

Contents

Part I Introduction and Terminology

1	Introduction	3
	References	7
2	Mathematical Background	9
2.1	Sets and Sequences	10
2.2	Relations	11
2.3	Functions	12
2.4	Graphs	12
	References	13
3	Rudiments of Formal Language Theory	15
3.1	Strings and Languages	16
3.2	Language Families	19
3.3	Grammars	20
3.4	Automata	31
	References	35

Part II Regulated Grammars: Fundamentals

4	Context-Based Grammatical Regulation	39
4.1	Classical Grammars Viewed as Tight-Context Regulated Grammars	40
4.1.1	Normal Forms	40
4.1.2	Uniform Rewriting	47
4.2	Context-Conditional Grammars	56
4.2.1	Definitions	56
4.2.2	Generative Power	57
4.3	Random Context Grammars	63
4.3.1	Definitions and Examples	64
4.3.2	Generative Power	65

4.4	Generalized Forbidding Grammars	68
4.4.1	Definitions	69
4.4.2	Generative Power and Reduction	69
4.5	Semi-Conditional Grammars	84
4.5.1	Definitions and Examples	84
4.5.2	Generative Power	86
4.6	Simple Semi-Conditional Grammars	88
4.6.1	Definitions and Examples	88
4.6.2	Generative Power and Reduction	89
4.7	Scattered Context Grammars	119
4.7.1	Definitions and Examples	119
4.7.2	Generative Power	123
4.7.3	Normal Forms	124
4.7.4	Reduction	126
4.7.5	LL Scattered Context Grammars	149
	References	153
5	Rule-Based Grammatical Regulation	155
5.1	Regular-Controlled Grammars	156
5.1.1	Definitions and Examples	156
5.1.2	Generative Power	160
5.2	Matrix Grammars	160
5.2.1	Definitions and Examples	161
5.2.2	Generative Power	163
5.3	Programmed Grammars	163
5.3.1	Definitions and Examples	163
5.3.2	Generative Power	165
5.3.3	Normal Forms	166
5.3.4	Restricted Non-Determinism	174
5.4	State Grammars	184
5.4.1	Definitions and Examples	184
5.4.2	Generative Power	186
	References	187

Part III Regulated Grammars: Special Topics

6	One-Sided Versions of Random Context Grammars	191
6.1	Definitions and Examples	194
6.2	Generative Power	198
6.2.1	One-Sided Random Context Grammars	198
6.2.2	One-Sided Forbidding Grammars	203
6.2.3	One-Sided Permitting Grammars	213

6.3	Normal Forms	215
6.4	Reduction	223
6.4.1	Total Number of Nonterminals	224
6.4.2	Number of Left and Right Random Context Nonterminals	231
6.4.3	Number of Right Random Context Rules	237
6.5	Leftmost Derivations	244
6.5.1	Type-1 Leftmost Derivations	245
6.5.2	Type-2 Leftmost Derivations	248
6.5.3	Type-3 Leftmost Derivations	253
6.6	Generalized One-Sided Forbidding Grammars	256
6.6.1	Definitions and Examples	257
6.6.2	Generative Power	259
6.7	LL One-Sided Random Context Grammars	267
6.7.1	Definitions	268
6.7.2	A Motivational Example	270
6.7.3	Generative Power	271
	References	277
7	On Erasing Rules and Their Elimination	281
7.1	Elimination of Erasing Rules from Context-Free Grammars	282
7.1.1	The Standard Algorithm	282
7.1.2	A New Algorithm	284
7.1.3	Can Erasing Rules Be Eliminated from Regulated Grammars?	291
7.2	Workspace Theorems for Regular-Controlled Grammars	293
7.3	Generalized Restricted Erasing in Scattered Context Grammars ..	310
	References	328
8	Extension of Languages Resulting from Regulated Grammars	329
8.1	Regular-Controlled Generators	330
8.2	Coincidental Extension of Scattered Context Languages	346
	References	348
9	Sequential Rewriting Over Word Monoids	351
9.1	Definitions	352
9.2	Generative Power	352
	References	361

Part IV Regulated Grammars: Parallelism

10	Regulated ETOL Grammars	365
10.1	Context-Conditional ETOL Grammars	367
10.1.1	Definitions	367
10.1.2	Generative Power	368

10.2	Forbidding ETOL Grammars.....	375
10.2.1	Definitions and Examples	375
10.2.2	Generative Power and Reduction	377
10.3	Simple Semi-Conditional ETOL Grammars.....	396
10.3.1	Definitions	396
10.3.2	Generative Power and Reduction	397
10.4	Left Random Context ETOL Grammars.....	411
10.4.1	Definitions and Examples	411
10.4.2	Generative Power and Reduction	414
	References.....	428
11	Uniform Regulated Rewriting in Parallel	431
11.1	Semi-Parallel Uniform Rewriting	432
11.2	Parallel Uniform Rewriting	439
	References.....	444
12	Parallel Rewriting Over Word Monoids	445
12.1	Definitions	445
12.2	Generative Power.....	446
	References.....	453
 Part V Regulated Grammar Systems		
13	Regulated Multigenerative Grammar Systems	457
13.1	Multigenerative Grammar Systems.....	459
13.2	Leftmost Multigenerative Grammar Systems	475
	References.....	489
14	Controlled Pure Grammar Systems	491
14.1	Definitions and Examples	492
14.2	Generative Power.....	495
	References.....	504
 Part VI Regulated Automata		
15	Self-Regulating Automata	509
15.1	Self-Regulating Finite Automata	510
15.1.1	Definitions and Examples	511
15.1.2	Accepting Power.....	513
15.2	Self-Regulating Pushdown Automata	526
15.2.1	Definitions	526
15.2.2	Accepting Power.....	527
	References.....	530

16 Automata Regulated by Control Languages	531
16.1 Finite Automata Regulated by Control Languages	532
16.1.1 Definitions	533
16.1.2 Conversions	534
16.1.3 Regular-Controlled Finite Automata	536
16.1.4 Context-Free-Controlled Finite Automata	537
16.1.5 Program-Controlled Finite Automata	537
16.2 Pushdown Automata Regulated by Control Languages	547
16.2.1 Definitions	548
16.2.2 Regular-Controlled Pushdown Automata	549
16.2.3 Linear-Controlled Pushdown Automata	550
16.2.4 One-Turn Linear-Controlled Pushdown Automata	558
References	563

Part VII Related Unregulated Automata

17 Jumping Finite Automata	567
17.1 Definitions and Examples	569
17.2 Basic Properties	571
17.3 Relations with Well-Known Language Families	573
17.4 Closure Properties	574
17.5 Decidability	578
17.6 An Infinite Hierarchy of Language Families	579
17.7 Left and Right Jumps	580
17.8 A Variety of Start Configurations	582
References	585
18 Deep Pushdown Automata	587
18.1 Definitions and Examples	589
18.2 Accepting Power	591
References	601

Part VIII Applications

19 Applications: Overview	605
19.1 Current Applications	605
19.2 Perspectives	609
References	612
20 Case Studies	615
20.1 Linguistics	616
20.1.1 Syntax and Related Linguistic Terminology	617
20.1.2 Transformational Scattered Context Grammars	621
20.1.3 Scattered Context in English Syntax	624

20.2	Biology	634
20.2.1	Simulation of Biological Organisms	634
20.2.2	Implementation	642
20.3	Compilers	648
20.3.1	Underlying Formal Model	648
20.3.2	Implementation	649
	References	650
 Part IX Conclusion		
21	Concluding Remarks	653
21.1	New Trends and Their Expected Investigation	654
21.2	Open Problem Areas	655
21.3	Bibliographical and Historical Remarks	657
	References	660
22	Summary	669
	References	678
 Language Family Index		679
 Subject Index		685

Regulated Grammars and Automata

Meduna, A.; Zemek, P.

2014, XX, 694 p. 12 illus., Hardcover

ISBN: 978-1-4939-0368-9