

# Contents

<b>1 Database and Graph Theory</b>	1
1.1 Graph as a Space of Entity Attributes as Sink, Source, and Transit.	3
1.2 Derivative, Variation and Chain by the Reference $e_1$ and $e_2$	10
<b>2 Crossover and Permutation</b>	13
2.1 Right Product RA.	15
2.2 Left Product AR.	17
<b>3 Similarity Between Graphs in Database by Permutations</b>	19
<b>4 Morphogenetic and Morpheme Network to Structured Worlds</b>	23
4.1 Morpheme Networks	23
4.2 Loop and General Similarity and Conflicts and Inconsistency in Graph Space	26
4.3 Vector Representation of Graph Inconsistency	26
4.4 From Inconsistent to Consistent Data by Map Reduction in Big Data.	32
4.5 Simple Electrical Circuit as Database Graph Structure	33
<b>5 Formal Description and References in Graph Theory</b>	39
5.1 Formal Description of Relationships.	39
5.2 Topological Inconsistency.	46
5.3 Inconsistency in Crystal Structure.	47
<b>6 Logic of Conflicts and Active Set with Uncertainty and Incoherence</b>	51
6.1 Agents and Logic in the Epistemic Logic.	52
6.2 Concepts and Definitions of Active Set	53
6.3 Properties and Definition of the Active Set.	53

6.4	Aggregation Rule for Active Set . . . . .	58
6.5	Fuzzy Set by Active Set. . . . .	58
6.6	Theory of Inconsistent Graph and Active Set. . . . .	61
<b>7</b>	<b>Cycles, Sinks, Sources and Links Products . . . . .</b>	<b>65</b>
7.1	Study of Sink Property . . . . .	68
7.2	Study of Source Property . . . . .	69
7.3	Both Sink and Source. . . . .	70
7.4	Cycle in the Database. . . . .	70
7.5	Graph as a Space with Reference . . . . .	73
7.6	External Product. . . . .	75
7.7	Internal Product for Multidimensional Many Sources, and Many Sinks Space . . . . .	79
7.8	Segment Type, Surface Type, Volume Type and Others in Graphs . . . . .	79
7.9	Orthogonality . . . . .	84
7.10	Multidimensional Graph Space. . . . .	87
<b>8</b>	<b>A New Interpretation of the Determinant as Volume and Entropy . . . . .</b>	<b>93</b>
8.1	De Bruijn Graph Evolution by Skew Product. . . . .	104
<b>9</b>	<b>Morphogenetic Computing in Genetic Algorithms . . . . .</b>	<b>107</b>
9.1	Projection Instrument as Formal Sink Source Change with Invariance. . . . .	107
9.1.1	Morphogenetic Transformation. . . . .	107
9.1.2	Inverse Problem in Systems with Different Numbers of Inputs and Outputs . . . . .	108
9.2	Geometric Image of the Pseudo-Inverse . . . . .	112
9.3	Simple Genetic Algorithm Subject to Constraint [22, 23, 25, 26, 35] . . . . .	116
9.3.1	Genetic Selection Algorithm in Two Dimensional State Subject to Normalize Constraint . . . . .	116
9.3.2	Three Dimension Selection Evolution Subject to the Normalize Constraint . . . . .	123
9.4	Selection, Mutation and Crossover Evolution Subject to the Normalize Constraint and Initial Probability Constraint . . . . .	127
9.5	Beyond the Normalized Constraint. . . . .	131
9.6	Conclusion . . . . .	132
<b>10</b>	<b>Neural Morphogenetic Computing and One Step Method . . . . .</b>	<b>133</b>
10.1	One Step Back Propagation to Design Neural Network . . . . .	133
10.2	Supervised Neural Network by Projection Method [17–19, 21] . . . . .	135
10.3	Conflict Situation in Supervised Neural Network with Compensation. . . . .	137

10.4 Evolvability and One Step Method in Neural Network. . . . .	148
10.5 Associative Memory by One Step Method [5] . . . . .	155
10.6 Hopfield Neural Network and Morphogenetic Computing as One Step Method [7] . . . . .	160
10.7 Kohonen Self Organizing Maps by Morphogenetic Computing [1–3] . . . . .	162
10.8 Morphogenetic Computing Learning with Noising to Learn Patterns and Retrieve Patterns . . . . .	166
10.9 Conclusion . . . . .	168
<b>References . . . . .</b>	<b>171</b>

Introduction to Morphogenetic Computing

Resconi, G.; Xu, X.; Xu, G.

2017, IX, 172 p. 145 illus., Hardcover

ISBN: 978-3-319-57614-5