

Contents

Abstract	page
Acknowledgements	v
Contents	vii
List of Figures	ix
List of Tables	xi
List of Symbols	xv
List of Abbreviations	xvii
	xix
Chapter 1: Introduction	1
1.1 Brief Introduction to Data Compression	2
1.1.1 Data Redundancy	2
1.1.2 Types of Data	3
1.2 Video Compression	3
1.3 Background and Motivation	4
1.4 Research Objectives of the Thesis	6
1.5 Contributions of the Thesis	6
1.6 Thesis Outline	7
Chapter 2: Literature Survey	9
2.1 Basics of Data Compression	9
2.1.1 Lossless Compression	10
2.1.2 Lossy Compression	11
2.1.3 Lossy Compression of Video Data	12
2.2 Motion Estimation: Review and Challenges	13
2.2.1 Block-based Motion Search Algorithms	14
2.2.2 Computational Complexity and Efficient Motion Search Algorithms	15
2.2.3 Efficient Motion Search Algorithms for Surveillance Videos	17
2.3 From Video and Motion Capture Coding to Skeleton Sequence Coding	18
2.4 Summary	19
Chapter 3: Direction-Oriented Motion Search Algorithm	21
3.1 Motion Vector Distribution Characteristics	21
3.2 Proposed Efficient Direction-Oriented Search	22
3.2.1 Dynamic Switch between SR with Adaptive SR Dimension	22
3.2.2 Direction-Oriented Search Patterns	26
3.2.3 Efficient Partial Distortion Measure	29
3.3 Experiments and Analysis	30
3.3.1 Test Video Sequences	30
3.3.2 Evaluation Metrics	30
3.3.3 Experimental settings	31
3.3.4 Results and Comparisons for the Proposed and Existing Methods	33
3.3.5 Bit Requirement for MV in the Proposed Work	37
3.4 Summary	38
Chapter 4: Background-Foreground Boundary aware Motion Search Algorithm for Surveillance Videos	39
4.1 Problem Analysis	40
4.1.1 Characteristics of Surveillance Videos	40
4.1.2 Problems in the Existing Works	41
4.2 Proposed Background Foreground Boundary aware Search	42
4.2.1 Overview of the Proposed Background Foreground Boundary aware Search Scheme	43
4.2.2 Block Classification	43
4.2.3 Block-class-based Search Strategy	45
4.2.3.1 Zero-biased Search for BG Blocks	45
4.2.3.2 Direction-Oriented Search for FG Blocks	46
4.2.3.3 BD Block Partitioning and Center-biased Direction-Oriented Search for BD Blocks	48
4.2.4 Block Partitioning Mechanism for Speed-up	50

4.3	Experiments and Analysis	50
4.3.1	<i>Datasets</i>	50
4.3.2	<i>Evaluation Metrics</i>	52
4.3.3	<i>Experimental Settings</i>	52
4.3.4	<i>Results for Different Components of the Proposed Method</i>	53
4.3.5	<i>Comparative analysis for the Proposed and the Existing Methods</i>	54
4.4	Summary	61
Chapter 5: Skeleton Sequence Coding		63
5.1	Framework and Skeleton Representation	64
5.1.1	<i>Framework of Proposed Skeleton Sequence Coding Scheme</i>	64
5.1.2	<i>Skeleton Representation</i>	65
5.2	Skeleton Prediction Modes	67
5.2.1	<i>Spatial Differential Coding</i>	67
5.2.2	<i>MV-based Prediction Mode</i>	68
5.2.3	<i>Relative MV-based Prediction Mode</i>	68
5.2.4	<i>Trajectory-based Prediction Mode</i>	70
5.2.5	<i>Adaptive Multimodal Coding Scheme</i>	71
5.3	Entropy Coding	73
5.3.1	<i>Adaptive Center Selection (ACS)</i>	73
5.3.2	<i>Dynamic Indexing (DI)</i>	75
5.4	Skeleton Side Information Coding	75
5.5	Experiments and Analysis	78
5.5.1	<i>Datasets</i>	78
5.5.2	<i>Evaluation Metrics</i>	78
5.5.3	<i>Experimental Settings</i>	78
5.5.4	<i>Methods used for Comparisons</i>	80
5.5.5	<i>Results for the Proposed Prediction Modes</i>	80
5.5.6	<i>Results for Proposed Entropy Coding Schemes</i>	82
5.5.7	<i>Results for Skeleton Side Information Coding & Overall Performance</i>	84
5.5.8	<i>Results for the Proposed Method under Different Scenarios</i>	84
5.6	Summary	87
Chapter 6: Conclusions and Future works		89
6.1	Conclusions	89
6.2	Recommendations for Future Work	90
References		91