

Contents

1. Introduction	1
1.1. Preliminaries	2
1.1.1. Signpost Sequences, Rounding Rules and Divisor Methods	2
1.1.2. Bipropportionality and Matrix Scaling	6
1.1.3. Discrepancy Theory	8
1.2. The Multidimensional Setting	9
1.3. Outline and Contributions of Our Work	10
2. A Linear Programming Approach	12
2.1. An Integer LP Inspired by Matrix Scaling	12
2.2. Characterizing Optimal Solutions of the Linear Relaxation	13
2.3. Nonexistence of 3-dimensional Proportional Apportionments	16
2.4. Complexity of the Multidimensional Apportionment Problem	20
3. An LP Rounding Algorithm for Multidimensional Apportionment	23
3.1. A Discrepancy Problem in d -partite Hypergraphs	24
3.2. Rounding an Optimal Solution of the Linear Relaxation	30
3.3. Tightness of the Bounds	32
3.4. The Case $u_1 = u_2 = 0$	37
Bibliography	41