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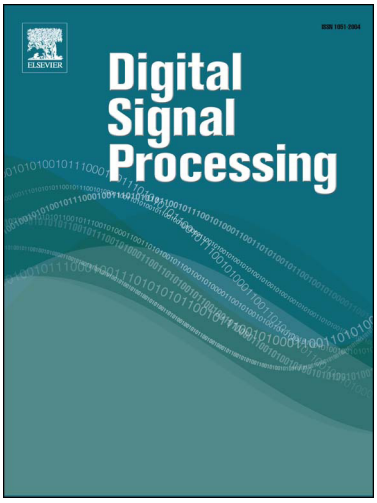

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Xiongpeng He, Guisheng Liao, Shengqi Zhu, Jingwei Xu, Yifan Guo, Jiaqi Wei

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Fast Non-Searching Method for Ground Moving Target Refocusing and Motion Parameters Estimation

Xiongpeng He, Guisheng Liao, Shengqi Zhu, Jingwei Xu, Yifan Guo, and Jiaqi Wei
National Lab of Radar Signal Processing, Xidian University, Xi'an, Shaanxi 710071, China

***Abstract*—Ground moving targets may be smeared in a synthetic aperture radar (SAR) image due to the range migration, Doppler ambiguity and azimuth spectrum split caused by target unknown motion parameters. To handle these problems, we propose a fast non-searching method for maneuvering target refocusing and motion parameters estimation in this paper. First, the azimuth-deramp is conducted, which is capable of eliminating the azimuth spectrum splitting. In the sequel, the second-order keystone transform (SOKT) based on the scaling principle is applied to further correct the residual range curvature. Then, the phase difference (PD) is performed to eliminate the range walk and estimate the motion parameters, which does not require the prior knowledge of Doppler ambiguity number. Finally, the moving target can be well focused with the estimated parameters. This method has high computational efficiency and improved parameter estimation accuracy. Both simulated and real data are processed to demonstrate the effectiveness of the proposed method.**

***Index Terms*—Synthetic aperture radar, ground moving target refocusing, second-order keystone transform, phase difference, motion parameter estimation.**

I. INTRODUCTION

The conventional synthetic aperture radar (SAR) is meant to acquire the image of static scene under all-time and all-weather conditions, which has been widely employed in civil and military areas [1]-[5]. Nevertheless, when moving target occurs, its Doppler history is usually inconsistent with that of the static scene, which will cause the moving target being smeared and dislocated in the SAR image. For this reason, to estimate the parameters of moving target and obtain its well-focused image, the defocusing effects caused by motion of target should be well compensated [6]-[10].

A moving target's across-track velocity will lead to the linear range cell migration (RCM). Perry et al. [11] first utilized the keystone transform (KT) to remove RCM through rescaling the azimuth-time for each range-frequency. KT can correct the range walks of multiple targets simultaneously without the first-order parameters of the moving target, which provides excellent compensation performance under low signal-to-clutter-plus-noise-ratio (SCNR). In practical applications, the Doppler ambiguity usually occurs when SAR observes fast-moving targets due to limited PRF. In this situation, the performance of KT technique degrades dramatically. To handle this issue, the Radon-FFT (RFT) method is proposed by searching the linear trajectory and