

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Problem description . . . . .	2
1.2	Challenges of People Re-Identification . . . . .	3
1.2.1	Intrinsic Factors that Affect People Appearance . . . . .	4
1.2.2	Extrinsic Factors that Affect the Perceived Appearance . . . . .	7
1.3	Overview Of The Approach . . . . .	11
1.4	Summary of Contributions . . . . .	12
1.5	Outline of the Dissertation . . . . .	14
<b>2</b>	<b>State of the Art on People Re-Identification</b>	<b>15</b>
2.1	Camera Networks Topologies . . . . .	15
2.2	Person Segmentation Algorithms . . . . .	16
2.3	Description Techniques . . . . .	18
2.3.1	Holistic and Part-based Techniques . . . . .	18
2.3.2	Color-based Techniques . . . . .	20
2.3.3	Texture-based Techniques . . . . .	22
2.3.4	Shape-based Techniques . . . . .	22
2.4	Dimensionality Reduction Techniques . . . . .	24
2.5	Matching Techniques . . . . .	25
<b>3</b>	<b>Person Segmentation and Tracking</b>	<b>27</b>
3.1	Introduction . . . . .	27
3.2	Motivation and Contributions . . . . .	29
3.3	The RGB-Depth sensor . . . . .	30
3.4	Scene Calibration . . . . .	32
3.4.1	Methodology . . . . .	32
3.4.2	Calibration Results . . . . .	34
3.5	Height Maps . . . . .	35
3.5.1	Definition . . . . .	35
3.5.2	Restrictions . . . . .	37
3.6	Person Segmentation and Tracking . . . . .	38
3.6.1	Segmentation . . . . .	38
3.6.2	Tracking . . . . .	40
3.6.3	Tracking Evaluation . . . . .	41
3.7	Low-Level Person Representation . . . . .	43
3.7.1	Person-Centred Cylindrical Coordinate System . . . . .	44
3.7.2	Raw Features . . . . .	45

<b>4 Person Description and Matching</b>	<b>49</b>
4.1 Introduction . . . . .	50
4.2 Motivation and Contributions . . . . .	50
4.3 Experimental Methodology . . . . .	53
4.3.1 Training and Test Datasets . . . . .	53
4.3.2 Evaluation Metrics . . . . .	54
4.4 Bodyprints . . . . .	56
4.4.1 Algorithm Description . . . . .	57
4.4.2 Color Representation and Normalisation . . . . .	60
4.4.3 Evaluation . . . . .	63
4.4.4 Conclusions . . . . .	67
4.5 3D Bodyprints . . . . .	72
4.5.1 Algorithm Description . . . . .	72
4.5.2 Evaluation . . . . .	75
4.5.3 Conclusions . . . . .	76
4.6 Bags of Appearances . . . . .	80
4.6.1 Algorithm Description . . . . .	81
4.6.2 Evaluation . . . . .	83
4.6.3 Conclusions . . . . .	87
4.7 Latent Features . . . . .	91
4.7.1 Algorithm Description . . . . .	94
4.7.2 Evaluation . . . . .	100
4.7.3 Conclusions . . . . .	101
4.8 Comparison with the State of the Art . . . . .	105
4.8.1 Experimentation Details . . . . .	105
4.8.2 Evaluation . . . . .	107
<b>5 Conclusions and Future Work</b>	<b>109</b>
5.1 Conclusions . . . . .	109
5.2 Future Work . . . . .	111
<b>A Dataset description</b>	<b>113</b>
A.1 General description . . . . .	113
A.2 Image Formats and Representation . . . . .	114
A.3 School Hall Database . . . . .	114
A.4 Supermarket Database . . . . .	115
<b>B Matching Metrics</b>	<b>119</b>
<b>Bibliography</b>	<b>121</b>