

# TABLE OF CONTENTS

0 INTRODUCTION .....	1
Formulation of the problem and basic notation .....	1
1 The problem.....	1
A Historical Overview .....	14
2 The gap between worst case and practical experience.....	14
3 Alternative algorithms.....	18
4 Results of stochastic geometry .....	23
5 The results of the author.....	27
6 The work of Smale .....	31
7 The paper of Haimovich .....	35
8 Quadratic expected number of steps for sign-invariance model.....	39
Discussion of different stochastic models.....	43
9 What is the “Real World Model”? .....	43
Outline of Chapters 1–5 .....	49
10 The basic ideas and the methods of this book.....	49
11 The results of this book.....	55
12 Conclusion and conjectures.....	61
1 THE SHADOW-VERTEX ALGORITHM .....	62
1 Primal interpretation .....	62
2 Dual interpretation .....	69
3 Numerical realization of the algorithm.....	86
4 The algorithm for Phase I .....	96
2 THE AVERAGE NUMBER OF PIVOT STEPS.....	112
1 The probability space.....	112
2 An integral formula for the expected number of S .....	121
3 A transformation of coordinates.....	134
4 Generalizations .....	137

<b>3 THE POLYNOMIALITY OF THE EXPECTED NUMBER OF STEPS .....</b>	<b>142</b>
1 Comparison of two integrals .....	142
2 An application of Cavalieri's Principle.....	150
3 The influence of the distribution .....	166
4 Evaluation of the quotient .....	174
5 The average number of steps in our complete Simplex-Method .....	177
<b>4 ASYMPTOTIC RESULTS .....</b>	<b>187</b>
1 An asymptotic upper bound in integral form .....	187
2 Asymptotic results for certain classes of distributions.....	197
3 Special distributions with bounded support .....	209
4 Asymptotic bounds under uniform distributions.....	210
5 Asymptotic bounds under Gaussian distribution .....	218
<b>5 PROBLEMS WITH NONNEGATIVITY CONSTRAINTS.....</b>	<b>227</b>
1 The geometry .....	227
2 The complete solution method .....	235
3 A simplification of the boundary-condition .....	236
4 Explicit formulation of the intersection-condition .....	237
5 Componentwise sign-independence and the intersection condition .....	241
6 The average number of pivot steps.....	243
<b>6 APPENDIX .....</b>	<b>245</b>
1 Gammafunction and Betafunction.....	245
2 Unit ball and unit sphere.....	250
3 Estimations under variation of the weights .....	255
<b>References .....</b>	<b>259</b>
<b>Subject Index .....</b>	<b>267</b>