CAMBRIDGE

Cambridge University Press
978-0-521-45021-8 - Efficient Algorithms for Listing Combinatorial Structures
Leslie Ann Goldberg
Table of Contents
More information

Table of Contents

Abstract vii
General References xi
Index of Notation and Terms xii
1. Introduction 1
1.1. Families of Combinatorial Structures 1
1.2. Motivation 4
1.2.1. Designing Useful Algorithms 4
1.2.2. Discovering General Methods for Algorithm Design 5
1.2.3. Learning about Combinatorial Structures 5
1.3. Listing Algorithms 6
1.4. Efficient Listing Algorithms 8
1.5. Synopsis of the Thesis 10
1.6. Bibliographic Notes 13
2. Techniques for Listing Combinatorial Structures 16
2.1. Basic Building Blocks 16
2.1.1. Recursive Listing 16
2.1.2. Random Sampling 25
2.2. Using Listing Algorithms for Closely Related Families 40
2.2.1. The Interleaving Method 41
2.2.2. The Filter Method 43
2.3. Avoiding Duplicates 47
2.3.1. Probabilistic Algorithms 47
Example 1: A family of colorable graphs 50
Example 2: A family of unlabeled graphs 52
2.3.2. Deterministic Algorithms 56
Example 1: A family of colorable graphs 60
Example 2: A family of unlabeled graphs 73
3. Applications to Particular Families of Structures 84
3.1. First Order Graph Properties 85
3.2. Hamiltonian Graphs 93
3.3. Graphs with Cliques of Specified Sizes 95
3.3.1. Graphs with Small Cliques 96
3.3.2. Graphs with Large Cliques 98

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-45021-8 - Efficient Algorithms for Listing Combinatorial Structures
Leslie Ann Goldberg
Table of Contents
More information

3.3.3. Graphs with Cliques whose Sizes are Between $\log(n)$ and $2\log(n)$ 103
3.4. Graphs which can be Colored with a Specified Number of Colors 104
3.4.1. Digression — The Problem of Listing k-Colorings 115
4. Directions for Future Work on Listing 119
5. Related Results 129
5.1. Comparing Listing with other Computational Problems 129
5.2. Evaluating the Cycle Index Polynomial 136
5.2.1. Evaluating and Counting Equivalence Classes 140
5.2.2. The Difficulty of Evaluating the Cycle Index Polynomial 142
5.2.3. The Difficulty of Approximately Evaluating the Cycle Index Polynomial 151
6. Bibliography 155

© Cambridge University Press www.cambridge.org