Multi Expression Programming

Mihai Oltean (✉ mihai.oltean@gmail.com)

Babes-Bolyai University, Cluj-Napoca, Romania <https://orcid.org/0000-0001-6390-1170>

D. Dumitrescu

Babes-Bolyai University, Cluj-Napoca, Romania

Method Article

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Abstract

Multi Expression Programming (MEP) is a new evolutionary paradigm intended for solving computationally difficult problems. MEP individuals are linear entities that encode complex computer programs. MEP chromosomes are represented in the same way as C or Pascal compilers translate mathematical expressions into machine code. MEP is used for solving some difficult problems like symbolic regression and game strategy discovering. MEP is compared with Gene Expression Programming (GEP) and Cartesian Genetic Programming (CGP) by using several well-known test problems. For the considered problems MEP outperforms GEP and CGP. For these examples MEP is two magnitude orders better than CGP.

Full Text

This preprint is available for [download as a PDF](#).

Figures

Figure 1

A CGP program with 5 inputs, 2 outputs and 3 functions (0, 1, 2 inside square nodes). The grey squares represent unconnected nodes. Picture adapted from [14]

Figure 2

Success rate of MEP and GEP algorithms. The number of symbols in chromosome varies between 8 and 100. The results are summed over 100 runs.

Figure 3

Success rate of MEP algorithm. The chromosome length varies between 5 and 100. The results are summed over 100 runs.

Figure 4

Success rate of MEP algorithm when the number of first positions occupied by terminal symbols varies. The number of first positions occupied by terminals varies between 1 and 20. The results are summed over 100 runs.

Figure 5

Success rate of MEP algorithm. Population size varies between 2 and 200. The results are summed over 100 runs.

Figure 6

Relationship between the success rate of MEP algorithm and the number of generations used in the search process. The number of generations varies between 10 and 500. The results are summed over 100 runs.

Figure 7

Success rate of MEP algorithm when operators are weighted. The chromosome length varies between 10 and 100. The results are summed over 100 runs.

Figure 8

(a) Success rate of MEP and SEP when the number of generations varies between 100 and 500. (b) Success rate of MEP and SEP when the chromosome length varies between 10 and 150. (c) Success rate of MEP and SEP when the population size varies between 10 and 300. The results are summed over 100 runs

0	1	2
3	4	5
6	7	8

Figure 9

Game board linearized representation.

Figure 10

Fitness of the best individual in the best runs and the average fitness of the best individuals over all runs. The results are taken over 30 runs.