

Design of digital circuit structure based on evolutionary algorithm method

ABSTRACT

Evolutionary Algorithms (EAs) cover all the applications involving the use of Evolutionary Computation in electronic system design. It is largely applied to complex optimization problems. EAs introduce a new idea for automatic design of electronic systems; instead of imagine model, abstractions, and conventional techniques, it uses search algorithm to design a circuit. In this paper, a method for automatic optimization of the digital circuit design method has been introduced. This method is based on randomized search techniques mimicking natural genetic evolution. The proposed method is an iterative procedure that consists of a constant-size population of individuals, each one encoding a possible solution in a given problem space. The structure of the circuit is encoded into a one-dimensional genotype as represented by a finite string of bits. A number of bit strings is used to represent the wires connection between the level and 7 types of possible logic gates; XOR, XNOR, NAND, NOR, AND, OR, NOT 1, and NOT 2. The structure of gates are arranged in an $m * n$ matrix form in which m is the number of input variables.

Keyword: Digital structure design; Evolutionary algorithm; Genetic algorithm; Optimization