Chapter 3
Models and Paradigms of Cellular Automata With One Active Cell

ABSTRACT

The chapter describes the basic models and paradigms for constructing asynchronous cellular automata with one active cell. The rules for performing local state functions and local transition functions are considered. The basic cell structures during the transmission of active signals for various local transmission functions are presented. The option is considered when the cell itself selects among the cells in the neighborhood of the cell, a cell that will become active in the next time step, and also the structure with active cells under control is considered. The analysis of cycles that occur in cellular automata with one active cell is carried out, and approaches to eliminating cycles are formulated. Cell structures are constructed and recommendations for their modeling in modern CAD are formulated.

INTRODUCTION

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MODEL OF A CELLULAR AUTOMATA WITH A SINGLE ACTIVE CELL

Cellular automata with one active cell belong to the ACA family, in which only one cell at a time changes its state. In this case, at each subsequent moment of time, the cell, which is in a predetermined neighborhood with the active cell at the current time, changes its state.

An active cell is a cell that at the current time can perform a local state function (LSF). In accordance with LSF, an active cell forms its new information state or remains in its current state. Also, an active cell (AC) implements a local transition function (LTF) to select AC at the next time (Bilan, 2017; Bilan, Bilan, & Bilan, 2015; Bilan, Bilan, & Bilan, 2017; Bilan, et al 2016).

Figure 1. Block diagram of an ACA cell with one active cell