

A STUDY OF NATURE INSPIRED OPTIMIZATION ALGORITHMS

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ABSTRACT

Nature has the abilities of balancing the 'eco-system', diversity maintenance and adaptation to changing environment which educated many strategies to the human beings and can be adaptable in the technologies. The generation of human beings and the behavior of many social agents and animals gave inspiration to design a set of meta-heuristic algorithms which are used to find optimal or best solutions for large number of complex problems. Most of these algorithms are independent of the nature of the problems to be solved. As many algorithms are being implemented for various applications, no one is proved as best among all the optimization problems. This paper surveys some of the nature inspired algorithms, their adaptability to real world problems and concludes with limitations and improvisation required in these algorithms.

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KEY WORDS

Optimization algorithms, Bio-inspired algorithms, Natural Evolution.

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INTRODUCTION

Charles Darwin analyzed the evolution of natural components and defined the "Theory of Natural Evolution". This theory describes about the "Survival of the Fittest" of the natural elements by taking on of the changing/dynamic environments. The natural elements have the ability of self-processing and self-learning. Best example for this is the 'generation of the human beings'. All the search/optimization problems go along with the "Survival of the Fittest". The optimization plays a major role in most of the engineering applications.

The problem solving methods are categorized into two types. They are Classical methods/traditional methods and Heuristic methods. Classical methods use either simple logical or mathematical steps and have clearly defined ways to get a solution. But heuristic methods are useful to solve NP-hard problems and need some optimization algorithms. These optimization algorithms mimic the behavior that inspired from the natural components [1].

The major reasons which makes trouble to solve a problem are [2,3]:

- Solution space has large number of possible solutions and this creates the need of exhaustive search to find the best answer.
- As the problem is more complicated, simple search is not useful.
- The evaluation strategy may vary with time or it may give a noisy solution.
- Constraint on the solution is so weighty and sometimes finding a single solution is so difficult.
- Wrong assumption about the problem/constraints may create barrier that prevents to find out a solution.

Some search algorithms like Gradient search are mostly problem dependent and convergence also depends on the selection of starting solutions. The algorithm cannot be parallelized. But nature inspired optimization algorithms can be used in wide class of applications and can be parallelized [2]. When adapting the nature inspired algorithms the following should be considered:

- The problem should be represented properly.