Pseudo Noise (PN) sequences are defined as a sequence of 1’s and 0’s which have randomness properties that make it appear noise-like but are generated by mathematical algorithms. PN sequences that are generated by shift registers such as M-sequences, Gold sequences are known and widely used since the 1960’s for various applications. These sequences are periodic and the periodicity is always in terms of powers of 2, hence donot offer much flexibility in terms of length of the sequence. In the past decade or so, PN sequences based on Prime numbers and quadratic residue theory have been discovered and are known to exist for a greater range of permissible lengths. The properties and generation of these Prime number based sequences have not been explored fully in literature and hence this paper explains two such sequences namely Legendre and Weil sequences and simulates them to analyse their properties which test their randomness. The simulation is done using MATLAB and Verilog Hardware Description Language. Generation of these sequences is described and implementation details on the Kintex-7 FPGA device with results are brought out.
FPGA Implementation of Pseudo Noise Sequences based on Quadratic Residue Theory

References


Index Terms

Computer Science

Signal Processing

Keywords

PN sequence, Quadratic residue, Legendre, Weil, correlation, FPGA.