

基于距离向Scaling原理的聚束SAR极坐标格式成像算法

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Polar Format Imaging Algorithm Based on Range Scaling for Spotlight SAR

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摘要

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摘要 极坐标格式成像算法(PFA)的实现存在两个问题:去调频后存在残余视频相位(RVP);极坐标格式转化成直角坐标格式的插值处理运算量大,且插值精度会影响聚焦效果。针对这两个问题,该文提出了一种基于Scaling原理的距离向重采样方法,而方位向则采用Chirp-Z变换,在完成去RVP的同时完全避免了插值。该算法与传统PFA相比,仅仅使用FFT及信号复乘,更利于在硬件上实现,极大节省了计算成本,而且所得图像质量也有一定提高。另外与已存在的距离向CZT方法相比该文流程更为简单,包含更少的FFT及信号复乘。仿真实验验证了该文算法的有效性。

关键词: 合成孔径雷达 极坐标格式算法 残余视频相位 Chirp-Z变换 Scaling

Abstract: There are two main problems through the implementation of Polar Format Algorithm (PFA). First, the error of Residual Video Phase (RVP) arises after the dechirp operation. Second, the interpolation has influence on the computation efficiency and imaging precision. This paper proposes a novel algorithm where range resampling is based on the principle of Scaling and Chirp-Z transform is adopted on azimuth dimension. The presented approach only consists in FFTs and multiplications, which effectively helps to decrease the computational burden and improve the imaging quality. Besides, the presented algorithm is much simpler than the existing range CZT approach. Point target simulation validates effectiveness of the presented algorithm.

Keywords: SAR Polar Format Algorithm (PFA) Residual Video Phase (RVP) Chirp-Z transform Scaling

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