Contents

Preface vii
Acknowledgements ix
Notation xi
List of Abbreviations xv

Chapter 1. Introduction and Preliminaries 1
  1.1 Historical Background of Interior-Point Methods 2
    1.1.1 Prelude 2
    1.1.2 A Brief Review of Modern Interior-Point Methods 3
  1.2 Primal-Dual Path-Following Algorithm for LO 5
    1.2.1 Primal-Dual Model for LO, Duality Theory and the Central Path 5
    1.2.2 Primal-Dual Newton Method for LO 8
    1.2.3 Strategies in Path-following Algorithms and Motivation 12
  1.3 Preliminaries and Scope of the Monograph 16
    1.3.1 Preliminary Technical Results 16
    1.3.2 Relation Between Proximities and Search Directions 20
    1.3.3 Contents and Notational Abbreviations 22

Chapter 2. Self-Regular Functions and Their Properties 27
  2.1 An Introduction to Univariate Self-Regular Functions 28
  2.2 Basic Properties of Univariate Self-Regular Functions 35
  2.3 Relations Between S-R and S-C Functions 42

Chapter 3. Primal-Dual Algorithms for Linear Optimization Based on Self-Regular Proximities 47
  3.1 Self-Regular Functions in $\mathcal{R}^n_+$ and Self-Regular Proximities for LO 48
  3.2 The Algorithm 52
  3.3 Estimate of the Proximity After a Newton Step 55
  3.4 Complexity of the Algorithm 61
  3.5 Relieving the Requirement on the Proximity Function 63

Chapter 4. Interior-Point Methods for Complementarity Problems Based on Self-Regular Proximities 67
  4.1 Introduction to CPs and the Central Path 68
  4.2 Preliminary Results on $P_*(\kappa)$ Mappings 72