

**Benchmark studies on Multi-Objective
Evolutionary Programming (MOEP) using
Mutation Based on Adaptive Mutation
Operator (AMO) and Polynomial Mutation
Operator (PMO)**

The performance of a Multi-Objective Evolutionary Programming (MOEP) is significantly dependent on the parameter setting of the operator. These parameters tend to change the characteristic of adaptive in different stages of evolutionary process. The intention of this paper is to create adaptive controls for each parameter existing in MOEP where it is able to improve even more the performance of the evolutionary programming. Hence, in this paper, an adaptive mutation operator based multi-objective evolutionary programming is presented. A computer program was written in MATLAB. At the end, the result was compared with the Polynomial Mutation Operator.

Keywords: Multi-Objective Evolutionary Programming, Adaptive Mutation Operator, Polynomial Mutation Operator

1. Introduction

There are numerous intelligent methods have been developed in recent years. There are Artificial Neural Networks (ANN), Genetic Algorithms (GA), Particle Swarm Optimization (PSO) and Evolutionary Programming (EP). Evolutionary Programming (EP) has been increasingly applied over the past years for the solution of optimization problems with multi-objective. There are a lot of MOEP has been recommended in recent years due to its capability to discover Pareto-optimal solutions in one single simulation run [1].

Multi-objective problems are more complicated to solve compared to the single objective since there is no unique solution. Moreover, there are two objective function implemented in multi-objectives optimization problem where need to optimize simultaneously with a number of equality and inequality constraints. Furthermore, the implementation of multi-objective capable to provide a set of optimal solutions which also known as Pareto-optimal solutions. The optimal set refer to all possible non-dominated solution while the Pareto Front refers to the corresponding objective function values in the objective space [2].

The typical MOEP utilizes three basic operators. It is included selection, crossover and mutation. Evolutionary programming mainly relies mainly on its mutation operator. The mutation operator helps to produce variety in the population. Furthermore, in EP, the step size control is a main significant matter in the design of mutation operator [2] [3].

Furthermore, there are plenty of mutation applies in MOEP. It is included Gaussian mutation, Levy mutation, Cauchy mutation, Polynomial mutation and Adaptive mutation. The AMO depends on its parameter setting which also known as Parameter Control where

* Corresponding author: M. Morgan, Faculty of Electrical Engineering, Universiti Malaysia Pahang, Pekan Branch, 26600, Pekan, Pahang, Malaysia, E-mail: mavinmd@gmail.com

¹ Faculty of Electrical Engineering, Universiti Malaysia Pahang, Pekan Branch, Pekan, Pahang, Malaysia