

CONTENTS

RESUMÉ	4
ABSTRACT	6
CONTENTS	8
LIST OF FIGURES	11
LIST OF TABLES	12
LIST OF SYMBOLS AND ABBREVIATIONS	13
1. INTRODUCTION AND STATE OF ART	18
2. DISSERTATION GOALS	21
THEORETICAL FRAMEWORK	22
3. SYMBOLIC REGRESSION	23
3.1. GENETIC PROGRAMMING	23
3.2. GRAMMATICAL EVOLUTION.....	25
3.3. ANALYTIC PROGRAMMING.....	29
3.3.1. <i>Description</i>	29
3.3.2. <i>Versions of AP</i>	33
3.4. COMPARISON.....	34
3.5. OTHER POSSIBLE APPROACHES.....	34
4. OPTIMIZATION ALGORITHMS - EVOLUTIONARY ALGORITHMS	36
4.1. DETERMINISTIC ALGORITHM – HILL CLIMBING.....	37
4.2. STOCHASTIC ALGORITHM - SIMULATED ANNEALING	37
4.3. GENETIC ALGORITHMS.....	38
4.3.1. <i>Coding and fitness function</i>	39
4.3.2. <i>Reproduction</i>	39
4.4. SELF-ORGANIZING MIGRATING ALGORITHM (SOMA)	41
4.5. DIFFERENTIAL EVOLUTION (DE).....	44
PRACTICAL PART	46
5. EXPERIMENTS PERFORMED BY ANALYTIC PROGRAMMING	47
5.1. DATA APPROXIMATION	47
5.2. LOGICAL CIRCUITS DESIGN	49
5.3. OPTIMAL SETTING OF ROBOT TRAJECTORY	53
5.3.1. <i>Set of functions</i>	54
5.3.2. <i>Results</i>	55
5.3.3. <i>Output from the simulations</i>	56

5.4.	LOCAL CONCLUSION AND DISCUSSION	56
6.	CREATION OF EVOLUTIONARY ALGORITHMS - PROGRESS	58
6.1.	FIRST EXPERIMENTS	58
6.1.1.	<i>General Function Set</i>	59
6.1.2.	<i>Cost Function</i>	60
6.1.3.	<i>Results of the preliminary study</i>	61
6.2.	DESIGN OF NEW COST FUNCTION	64
6.2.1.	<i>New operators added and renamed</i>	64
6.2.2.	<i>Design of cost function</i>	67
6.2.3.	<i>Results</i>	68
6.3.	HIGHER DIMENSIONAL PROBLEMS	72
6.3.1.	<i>Results</i>	76
6.3.2.	<i>Comments to behaviour of new algorithms itself</i>	77
6.3.3.	<i>Possible approach to giving a name to new algorithms</i>	88
	CONCLUSIONS AND DISCUSSIONS	89
	REFERENCES	93
7.	APPENDIX - TEST FUNCTIONS	98
7.1.	SPHERE MODEL, 1 ST DE JONG'S FUNCTION – 2D	98
7.2.	SPHERE MODEL, 1 ST DE JONG'S FUNCTION – 20D	100
7.3.	SPHERE MODEL, 1 ST DE JONG'S FUNCTION – 100D	102
7.4.	ROSENBROCK'S SADDLE, 2 ND DE JONG'S FUNCTION – 2D.....	104
7.5.	ROSENBROCK'S SADDLE, 2 ND DE JONG'S FUNCTION – 20D.....	106
7.6.	ROSENBROCK'S SADDLE, 2 ND DE JONG'S FUNCTION – 100D.....	108
7.7.	3 RD DE JONG'S FUNCTION – 2D	110
7.8.	3 RD DE JONG'S FUNCTION – 20D	112
7.9.	3 RD DE JONG'S FUNCTION – 100D	114
7.10.	4 TH DE JONG'S FUNCTION – 2D	116
7.11.	4 TH DE JONG'S FUNCTION – 20D	118
7.12.	4 TH DE JONG'S FUNCTION – 100D	120
7.13.	RASTRIGIN'S FUNCTION – 2D	122
7.14.	RASTRIGIN'S FUNCTION – 20D	124
7.15.	RASTRIGIN'S FUNCTION – 100D	126
7.16.	SCHWEFEL'S FUNCTION – 2D	128
7.17.	SCHWEFEL'S FUNCTION – 20D	130
7.18.	SCHWEFEL'S FUNCTION – 100D	132

7.19.	GRIEWANGK'S FUNCTION – 2D	134
7.20.	GRIEWANGK'S FUNCTION – 20D	136
7.21.	GRIEWANGK'S FUNCTION – 100D	138
7.22.	SINE ENVELOPE SINE WAVE FUNCTION – 2D	140
7.23.	SINE ENVELOPE SINE WAVE FUNCTION – 20D	142
7.24.	SINE ENVELOPE SINE WAVE FUNCTION – 100D	144
7.25.	STRETCHED V SINE WAVE FUNCTION (ACKLEY) – 2D	146
7.26.	STRETCHED V SINE WAVE FUNCTION (ACKLEY) – 20D	148
7.27.	STRETCHED V SINE WAVE FUNCTION (ACKLEY) – 100D	150
7.28.	TEST FUNCTION (ACKLEY) – 2D	152
7.29.	TEST FUNCTION (ACKLEY) – 20D	154
7.30.	TEST FUNCTION (ACKLEY) – 100D	156
7.31.	ACKLEY'S FUNCTION – 2D	158
7.32.	ACKLEY'S FUNCTION – 20D	160
7.33.	ACKLEY'S FUNCTION – 100D	162
7.34.	EGG HOLDER – 2D	164
7.35.	EGG HOLDER – 20D	166
7.36.	EGG HOLDER – 100D	168
7.37.	RANA'S FUNCTION – 2D	170
7.38.	RANA'S FUNCTION – 20D	172
7.39.	RANA'S FUNCTION – 100D	174
7.40.	PATHOLOGICAL TEST FUNCTION – 2D	176
7.41.	PATHOLOGICAL TEST FUNCTION – 20D	178
7.42.	PATHOLOGICAL TEST FUNCTION – 100D	180
7.43.	MICHALEWICZ'S FUNCTION – 2D	182
7.44.	MICHALEWICZ'S FUNCTION – 20D	184
7.45.	MICHALEWICZ'S FUNCTION – 100D	186
7.46.	MASTER'S COSINE WAVE FUNCTION – 2D	188
7.47.	MASTER'S COSINE WAVE FUNCTION – 20D	190
7.48.	MASTER'S COSINE WAVE FUNCTION – 100D	192
	LIST OF AUTHOR'S PUBLICATION ACTIVITES.....	194
	CURRICULUM VITAE	197