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基于空域滤波的雷达目标二维散射中心快速提取

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Fast Extraction of Radar Target 2D Scattering Centers Based on Spatial Filtering

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摘要 针对几何绕射(GTD)模型，该文提出一种基于空域滤波的2维散射中心参数快速提取方法。该方法利用空域滤波过程将2维散射中心参数提取问题分解为多个1维散射中心提取问题，并利用1维旋转不变技术(1D-ESPRIT)来估计散射中心各维参数，最后利用最小欧氏距离实现2维参数的配对。与基于2维旋转不变技术(2D-ESPRIT)的方法相比，该方法避免了高维数的特征值分解，因而可以显著地降低计算的复杂度。仿真实验表明，与2D-ESPRIT高分辨算法相比，该方法不仅能够显著降低计算量，并且还能获得较好的估计精度，可以有效地用于提取目标散射中心参数信息。

关键词： 雷达 散射中心 几何绕射(GTD)模型 空域滤波 旋转不变技术

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Abstract： For a model derived from the Geometrical Theory of Diffraction (GTD), a fast method based on spatial filtering is proposed to extract parameters of two-dimensional scattering centers. The proposed method utilizes spatial filtering process to decompose two-dimensional scattering centers extraction into several times of one-dimensional scattering centers extraction, in which the one-dimensional Estimation of Signal Parameters via Rotational Invariance Techniques (ESPRIT) is employed to estimate the parameters of scattering centers for each dimensional independently. Finally, the pair-matching of two-dimensional parameters is accomplished by searching the minimums of Euclidean distance. Compared with the method based on two-dimensional ESPRIT, the proposed method does not need high-dimensional eigenvalue decomposition, thus the computational complexity is significantly reduced. Simulation results show that the proposed method not only reduces greatly the computational burden, but also keeps high accuracy of parameter estimation compared with 2D-ESPRIT algorithm, and it is proved to be effective in scattering center extraction.

Keywords： Radar   Scattering center   Geometric Theory of Diffraction (GTD) model   Spatial filtering   Estimation of Signal Parameters via Rotational Invariance Techniques (ESPRIT)

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