CONTENTS

PREFACE vii

1. THE PROBLEM OF VIDEO COMPRESSION 1
- 1.1 Storage and Bandwidth Requirements for Multimedia 1
- 1.2 Multimedia and Compression 3
- 1.3 Image and Video Formats 6
- 1.4 Overview of the Book 11

2. VIDEO COMPRESSION TECHNIQUES 13
- 2.1 JPEG Image Compression and Motion JPEG 13
- 2.2 Fractal Image Compression 24
- 2.3 Wavelet-Based Compression 27
- 2.4 The H.261/H.263 Compression Standard 30
- 2.5 MPEG Video Compression Standard 35
- 2.6 Applications of Compressed Video 46

3. MOTION COMPENSATION AND ESTIMATION 49
- 3.1 Motion Compensation in MPEG 52
- 3.2 Principles of Block-Matching Motion Estimation 53
- 3.3 Cost Functions 57
- 3.4 Motion Vector Search Algorithms 61
- 3.5 Complexity of Motion Estimation Algorithms 77

4. EXPERIMENTS ON CURRENT MOTION ESTIMATION TECHNIQUES 83
4.1 Analysis of Pattern of Motion 84
4.2 Comparison of Current Search Algorithms and Cost Functions 88
4.3 Impact of the Search Parameter 92
4.4 Visual Output Data 95
4.5 Summary of Results 95

5. THE MOTION COMPENSATION HYPOTHESIS 105
5.1 The Motion Compensation Assumptions 105
5.2 Testing the Motion Hypothesis 110

6. FAST SEARCH ALGORITHMS: NEW RESULTS 127
6.1 The Need for Fast Search Algorithms 127
6.2 The Fast Search Hypothesis 128
6.3 The One-Pixel Greedy Search Algorithm 135
6.4 The Densely-Centered Uniform P-Search Algorithm 144
6.5 Comparison of Fast Search Algorithms 148

7. CONCLUSIONS AND RESEARCH DIRECTIONS 153

BIBLIOGRAPHY 157

INDEX 163