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Critically Sampled Hybrid Trigonometry Generalized Discrete Fourier Transform for Multistandard Receiver Platform

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Abstract : This paper presents a low computational channelization algorithm for the multi-standards platform using poly phase implementation of a critically sampled hybrid Trigonometry generalized Discrete Fourier Transform, (HGDFT). An HGDFT channelization algorithm exploits the orthogonality of two trigonometry Fourier functions, together with the properties of Quadrature Mirror Filter Bank (QMFB) and Exponential Modulated filter Bank (EMFB), respectively. HGDFT shows improvement in its implementation in terms of high reconfigurability, lower filter length, parallelism, and medium computational activities. Type 1 and type 111 poly phase structures are derived for real-valued HGDFT modulation. The design specifications are decimated critically and over-sampled for both single and multi standards receiver platforms. Evaluating the performance of oversampled single standard receiver channels, the HGDFT algorithm achieved 40% complexity reduction, compared to 34% and 38% reduction in the Discrete Fourier Transform (DFT) and tree quadrature mirror filter (TQMF) algorithm. The parallel generalized discrete Fourier transform (PGDFT) and recombined generalized discrete Fourier transform (RGDFT) had 41% complexity reduction and HGDFT had a 46% reduction in oversampling multi-standards mode. While in the critically sampled multi-standard receiver channels, HGDFT had complexity reduction of 70% while both PGDFT and RGDFT had a 34% reduction.

Keywords : software defined radio, channelization, critical sample rate, over-sample rate
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