

防御电子技术

大斜视SAR的改进NCS算法

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摘要:

合成孔径雷达(synthetic aperture radar, SAR)回波信号在大斜视时存在着严重的耦合, 采用常规的非线性调频变标(nonlinear chirp scaling, NCS)算法成像, 结果会出现散焦。为了消除大斜视时回波的耦合, 提出一种改进NCS算法。首先, 在二维频域中补偿参考距离处二阶以上的相位耦合项。其次, 在第一次变标过程中采用四次多项式模型, 同时引入常量因子消除常规NCS中多普勒参考频率须在频带范围外的限制。最后, 通过第二次变标消除常量因子的影响。同时, 分析了测绘带宽度对调频率误差的影响, 从而确定理想测绘带宽度。仿真结果表明, 改进后的算法完成大斜视时的场景聚焦, 满足大斜视下的成像要求。

关键词: 非线性调频变标 大斜视合成孔径雷达 相位耦合

Improved nonlinear chirp scaling algorithm of SAR in high squint mode

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Abstract:

There exists serious coupling between azimuth and range for synthetic aperture radar (SAR) in high squint mode. A swath image is defocused in normal nonlinear chirp scaling (NCS). To eliminate the coupling, an improved NCS is proposed. First, the coupling phase above second-order is compensated in frequency domain. Then in the first chirp scaling step, a fourth-order model is used in range Doppler domain. Meanwhile a constant factor is adopted to overcome the constraint of Doppler reference frequency beyond the scope of Doppler frequency. Finally, the influence of the constant factor is eliminated through the second scaling step. Simultaneously, the influence of swath width on the range frequency modulation ratio error is analyzed so as to define a perfect one. Simulation results illustrate that the improved algorithm can fulfill the focusing of the whole swath and satisfy the imaging quality of SAR in high squint mode.

Keywords: nonlinear chirp scaling (NCS) SAR in high squint mode phase coupling

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