

Abstract

## Unimodular Perfect and Nearly Perfect Sequences: A Variation of Björck's Scheme

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Constant Amplitude (CA), Zero Auto Correlation (ZAC) sequences (or CAZAC sequences, aka perfect sequences) have numerous applications: linear system parameter identification, real-time channel evaluation, synchronization, timing measurements, direct-sequence spread spectrum multiple access (DS/SSMA), frequency hopped spread-spectrum multiple access (FH/SSMA), and two-dimensional processing. The study of CAZAC property originates in radar and communication theory. The constant amplitude property ensures the ability to transmit signals at peak power constantly, while the zero autocorrelation property ensures that returning radar signals do not interfere with outgoing signals. We investigate Björck sequences, which are CAZAC. We also generalize these notions to what we term as CASAC by permitting small autocorrelations (SAC). Out-of-phase periodic auto-correlation values of these Björck-like CASAC sequences can be made to set to any desirable (small) constant value. Using only parameter based group ring calculations, we characterize all 2-valued and almost 2-valued (i.e., two-valued except for the first position which uses a third value) CAZAC and CASAC sequences. A one-parameter infinite family of CASAC we construct may have applications in Multiple-Input Multiple-Output (MIMO) areas. Toward this, we introduce a performance measure we term as cross merit factor to study cross correlation behavior, generalizing the celebrated notion of Golay Merit Factor (GMF).

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