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## The analysis of one-dimensional linear cellular automata their aliasing properties

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### Abstract

It is shown how to construct a general linear hybrid cellular automaton (CA) such that it has a cycle, and how the aliasing properties of such automata compare with linear feedback shift registers when used as signature analyzers. The construction is accomplished by formally demonstrating an isomorphism which binds this kind of CA to the LFSRs. Consequently, these CAs can be implemented as machines. Linear algebraic techniques are then applied appropriately for the transformation. A search algorithm is developed which, given an irreducible characteristic polynomial, finds a linear hybrid automaton. Such CAs are tabulated for all irreducible and primitive polynomials of degree 8 plus a selection of others of higher degree. The behavior of a linear hybrid CA and that of an LFSR are similar—that is, they have the same cycle structure and only relabel the states. Properties, when they are used as signature analyzers, remain unchanged.

### Index Terms

#### Inspection

##### Controlled Indexing

[finite automata](#) [logic testing](#)

##### Non-controlled Indexing

[aliasing properties](#) [cycle structure](#) [irreducible characteristic polynomial](#) [isomorphic](#) [hybrid automaton](#) [linear machines](#) [maximum length cycle](#) [one-dimensional linear cellular automata](#) [search algorithm](#) [signature analyzers](#)

#### Author Keywords

Not Available

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No references available on IEEE Xplore.

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