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GENETIC ALGORITHM PARAMETER CONTROL FOR ACHIEVING BETTER OPTIMIZATION PERFORMANCE

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ABSTRACT: This research is directed towards controlling genetic algorithm operator parameters. Simulations have been done in MatLab on examples taken from literature for genetic algorithm testing. Based on a large number of simulations with different parameter values, algorithm operator values are attained experimentally. An analysis of results has been completed in Statistica, as well as the creation of nonlinear equations for the correlation between operators and results. By optimizing the derived equations it is possible to determine general parameter values of operators which will have beneficial optimization performances, in terms of convergence. One equation which gives the best optimization values is favored. Attained values are again tested on new examples which define achieved performance and benefits of this approach. These results lead to a simplified use of the genetic algorithm for practical optimization with satisfactory results. This approach has a practical engineering optimization use perspective.

Keywords: genetic algorithm, parameter control, operators, MatLab, mathematical mode

1. INTRODUCTION

Optimization, as an alternative solution finding approach, is represented in a wide field of disciplines, and its practical use is most commonly found in engineering. The optimization process implies the use of an optimization method. Due to their good performance heuristic methods are in massive use, which include the Genetic algorithm. The evolutionary character of the genetic algorithm implies operators (operations) of selection, crossover and mutation, and since there is a rapid development of operator algorithm it is not easy to set and control them in order to have an adequate optimization. Bad operator characteristics lead to early convergence, slow convergence, increased time of optimization and an increase of never reaching the optimum. Due to a large possibility of setting operators the user usually has no alternative choice of adequate settings. Numerous researchers have worked on the quality of genetic algorithm use, convergence characteristics, and possibility of optimization. These researches are generally oriented on specific operator's for real coded genetic algorithm (RCGA).

Author Saber M. Elsayed et al. [1] have oriented their research on the analysis of the work of the crossover as an alternative to new Genetic algorithms useful for optimization. Manoj Thakur et al. [2] oriented their work on crossover and mutation, as segments of the genetic algorithm. Authors used LX-PM method RCGA which had modified crossover and created the BEX approach (bounded exponential crossover). Kusum Deep and Manoj Thakur [3] were oriented on RCGA operators, more specifically on LX. Authors have combined this crossover with already developed mutations MPTM and NUM in order to achieve a new genetic algorithm LX-MPTM and LC-NUM respectively. Values are compared to HX-MPTM and HX-NUM. C. García-Martínez et al. [4] researched parent-client crossover. Authors suggested steps which they think will increase the efficiency of RCGA. The first step is separating individuals in the population to male and female. The next step they suggest is to have different selections make choices from different parents and determine an

