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and Alexander S. Malioukov

Genetic Algorithms for Applied CAD Problems

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Foreword

The development of intelligent systems connecting the human brain and computer technologies represents one of the most important problems of the 21st century. Therefore, analytical methods of data mining of computer databases are being developed.

Intellectual behavior of technical objects as well as the biological ones is defined by their structure, architecture and a general organization first of all.

A purposeful direction can be defined as an intelligent behavior. It consists in finding the best ways to obtain some purpose by means of trial-and-error and study methods. These purposes are different for each category but all of them assume the control object adaptation to unpredictable changes of their characteristics in time.

The intelligent behavior of technical objects can be defined as simulation of some important functions of biological systems.

New perspective technologies of genetic search and evolution simulation represent the kernel of this book. The authors wanted to show how these technologies are used for practical problems solution.

This monograph is meant for specialists of computer aided design (CAD), intelligent information technologies in science, biology, economics, sociology and others. It may be used by post-graduate students and students of specialties connected to systems theory and system analysis, information science, optimization, operations research, etc.

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Preface

The development of intellectual systems connecting the human brain and computer technologies represents one of the most important problems of the 21st century. Therefore analytical methods of data mining of computer databases are being developed.

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Abbreviations

ADP	automated design procedure
AI	artificial intelligence
AIS	artificial intelligence system
ART	algorithm running time
AS	artificial system
BB	building block
BEA	block of evolutionary adaptation
CAD	computer aided design
CAE	computer aided engineering
CAM	computer aided manufacturing
CD	connections diagram
CF	commutation field
CNC	computer numeric control
CO	crossover operator
CS	conflict situation
DB	database, databank
DCT	directed covering tree
DD	discrete device
DE	evolution on Darwin
DGA	dynamic genetic algorithm
DL	design language
DM	a method of dichotomy
DMP	decision-making person
DMSS	decision-making support system
DP	dialogue processor
DSD	data storage device
DTWF	discrete topological working field
DWF	discrete working field
ECE	electronic computing equipment
EE	electronic equipment

ES	expert system
FM	Fibonacci method
FN	Fibonacci numbers
FS	fractal set
GA	genetic algorithm
GAFA	genetic algorithm of formula approximation
GAMG	genetic algorithm with multiple genotype
GC	graph coloring
GCO	greedy crossing-over operator
GH	greedy heuristic
GIR	graph isomorphism recognition
GO	genetic operator
GS	genetic search
GSMS	genetic search management system
LSI	large-scale integrated circuit
HM	homeostatic management
IC	integrated circuit
IO	inversion operator
IPP	integer programming problem
IS	independent subset
KB	knowledge base
LE	evolution on Lamarck
LS	linguistic software
LTEC	linear thermal expansion coefficient
MD	micro-discrete
MH	magnetic head
MIS	metal-isolator-semiconductor
MM	mathematical model
MO	mutation operator
MRD	magnetic recording device
MRE	magneto-resistive element
MS	mathematical software
MTS	methodical software
NS	natural system
OT	optimization task
PTMRH	planar single-turn thin-film magneto-resistive head
RF	recombination function

RO	removal operator
RPO	reproduction operator
RS	random search
SA	simulated annealing
SC	silicon compiler
SCT	shortest covering tree
SET	synthetic theory of evolution
SGA	simple genetic algorithm
SO	segregation operator
SOM	statistical optimization method
SP	Steiner point
ST	Steiner tree
SW	Software
TF	target function
TO	translocation operator
TRE	natural system
TSP	traveling salesman problem
VLSI	very large-scale integrated circuit