

Contents

Acknowledgements	v
Abstract	vii
List of Figures	xi
1 Introduction	1
1.1 Limitations of 2D/3D Imaging and Contributions	2
1.2 Thesis Outline	3
2 Depth Camera Assessment	5
2.1 Depth Camera Overview	5
2.2 Experimental Evaluation	9
2.3 Summary	18
3 PMD Imaging	21
3.1 PMD Operation Principles	21
3.2 ZESS MultiCam	34
3.3 Novel Lighting Devices	35
3.4 Phase Unwrapping	44
4 Calibration of Depth Cameras	49
4.1 Literature on Depth Camera Calibration	50
4.2 Intra-Pixel Intensity Calibration	51
4.3 Depth Camera Model	53
4.4 Auto-Calibration	54
5 Multi-Modal Background Subtraction	63
5.1 Overview	63
5.2 Related Work	64
5.3 Multi-Modal Gaussian Mixture Models	65
5.4 Experiments	67
5.5 Limitations	72

5.6	Summary	73
6	Super-Resolution for Depth Maps	75
6.1	Comparison of Super-Resolution Methods for 2D/3D Images	75
6.2	Motion Compensation and Joint Super-Resolution	90
6.3	2D/3D Segmentation and Joint Super-Resolution	100
7	Multiple Camera 2D/3D Tracking	111
7.1	Overview	111
7.2	Related Work	112
7.3	Proposed Tracking Approach	113
7.4	Experiments	118
7.5	Summary	122
8	Conclusion	125
8.1	Summary	125
8.2	Future Work	126
	References	127
	Publications	135