

Contents

1	Introduction	1
2	Understanding	11
3	Understanding Systems	25
4	Machine Understanding—Human Understanding	35
4.1	Machine Understanding—Simple Understanding— Human Understanding	35
4.2	Machine Understanding—Shape Understanding— Philosophical Concepts	43
5	Machine Understanding	49
6	Categories	73
6.1	Introduction	73
6.2	Category of Figures	74
6.3	Shape Categories (Shape Classes)	75
6.3.1	Shape Categories—Colored Category (Class)	76
6.4	Basic Abstract Categories	77
6.4.1	Basic Abstract Categories—Basic Abstract STA Category	78
6.4.2	Basic Abstract Categories—Category of Numbers	79
6.4.3	Basic Abstract Categories—Basic Abstract Relational STA Category	81
6.4.4	Basic Abstract Categories—Basic Spatial Relation Category	82
6.4.5	Basic Abstract Categories—Basic Visual Attribute Category	83

6.4.6	Basic Abstract Categories—Nonvisual Attribute Category	86
6.4.7	Basic Abstract Categories—Change Category	86
6.5	Category of Mathematical Symbols	89
6.5.1	Category of Mathematical Symbols—Category of Logical Symbols	89
6.5.2	Category of Mathematical Symbols—Category of Set Theory (STA) Symbols	90
6.6	Category of Letters	90
6.7	Text Category	91
6.8	Category of Parts	92
7	Problem Solving	97
7.1	Introduction	97
7.2	Category of Problems	98
7.3	Visual Problem Category	99
7.3.1	Visual Problem Category—Perceptual Problem Category	100
7.3.2	Visual Problem Category—Visual Diagnosis Problem Category	101
7.3.3	Visual Problem Category—Visual Analogy Problem Category	102
7.3.4	Visual Problem Category—Assembling Tools Problem Category	102
7.3.5	Visual Problem Category—Visual Process Control Problem Category	103
7.3.6	Visual Problem Category—Naming Problem Category	103
7.4	Text-Task Category	104
7.4.1	Text-Task Category—Text-Task with Numerical Solution Category	106
7.4.2	Text-Task Category—Multiple-Choice Test Category	106
7.4.3	Text-Task Category—True-False Test Category	109
7.4.4	Text-Task Category—Matching Test Category	110
7.4.5	Text-Task Category—Essay Test Category	110
7.4.6	Text-Task Category—Explanatory Text-Task Category	111
7.4.7	Text-Task Category—IQ-Text-Task Category	112
7.4.8	Text-Task Category—Command-Text-Task Category	113
7.4.9	Text-Task Category—Visual-Text-Task Category	114
8	Visual Understanding	131
8.1	Visual Understanding—Generalization	132
8.2	Visual Understanding—Specialization	133
8.3	Visual Understanding—Schematization	135
8.4	Visual Understanding—Visual Abstraction	137

8.5	Visual Understanding—Imagery Transformation	138
8.5.1	Meaningful Imagery Transformation	139
8.6	Visual Understanding—Conceptual Magnification	142
8.7	Understanding Object from the Real World Object Category . . .	145
8.8	Learning and Understanding Objects from the Flat Object Category	151
8.8.1	Learning and Understanding Objects from the Flat Object Category—The Leaf Category	154
8.8.2	Learning and Understanding Objects from the Flat Object Category—The Butterfly Category	159
9	Understanding Signs	165
9.1	Introduction	165
9.2	Understanding Signs—Visual Object and Its Meaning	166
9.2.1	The Image of a Real World Object Refers to the Real World Object $o(R) \rightarrow R$	168
9.2.2	The Conventional Image of a Real World Object Refers to the Real World Object $c(R) \rightarrow R$	168
9.2.3	The Image of a Real World Object (Conventional Representation) Refers to Another Real World Object or Phenomenon $o(R) \rightarrow \phi, c(R) \rightarrow \phi$	169
9.2.4	The Image of a Real World Object (Conventional Representation) Refers to the Imagery Object $o(R) \rightarrow \Lambda, c(R) \rightarrow \Lambda$	169
9.2.5	The Conventional Image of an Imagery Object Refers to the Real World Object $c(I) \rightarrow R$	170
9.2.6	The Conventional Image of an Imagery Object that Refers to the Imagery Object $o(I) \rightarrow \Lambda$	170
9.2.7	The Conventional Image of an Imagery Object that Refers to the Abstract Object $o(I) \rightarrow H (o(I) \rightarrow H)$	171
9.3	Understanding Signs—Sign and Its Meaning	171
9.4	Understanding Signs—The Visual Symbol Category	173
9.4.1	Understanding Objects from the Musical Symbol Category	175
9.4.2	Understanding Objects from the Electronic Symbol Category	181
9.5	Understanding Signs—The Symbolic Sign Category	187
9.5.1	Understanding Objects from the Road Sign Category . . .	187
9.5.2	Understanding Objects from the Astrological Symbol Category	195
10	Understanding Text	197
10.1	Introduction	197
10.2	Natural Language Understanding—Understanding Text	199

10.3	Text Category	202
10.4	Understanding the Dictionary Text	203
10.5	Understanding Mathematical Text—Understanding Mathematics . . .	204
10.5.1	Mathematical Text Category	205
10.5.2	Deep Understanding of Text	207
10.5.3	Understanding the Set Theory (STA) Texts	208
10.5.4	Understanding the Set Theory (STA) Text—STA-Text Category	210
11	Understanding Explanations	229
11.1	Explanation in Science	230
11.2	Explanation—Understanding	231
11.3	Understanding Explanatory Text-Tasks	232
11.4	Understanding Explanatory Texts	233
11.4.1	Understanding Explanatory Algebraic Texts	234
11.4.2	Learning Categories of the Explanatory Algebraic-Equation-Texts	239
11.4.3	Learning Explanatory Form of the Explanatory Algebraic-Equation-Text Category	240
11.5	Visual Explanation	243
	References	247
	Index	255

Shape Understanding System

Machine Understanding and Human Understanding

Les, Z.; Les, M.

2015, X, 256 p. 189 illus., 90 illus. in color., Hardcover

ISBN: 978-3-319-14196-1