

UNIVERSITI TEKNOLOGI MARA

**IDENTIFYING AND DETECTING
UNLAWFUL BEHAVIOR IN
VIDEO IMAGES USING
GENETIC ALGORITHM**

SHAHIRAH BINTI MOHAMED HATIM

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Computer and Mathematical Sciences

August 2016

ABSTRACT

Unlawful behavior detection is one of the important research topic in Video Surveillance System (VSS). This is usually done manually by human. However, this is unfeasible due to the size of images that need to be scan through. Moreover, human are prone to misjudgment. Behaviors are usually detected through surveillance camera in the form of video recording. Video scenes are sequence of picture frame. The focus of this research is to identify and detect unlawful behavior in an academic restricted area. A total number of 95 videos used in the research are based on different types of hand movement which are knocking, twisting, waving and clapping. The videos are stored in *avi* format which are sampled to the resolution of 200×164 pixels. Each video is of less than 30 seconds length. The data undergo the pre-processed phase which consists of edge detection, adaptive thresholding segmentation and MATLAB *regionprops* function for feature extraction. The main goal of the research is to apply the concept of Genetic Algorithm (GA) that can classify hand movements as unlawful behavior in videos. GA is used as the method of unlawful behavior detection. Previous research on GA components impact evaluation has identified selection parameter as high potential of increasing GA performance for unlawful behavior detection. Two types of selection parameter namely tournament selection (TOS) and random permutation selection (RPS) are chosen. From the result and analysis obtained in this research, it is established that both TOS and RPS are comparable in terms of the detection rate, specificity, false positive rate, false negative rate and accuracy. It is proven that TOS gives better result of detection than RPS.

ACKNOWLEDGEMENT

In the name of Allah
The Most Gracious and The Most Merciful

I would like to express my gratitude to Allah for His blessings and guidance to me. I thank Him for honored me the strength and patience in completing my research and thesis. My appreciation is also for several people who have supported me towards my hard time throughout my master's journey.

Here I would like to express my deepest thank to my main supervisor, Dr. Noor Elaiza Abd Khalid for her continuous trust, guidance, useful ideas and support. She has been really patience in helping me to understand my working process and also for providing me useful information as needed. I also would like to convey my gratitude to my co-supervisor, Pn. Itaza Afiani Mohtar whom this research idea was released. She has been with me since my bachelor degree time and never stops in motivating me with her valuable ideas and knowledge.

Greatest thanks and love to my dearest husband, Mr. Razizul Mohamad Ali for his company, time and moral support. He is my best friend who I cannot live without and also my cute little baby boy, Muhammad Raziq who acted like a 'medicine' whenever I am in a stress mode.

Last but not least, I would like to say thanks to my beloved parents and parents in law for their understanding and positive energy to me.

May Allah's blessing will always be with all of you.
Thank you.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF CODES	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Research Questions	3
1.4 Research Objectives	4
1.5 Research Objectives Outline	4
1.6 Research Scope	5
1.7 Research Significance	6
1.8 Summary	6
CHAPTER TWO: LITERATURE REVIEW	8
2.1 Overview	8
2.2 Human Behavior	8
2.2.1 Dataset on Human Behavior	9
2.2.2 The Behavior and Video Surveillance	11
2.2.2.1 Motion Detection	12
2.2.2.2 Object Classification	13

2.2.2.3	Object Tracking	14
2.2.2.4	Behavior and Activity Recognition and Analysis	14
2.3	Unlawful Behavior	14
2.3.1	Potential Unlawful People	16
2.4	Video Camera Recording	16
2.4.1	Sample Images in Previous Research	17
2.5	Image Processing	18
2.5.1	Segmentation	19
2.5.1.1	Adaptive Thresholding	19
2.5.1.2	Background Subtraction	19
2.5.1.3	Frame Differencing	20
2.5.1.4	Optical Flow	20
2.5.2	Edge Detection	21
2.6	Statistical Algorithms on Suspicious Behavior Identification and Detection	21
2.6.1	Bayesian Network	22
2.6.2	Hidden Markov Model (HMM)	23
2.6.3	Latent Dirichlet Allocation (LDA)	24
2.6.4	Incremental Outlier Detection Algorithms	25
2.6.5	Maximum A Posterior Probability (MAP)	26
2.6.6	Comparison of Statistical Algorithms	27
2.7	Bio-inspired Algorithm	28
2.7.1	Bio-inspired Algorithm in Scene Recognition	29
2.7.2	Bio-inspired Algorithm for Objects and Obstacles Recognition	29
2.8	Genetic Algorithm (GA)	30
2.8.1	Methodology of GA	31
2.8.2	Impact of GA Components on GA Performance	34
2.9	Summary	36
 CHAPTER THREE: RESEARCH METHODOLOGY		 38
3.1	Overview	38
3.2	Research Methodology Framework	38