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RANGE DEVIATION CLATTERER CENTERS FOR REGISTRATION USING INTEGRATION CROSS-RANGE EXTENT ANGLE

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ABSTRACT

In this paper, a new generalized maximum integration angle for ISAR imaging system before uncorrected rotation produces defocusing in cross-range is presented which is in terms of allowable two-way phase deviation. It is assumed that the radar is in the far field of the target so that no significant range deviation exists over the target's cross-range extent. What remains is the range deviation produced when a scattered first approaches and then recedes from the radar the cross-range resolution in unfocused ISAR is limited by the maximum integration angle, and a Focused Aperture ISAR is desirable for a larger integration angle.

Keywords: Cross Range Extent Angle, Clatterer.

I. INTRODUCTION

Image registration is an important problem in computer vision, remote sensing data processing and medical image analysis. The goal of image registration is to find a spatial transformation such that a similarity metric achieves its maximum between two or more images taken at different times, from different sensors, or from different viewpoints.One such example which is the primary interest in the sequel is Inverse Synthetic Aperture Radar (ISAR) imaging. ISAR is a microwave imaging system capable of producing high resolution imagery from data collected by a relatively small antenna. ISAR imaging is induced by target motion, which unfortunately also blurs the resulting image. After a conventional ISAR translational focusing process, image registration can be applied to estimate the target rotational motion parameter, upon which polar re-formatting may be used to achieve a higher resolution image. Related work in this area includes the image registration in interferonmetric SAR processing by [1-5]. Over the last three decades, a wide variety of registration techniques have been developed for different applications. These techniques can be classified into correlation methods, Fourier methods, landmark mapping, and elastic model-based matching. Given two images, correlation methods calculate the normalized two-dimensional cross-correlation function between a Euclidean transformation with translational parameter, rotational parameter and scaling parameter. The registration problem may be succinctlythe correlation methods are generally limited to registration problems. In case of misregistration, the joint histogram has less significant peaks and is more dispersed than that of the correct alignment of images. The registration criterion is hence to find a transformation such that the mutual information of the corresponding pixel pair intensity values in the matching images is maximized. The proposed approach is accepted widely as one of the most accurate and robust registration measures.Fourier methods are also limited to registration problems with a small rigid transformation. If thereexists spatially local variation, then both the correlation methods and the Fourier methods would fail. For cases of unknown misalignment type, landmark mapping techniques and elastic model-based matching may be used to tackle the registration problem. Landmark mapping techniques extract feature points from a reference image and a target image respectively, then apply piecewise interpolation to compute a transformation to map the feature point sets from the reference image to the target image. The results show that the proposed method is so effective for recondition of landmarks.

II. METHODS AND MATERIALS

An antenna located at the origin illuminates a line of clatterers centered, having length and reflectivity. Let the transmitted signal be a pulse of duration T and bandwidth given by the baseband equivalent signal, and then, ignoring the round-trip attenuation, divergence measure, Jensen divergence, is proposed. Some properties such as convexity and its upper bound are derived. Based on the Jensen divergence, we propose a new approach to the problem of ISAR image registration. The goal of ISAR image registration is to estimate the target motion during the imaging time. Our approach applies Jensen divergence to measure the statistical dependence between consecutive ISAR image frames, which would be maximal if the images are geometrically aligned. Simulation results demonstrate that the proposed method is efficient and effective. the returned signal can be represented as the convolution of target reflectivity density with the transmitted signal where the speed of light, and the round trip delay.An estimate of the reflectivity density can be obtained by passing through matched then we can rewrite, since the transmitted pulse usually has a large time-bandwidth product, can be approximated by a sinc function. The estimate of target reflectivity density may thus be represented as the range resolution. To gain a basic understanding of the cross-range resolving mechanism in ISAR, let'sconsider with a line of clatterers having the reflectivity. As the radar is moving, the two-way phase advance at cross-range For the case of approaches can be re-expressed in terms of angle. Then, the echo response from the line scatterers is given by an estimate of the reflectivity density can be obtained by integrating the echo response. When the two images are properly matched, corresponding areas overlap, and the resulting joint histogram contains high values for the pixel combinations of the corresponding regions. When the images are miss-registered, non-matched areas also overlap and will contribute to additional pixel combinations in the joint histogram.To form a radar image, N bursts of returned signals first pass through a quadrature demodulator to obtain in-phase and quadrature signals at baseband. An complex data, is constructed to represent an unprocessed spatial frequency signature of the target. The radar processor uses the frequency signatures as the raw data to perform range compression and standard motion compensation. Range compression functions as a matched filter to resolve range.

III. RESULTS

Considering the echo signal from scatterer, located at, the phase advance term at time iswhere the target rotates at a constant angular rotation rate. for focused ISAR the same as the cross-range resolution for an unfocused, small integration angleISAR. The ISAR imaging is induced by target motion. During the imaging time, the clatterers must remain in their range cells. Reflectivity density function won't remain the same over a wide range of radar viewing angles. Therefore we cannot use an arbitrary large integration angle in Equation. Optimal Integration Angle need to be estimated to achieve the highest possible cross-range resolution and prevent defocusing in the image. Other wide-band radar waveforms, such as a linear FM chirp pulse can also be used but with different range compression techniques. UsingSF waveforms, a radar typically transmits a sequence of N bursts. Each burst consists narrow-band pulses. Within each burst, the center frequency of each successive pulse is increased by a constant frequency step. Fig 1 shows Reconstructed Airplane with proposed method. The total bandwidth of the burst, determines the radar range resolution. The total number of bursts for a given imaging time determines the Doppler or cross-range resolution. For SF signals, the range compression performs an M-point IFT to each of the N received frequency signatures where denotes the IFT operation with respect to variable m. All together, N range profiles, each containing M range cells, are thus obtained. Along each range cell, N range profiles constitute a time history series of the target. The Fourier imaging approach applies a FFT to the time history series and generates a N-point Doppler spectrum, or Doppler profile. By combining the N Doppler spectra denotes a FFT operation. The radar image I is hence the target's reflectivity function mapped onto the range-Doppler planeImage is misaligned by only a small rigid transformation. Fig 2 Noisy SAR IMAGE with proposed method. In addition, the peak of the correlation may not be clearly discernible in the presence of noise. Fourier methods are the frequency domain equivalent of the correlation methods. Fourier methods make use of the translation property of the Fourier transform and search for the optimal spectrum matching between two images. Since rotation is invariant under a Fourier transformation, rotating an image merely rotates the Fourier transform of that image.

Fig 1.reconstructed SAR IMAGE with proposed method

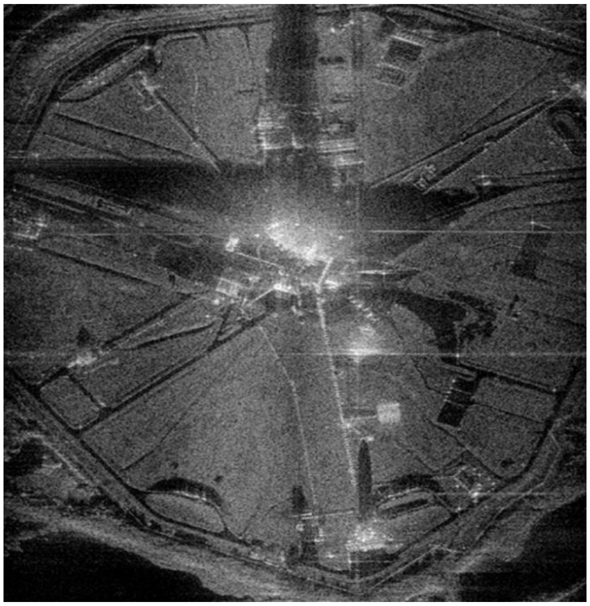

Fig 2.noisySAR IMAGE with proposed method

IV. CONCLUSION

Landmark based methods are usually labor intensive and their accuracy depends on the degree of reliability of the feature points. Instead of finding the mapping between the feature point sets, elastic model-based matching methods model the distortion in the image as the deformation of an elastic material. The resulting registration transformation is the deformation with a minimal bending and stretching energy. Practical elastic model-based methods are based on computation expensive iterative algorithms, and the choice of feature points plays a crucial role in its performance.

V. REFERENCES

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