

DBF-SAR系统1 bit量化的可行性分析

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The Feasibility Analysis of One-bit Quantization for DBF-SAR

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摘要

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摘要 该文针对DBF-SAR系统数据率巨大的问题,研究了在低信噪比条件下1 bit量化的可行性。提出了两种信号处理方法:(1)回波1 bit量化;(2)回波和距离向匹配滤波器都1 bit量化。通过理论分析和仿真验证,1 bit量化的两种处理方法均能正确反映出目标位置及散射特性,不影响图像空间分辨率,但会产生虚假目标并抬升旁瓣,且虚假目标幅度随着回波信噪比的升高而增大。因此仅在单通道回波信噪比低于-5 dB左右时使用1 bit量化才有意义。

关键词: 合成孔径雷达 数字波束形成 扫描接收 1 bit量化 信噪比

Abstract: Considering the issue of huge data rate in DBF-SAR system, the feasibility of one-bit quantization under low signal-to-noise ratio condition is analyzed by two methods. In the first method, each sample of echo is quantized into one bit, while in the second, samples of both echo and range matched filter are quantized into one bit. Theoretical analysis and numerical experiments indicate that, both methods can correctly get the positions and scattering characteristic of targets, and keep the spatial resolutions. However, false targets and high side lobe are generated, and false targets become more obvious with higher SNR. Therefore, one-bit quantization is feasible when single channel echo's SNR is lower than -5 dB.

Keywords: SAR Digital BeamForming (DBF) Scan-on-receive One-bit quantization SNR

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