

Signal Processor Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications

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Approaches for parallel implementation of real-time image formation processing (IFP) for ultra-wideband wide-angle synthetic aperture radar (SAR) are discussed. Integration over wide-angles and ultra-wideband waveforms are typically required for applications with low operating frequencies as well as other important applications [1] [2] [3]. The wide integration angles and ultra-wideband (UWB) waveforms that are implemented for these type of state-of-the-art systems are intended to compensate for a loss in resolution in relation to systems that operate under standard systems parameters. State-of-the-art SAR image formation algorithms that address this ultra-wideband wide-angle problem includes time-domain backprojection-type algorithms and Fourier-based processing algorithms. An analysis of these algorithms in terms of computational gains as a function of HPC implementation parameters is presented. A sample set of simulation results are included that illustrate the trade-offs between image quality and computational efficiency. In addition, a discussion of approaches to implementing IFP post-processing algorithms that specifically address the real-time nature of this problem are presented.