

An Assessment of Efficient Output of a Digital Circuit Using Genetic Algorithm

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Abstract – The rapid growth of Digital devices increases the interest of researchers in this area. In this field, Digital circuit is an important part of providing better services. There is a crucial algorithm called Genetic Algorithm can be use in order to solve the problem of finding the maximum output through the given complex circuit. The Paper has studied the genetic algorithm and its application. It seems to be that it is also applicable for finding maximum output of digital circuits.

Keywords: Genetic Algorithm, Sequential Logic circuit, combinational logic circuit.

I. Introduction

Genetic algorithms are one of the best ways to solve a problem for which little is known. Genetic algorithms use the principles of selection and evolution to produce several solutions to a given problem. Based on efficiency of genetic algorithm it can be applicable for search the best output of a digital circuit. Genetic algorithm is used as a search algorithm, which is an efficient and cost effective. It has various applications.

The paper has seven sections. First one is introduction of paper. The second section explains the genetic algorithm. It also describes the application of Genetic Algorithm. Digital circuits and its types are defined in section three. This paper defines moreover about the previous work, which has done in recent years in section fourth. Finally paper concludes in section five with section six has all the references that have been used in this paper.

II. Genetic Algorithm

Genetic Algorithms are a unit of computational models enthused by progress. The algorithm encode a potential solution to a definite problem on a simple chromosome-like data structure and apply recombination operators to these structures as to protect critical information. Genetic algorithms are often viewed as function optimizer, although the range of problem to which genetic algorithms have been applied are quite wide.

It is an adaptive heuristic search based on evolutionary idea of natural selection and inheritance. Method based on population genetics. Genetic algorithm were introduced by John Holland in the early 1970s [1]. Genetic algorithm is a probabilistic search algorithm based on the mechanics of natural selection and natural genetics. Genetic algorithm is started with a set of solutions [2]

- (1) Initialization: The first process decides initial genotype, namely value and genetic length.

Fig.1. Shows the basic steps taken by the genetic algorithm.

- (2) Evaluation: The second process calculates the fitness for each individual with the target function. The evaluation depends on each problem.
- (3) Termination Judgment: If the process satisfies the termination condition, the operation finishes and output the individual with the best fitness as the optimized solution.
- (4) Selection: To generate the children, this process chooses parents from individuals. For example, if we assume parents the first generation, children become the second generation. The children generate the next children again. The children inherited the characteristic of the parents are generated in this way.
- (5) Crossover: This process crosses individuals chosen by selection operation and generates the individuals of the next generation. Example of crossover operation is shown in Fig. 3.
- (6) Mutation: This process mutates the chromosome of new generation. The mutation is effective to escape from a local optimum solution.

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Genetic Algorithm()
{
Initialize population;
Evaluate the initial population;
For all population
{
If( Test Condition=True)
{
Search Element Found
}
Else
{
Apply CrossOver();
And Mutation();
}
}
}
    
```

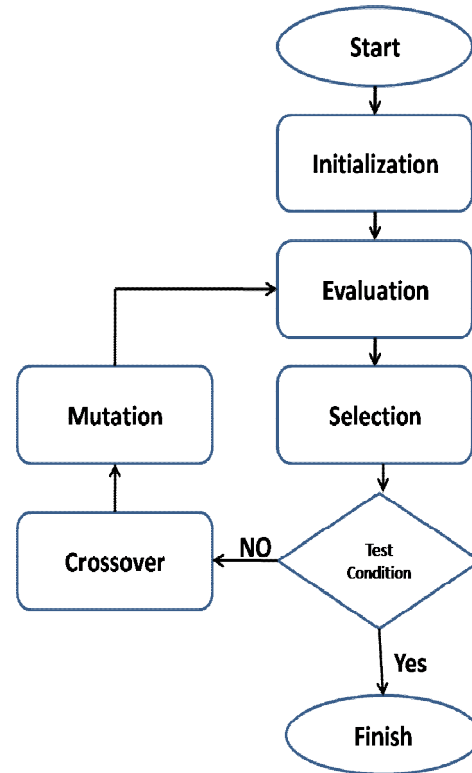


Fig.1. Flow diagram of Genetic algorithm

II.1. Applications of GA

GA representation and meaningful fitness evaluation are the keys of the accomplishment in GA applications. The demand of GAs comes from their simplicity and elegance as robust search algorithms as well as from their power to discover good solutions rapidly for difficult high-dimensional problems. These are the following aspects when GA efficient:

- Image Processing
- Fuzzy Control
- Neural Network
- Communication System
- Layout Optimization

III. Digital Circuits

Basic concept behind designing a digital circuit to use logic gates with a digital signal to enhance the efficiency and accuracy of circuit and overcome the noise as much as possible. There are two major divisions in digital circuits.

Sequential Logic Circuit
 Combinational Logic Circuit

Now a days most of the circuits designed using digital components because of their features, in Fig. 2 shown a digital circuit by using genetic algorithm calculate maximum and minimum output of the circuit

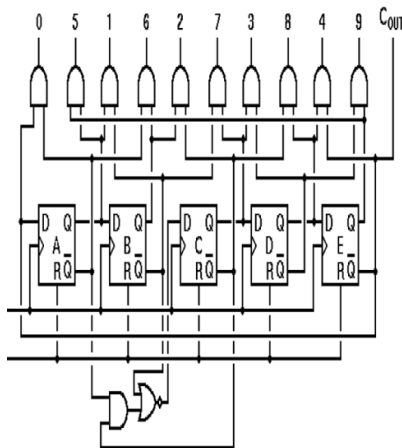


Fig.2. A Digital Circuit

IV. Literature Review

For solving the problem of travelling salesman problem using genetic algorithm by Rong yang. The approach is to introduce several knowledge-augmented genetic operators which guide the genetic algorithm. The algorithm applies a greedy crossover and two advanced mutation operations based on the 2-opt and 3-opt heuristics [3].

TS (Tabu Search) is one of the meta-heuristic algorithms that can solve the combinatorial optimization problems, which is NP-hard such as TSPs (traveling salesman problems), satisfied. With the requirement of solving large-scale problems, they proposed a new Parallel Tabu Search (PTS) approach, which was cooperated with genetic crossover operation, for TSPs [4].

Genetic algorithm with some improvement is proposed to avoid the local optimum for job-shop scheduling problem (JSP). There is recurrent searching process of genetic operation in the improved genetic algorithm proposed by Yingjie Xing et all [5].

The objective of Network Design Problem gives the overview of planning and designing for a road network systematically so that the total travel cost of the whole road system is minimized. The Paper Presents a case study in order to explain application of the algorithm and some meaningful conclusions are drawn concerning improvement of the test road network.[6].

Timetabling is a kind of problem in which events have to be arranged into a number of timeslots such that conflicts in using a given set of resources are avoided it is easy to solve this problem by genetic algorithm.[7].

V. Conclusion

Theory of Genetic Algorithm offers an important approach to plan the strategy in order to Search Maximum & Minimum output of a complex digital circuit in efficient manner. This paper has given a general idea for genetic algorithm and the Output of a digital circuit. It can also describe the various application of genetic algorithm. Here we get an idea to apply genetic algorithm on Digital circuits.

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Author's Profile

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