radar target recognition performance. To enhance recognition capability under low Signal-to-Noise Ratio (SNR) conditions, this paper proposes a radar target recognition method that integrates electromagnetic scattering modelling, CST-based Radar Cross Section (RCS) simulation, and an improved one-dimensional Convolutional Neural Network (1D CNN). High-fidelity Linear Frequency-Modulated (LFM) echo signals are constructed from CST-based multi-angle RCS data. A wavelet transform module, a convolutional denoising block, and the Transformer are introduced to strengthen multi-scale feature representation and noise robustness. Experimental results demonstrate that the proposed model outperforms conventional CNN methods in terms of accuracy and F1-score, and maintains a recognition rate of 93% in low-SNR scenarios, indicating strong robustness and practical applicability.

Keyword—Radar Target Recognition, Target Scattering Characteristics, RCS Simulation, CNN, LFM Radar Echo



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