

Real-Time Space-Time Adaptive Processing on the STI CELL Multiprocessor

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Abstract

Space-Time Adaptive Processing (STAP) has been widely used in modern radar systems such as Ground Moving Target Indication (GMTI) systems in order to suppress jamming and interference. However, its baseband signal processing part usually requires huge amount of computing power. This paper presents the real-time implementation of an STAP baseband signal processing flow on the state-of-the-art STI CELL multiprocessor which enables the concept of Software-Defined Radar (SDR). SIMD vectorization is applied to speed-up the kernel subroutines of STAP such as the QR decomposition, forward/backward substitution and fast Fourier transform (FFT). Benchmarking results of both the kernel subroutines and the overall flow are presented. Furthermore, based on the result of earlier benchmarking, optimized task partitioning and scheduling methods are proposed by us to improve the overall performance so that the overhead is reduced to the minimum.