

TABLE OF CONTENTS

CHINESE ABSTRACT	i
ENGLISH ABSTRACT	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	viii
LIST OF TABLES	ix



CHAPTER 1 INTRODUCTION	1
1.1 Motivation	1
1.2 Problem Definition	1
1.2.1 Detection of single persons	2
1.2.2 Recognition of human actions	2
1.3 Survey of Related Works	3
1.3.1 Background Modeling	3
1.3.2 Human Action Recognition	4
1.4 Assumptions	6
1.5 System Description	6
1.6 Organization of this Thesis	8
CHAPTER 2 BACKGROUND MODELING AND SINGLE PERSON DETECTION	9

2.1	Perceptually Uniform Color Space	9
2.2	Background Modeling	11
2.2.1	Background Subtraction	11
2.2.2	Background Model Update	15
2.3	Foreground Region Detection	16
2.4	Human Extraction	17
CHAPTER 3 HUMAN POSTURE ANALYSIS	19	
3.1	Types of Postures	19
3.2	Posture Description	20
3.3	Posture Estimation	23
CHAPTER 4 HUMAN ACTION RECOGNITION	26	
4.1	Posture State Diagram	26
4.2	Action Recognition	27
CHAPTER 5 EXPERIMENTAL RESULTS AND ANALYSES	29	
5.1	Experiments of Human Posture Estimation	29
5.2	Experiments of Human Action Recognition	32
CHAPTER 6 CONCLUSION AND FUTURE WORK	34	
REFERENCE	36	

LIST OF FIGURES

Fig. 1.1 An example of dangerous actions, falling down	2
Fig. 1.2 The system architecture	7
Fig. 2.1 Nonlinear transformation of the CIE chromaticity diagram	10
Fig. 2.2 An example of background subtraction	13
Fig. 2.3 An example of the detection results using color information and chromaticity information	14
Fig. 2.4 An example of the influence of using the extra restriction	16
Fig. 2.5 An example of foreground region detection	18
Fig. 3.1 An example of the seven main postures	20
Fig. 3.2 The eight view-based appearances of a sitting with stretched legs posture	21
Fig. 3.3 The shape features of a single person silhouette	22
Fig. 3.4 The procedure for calculating the normalized silhouette of a single person silhouette	23
Fig. 3.5 Some of the normalized silhouettes of the appearances (postures) used in posture estimation	25
Fig. 4.1 The posture state transition diagram	26
Fig. 4.2 An example of the detection of dangerous actions	28
Fig. 5.1 An example of error type 1	31
Fig. 5.2 An example of error type 2	31
Fig. 5.3 A dangerous human action that is kneeling suddenly and then lying down	32
Fig. 5.4 A dangerous action that is falling down	33

LIST OF TABLES

Table 1 The Accuracy rate for each posture	30
--	----

