

Generation of Generalized Signature Sequences

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ABSTRACT

In this thesis, we investigate the generation of pseudo-noise (PN) sequences over the Galois field $GF(p)$ where p is a prime number other than the conventionally used value of 2. $GF(2)$ sequences, which produce two levels, have traditionally been used as signature sequences in spread spectrum systems. We are motivated by generalized spread spectrum systems that utilize multi-level PN sequences as signature sequences. We consider PN sequences generated using the linear feedback shift register (LFSR) method in implementing a generator polynomial. The generated sequences are statistically evaluated under various tests using Matlab@ software. . Results of these tests are plotted for generator polynomials of a particular degree over $GF(3)$ and $GF(5)$. We find that PN sequences with more than two levels, when tested for auto-correlation properties, display better randomness than the conventional two-level PN sequences. We also implement two algorithms in order to construct generator polynomials over $GF(3)$ and $GF(5)$. For design and implementation of the PN generator circuitry, we consider using Field Programmable Gate Array (FPGA) technology. We also introduce a generalized design for a digital-to-analog converter (DAC) over $GF(p)$. For performance analysis of the PN generator circuits designed, such as maximum delay and highest speed, we use Altera Max+Plus 10.1 Baseline@ software. We plot performance graphs for particular degrees of generator polynomials over $GF(3)$ and $GF(5)$, and find that we can achieve sufficiently high operational