

# Contents

## Part I Local Binary Pattern Operators

<b>1</b>	<b>Background</b>	3
1.1	The Role of Texture in Computer Vision	3
1.2	Motivation and Background for LBP	4
1.3	A Brief History of LBP	6
1.4	Overview of the Book	7
	References	10
<b>2</b>	<b>Local Binary Patterns for Still Images</b>	13
2.1	Basic LBP	13
2.2	Derivation of the Generic LBP Operator	13
2.3	Mappings of the LBP Labels: Uniform Patterns	16
2.4	Rotational Invariance	18
2.4.1	Rotation Invariant LBP	19
2.4.2	Rotation Invariance Using Histogram Transformations	20
2.5	Complementary Contrast Measure	21
2.6	Non-parametric Classification Principle	23
2.7	Multiscale LBP	24
2.8	Center-Symmetric LBP	25
2.9	Other LBP Variants	26
2.9.1	Preprocessing	26
2.9.2	Neighborhood Topology	31
2.9.3	Thresholding and Encoding	32
2.9.4	Multiscale Analysis	35
2.9.5	Handling Rotation	37
2.9.6	Handling Color	38
2.9.7	Feature Selection and Learning	39
2.9.8	Complementary Descriptors	42
2.9.9	Other Methods Inspired by LBP	42
	References	43

<b>3</b>	<b>Spatiotemporal LBP</b>	49
3.1	Basic VLBP	49
3.2	Rotation Invariant VLBP	52
3.3	Local Binary Patterns from Three Orthogonal Planes	53
3.4	Rotation Invariant LBP-TOP	57
3.4.1	Problem Description	57
3.4.2	One Dimensional Histogram Fourier LBP-TOP (1DHFLBP-TOP)	59
3.5	Other Variants of Spatiotemporal LBP	61
	References	64

## Part II Analysis of Still Images

<b>4</b>	<b>Texture Classification and Segmentation</b>	69
4.1	Texture Classification	69
4.1.1	Texture Image Datasets	70
4.1.2	Texture Classification Experiments	72
4.2	Unsupervised Texture Segmentation	73
4.2.1	Overview of the Segmentation Algorithm	74
4.2.2	Splitting	75
4.2.3	Agglomerative Merging	75
4.2.4	Pixelwise Classification	76
4.2.5	Experiments	77
4.3	Discussion	77
	References	78
<b>5</b>	<b>Description of Interest Regions</b>	81
5.1	Related Work	81
5.2	CS-LBP Descriptor	82
5.3	Image Matching Experiments	84
5.3.1	Matching Results	86
5.4	Discussion	87
	References	88
<b>6</b>	<b>Applications in Image Retrieval and 3D Recognition</b>	89
6.1	Block-Based Methods for Image Retrieval	89
6.1.1	Description of the Method	90
6.1.2	Experiments	92
6.1.3	Discussion	95
6.2	Recognition of 3D Textured Surfaces	96
6.2.1	Texture Description by LBP Histograms	97
6.2.2	Use of Multiple Histograms as Texture Models	98
6.2.3	Experiments with CURET Textures	99
6.2.4	Experiments with Scene Images	101
6.2.5	Discussion	102
	References	104

## Part III Motion Analysis

<b>7</b>	<b>Recognition and Segmentation of Dynamic Textures</b>	109
7.1	Dynamic Texture Recognition	109
7.1.1	Related Work	109
7.1.2	Measures	110
7.1.3	Multi-resolution Analysis	111
7.1.4	Experimental Setup	111
7.1.5	Results for VLBP	112
7.1.6	Results for LBP-TOP	113
7.1.7	Experiments of Rotation Invariant LBP-TOP to View Variations	115
7.2	Dynamic Texture Segmentation	116
7.2.1	Related Work	116
7.2.2	Features for Segmentation	118
7.2.3	Segmentation Procedure	120
7.2.4	Experiments	122
7.3	Discussion	123
	References	124
<b>8</b>	<b>Background Subtraction</b>	127
8.1	Related Work	127
8.2	An LBP-based Approach	128
8.2.1	Modifications of the LBP Operator	128
8.2.2	Background Modeling	129
8.2.3	Foreground Detection	130
8.3	Experiments	130
8.4	Discussion	133
	References	134
<b>9</b>	<b>Recognition of Actions</b>	135
9.1	Related Work	135
9.2	Static Texture Based Description of Movements	136
9.3	Dynamic Texture Method for Motion Description	138
9.3.1	Human Detection with Background Subtraction	138
9.3.2	Action Description	139
9.3.3	Modeling Temporal Information with Hidden Markov Models	141
9.4	Experiments	142
9.5	Discussion	145
	References	146

## Part IV Face Analysis

<b>10</b>	<b>Face Analysis Using Still Images</b>	151
10.1	Face Description Using LBP	151
10.2	Eye Detection	153

10.3	Face Detection . . . . .	154
10.4	Face Recognition . . . . .	159
10.5	Facial Expression Recognition . . . . .	164
10.6	LBP in Other Face Related Tasks . . . . .	165
10.7	Conclusion . . . . .	165
	References . . . . .	165
<b>11</b>	<b>Face Analysis Using Image Sequences . . . . .</b>	<b>169</b>
11.1	Facial Expression Recognition Using Spatiotemporal LBP . . . . .	169
11.2	Face Recognition from Videos . . . . .	173
11.3	Gender Classification from Videos . . . . .	176
11.4	Discussion . . . . .	178
	References . . . . .	179
<b>12</b>	<b>Visual Recognition of Spoken Phrases . . . . .</b>	<b>181</b>
12.1	Related Work . . . . .	181
12.2	System Overview . . . . .	182
12.3	Local Spatiotemporal Descriptors for Visual Information . . . . .	182
12.4	Experiments . . . . .	185
12.4.1	Dataset Description . . . . .	185
12.4.2	Experimental Results . . . . .	185
12.4.3	Boosting Slice Features . . . . .	187
12.5	Discussion . . . . .	188
	References . . . . .	189
<b>Part V LBP in Various Computer Vision Applications</b>		
<b>13</b>	<b>LBP in Different Applications . . . . .</b>	<b>193</b>
13.1	Detection and Tracking of Objects . . . . .	193
13.2	Biometrics . . . . .	194
13.3	Eye Localization and Gaze Tracking . . . . .	195
13.4	Face Recognition in Unconstrained Environments . . . . .	195
13.5	Visual Inspection . . . . .	196
13.6	Biomedical Applications . . . . .	197
13.7	Texture and Video Texture Synthesis . . . . .	198
13.8	Steganography and Image Forensics . . . . .	199
13.9	Video Analysis . . . . .	199
13.10	Systems for Photo Management and Interactive TV . . . . .	200
13.11	Embedded Vision Systems and Smart Cameras . . . . .	201
	References . . . . .	202
<b>Index . . . . .</b>		<b>205</b>



<http://www.springer.com/978-0-85729-747-1>

Computer Vision Using Local Binary Patterns  
Pietikäinen, M.; Hadid, A.; Zhao, G.; Ahonen, T.  
2011, XVI, 212 p., Hardcover  
ISBN: 978-0-85729-747-1