I hereby declare that I have read through this report entitle “Human Pedestrian Detection for Surveillance System” and found that is has comply the partial fulfilment for awarding the degree of Bachelor of Electrical Engineering (Mechatronic).

Signature : .....

Supervisor’s Name : Madam Nurul Fatiha binti Johan

Date : .....

HUMAN PEDESTRIAN DETECTION

FOR SURVEILLANCE SYSTEM

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A report submitted in fulfilment of the requirement for the degree of Bachelor of Electrical Engineering (Mechatronics)

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELKA

2016

I declare that this report entitled “Human Pedestrian Detection for Surveillance System” is the result of my own research excepts that is citid in my references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : MOHAMAD FADLI BIN FAISAL

Date : .....

To my beloved family especially my father and mother and also to my sibling for their supports and also goes to everyone that directly or indirectly in this project.

May Allah bless all of us.

Wassalam.

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ABSTRACT

Over the last years, detecting human in pedestrian surveillance system video is crucial for diverse application area. For example, it can overcome the terrorism, some general social problem and violence by providing the surveillance to the pedestrian. This also ensure them in a very close watch to keep them in secure environment. So, this project will be focusing on the designing system that can detect human that been recorded by the camera. The purpose is to detect human in the system. In other statement, can be said that the video surveillance system is nothing but recording and highlight pedestrian. In this research, several parameters should be take into consideration. Then, is the system will be tested in outdoor and indoor environment to take sample of the detection using different light intensity. System also being test with difference distance to get the best range between human and camera that the system can perform. Lastly the system is test using multiple number of human that pass by the surveillance area. Maybe, when the system being analyse some problem will occur and some error will form on the frame image. In order to detect human, we must use some technique such as Motion Detection and Histogram of Gradient. Thus, the moving entities in the video then will be differentiate either it human or non-human using this technique. As a results this system is expected to detect human pedestrian precisely.

ABSTRAK

Sejak beberapa tahun yang lalu, sistem pengesan manusia pejalan kaki penting kerana untuk aplikasinya yang luas dalam pelbagai bidang. Sebagai contoh, ia boleh mengatasi keganasan, beberapa masalah sosial umum dan keganasan dengan menyediakan pengawasan untuk pejalan kaki. Ini juga memastikan mereka dalam pemerhatian untuk memastikan mereka dalam persekitaran yang selamat. Jadi, projek ini akan memberi tumpuan kepada mereka untuk membentuk sistem yang boleh mengesan manusia dalam video yang telah dirakamkan oleh kamera. Tujuannya adalah hanya untuk mengesan manusia di dalam sistem. Dalam satu kenyataan lain, boleh dikatakan bahawa sistem pengawasan video tidak lain hanyalah rakaman, menyerlahkan pejalan kaki. Dalam kajian ini, beberapa parameter perlu mengambil kira. Kemudian, sistem yang akan diuji dalam persekitaran luaran dan dalaman adalah untuk mengambil sampel pengesanan menggunakan keamatan cahaya yang berbeza. Sistem juga diuji dengan beberapa jarak antara manusia dengan kamera untuk mendapatkan jarak yang paling bagus untuk system beroperasi. Akhir sekali, system diuji dengan beberapa manusia melalui kawasan yang diawasi system. Mungkin, apabila video yang sedang dianalisis, beberapa masalah akan berlaku dan beberapa kesalahan bacaan berlaku dalam frame imej tersebut. Untuk mengesan manusia, kita perlu menggunakan beberapa teknik seperti “Motion Detection and Histogram of Gradient”. Oleh itu, entiti bergerak dalam video itu akan diklasifikasikan sama ada ia manusia atau bukan manusia menggunakan teknik ini. Oleh itu sistem ini dijangka boleh mengesan pejalan kaki dengan bacaan yang agak tepat.

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LIST OF ABBREVIATION

SYMBOL	TITLE
RAM	Random Access Memory
AI	Artificial Intelligent
PTZ	Pan Tilt Zoom
HOG	Histogram of Oriented Gradient
SVM	Support Vector Machine
VB	Visual Basic
TP	True Positive
TN	True Negative
FP	False Positive
FN	False Negative
DET	Detection Error Trade off
FFPW	False Frame Per Windows

CHAPTER 1

INTRODUCTION

1.1 Motivation

Pedestrian walk is place designed special for pedestrian to walk without worrying about traffic or anything else. Nowadays, the increase criminal activity that especially target the pedestrian as their prey have being worrying many party. Pedestrian itself feel insecure and uncomfortable when walking there.

As known, crime activity such as snatching and robbery always targeting pedestrian as their prey. Every day in newspaper and television always have news about these crimes. Based on statistic, that being take from Polis Diraja Malaysia (PDRM), can be said that these crimes are becoming popular nowadays. It shows that, the cases are being report are increase over the year. It means that the pedestrian become the victims for criminal to take advantage. Only a few criminals had been caught by the police and it shows at the figure 1.1.

Malaysia: Kes Ragut yang Telah Diselesaikan dan Tangkapan yang Dibuat bagi Tahun 2003 dan 2004

Negeri	2003			2004		
	Jumlah	Selesai	Tangkapan	Jumlah	Selesai	Tangkapan
Perlis	12	4	3	10	5	3
Kedah	274	132	16	332	175	95
Pulau Pinang	56	20	12	38	9	6
Perak	155	97	23	167	153	55
Selangor	507	201	95	687	140	31
Kuala Lumpur	254	127	48	256	19	9
Negeri Sembilan	98	34	14	98	43	11
Melaka	38	23	16	48	7	2
Johor	237	133	47	263	71	21
Pahang	28	12	11	34	19	13
Terengganu	47	20	12	52	26	22
Kelantan	56	32	30	58	34	29
Sabah	151	101	48	153	79	32
Sarawak	67	37	26	91	22	18
Jumlah	1980	973	380	2287	802	347

[Sumber: Dipetik dan diubahsuaikan daripada Polis Diraja Malaysia,Bukit Aman,2005]

Figure 1.1: Statistic of snatch cases [1]

Besides that, women pedestrian also become target for the irresponsible people to make them as a victim for them to unleashed their lust. Based on statistic, can be said that this case is increasingly every year. From the statistic also we can say that, this criminal being targeting women pedestrian that walk alone as their victims. Some of the victims will fell traumatize and some of them had decided to suicide. Figure 1.1 show the rape statistic in Malaysia.

RAPE CASES IN MALAYSIA/ KES ROGOL DI MALAYSIA
YEAR/ TAHUN 2000-2009 (By States/ Mengikut Negeri)

STATES/NEGERI	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
PERLIS	12	10	13	11	21	26	28	27	41	43
KEDAH	110	123	132	119	127	163	221	313	314	344
P/PINANG	61	75	73	70	89	71	115	161	177	179
PERAK	91	79	100	118	121	148	183	226	234	257
SELANGOR	216	269	253	280	289	368	421	562	630	623
K/LUMPUR	67	97	120	77	116	111	142	221	186	155
N/SEMBILAN	59	82	62	69	89	97	103	153	194	210
MELAKA	43	43	57	67	100	77	125	139	130	110
JOHOR	194	234	235	312	323	324	343	473	535	589
PAHANG	74	79	79	70	102	84	143	194	206	221
TERENGGANU	48	48	45	38	58	99	127	130	141	122
KELANTAN	52	74	70	66	82	90	152	167	246	308
SABAH	109	94	115	111	149	156	199	196	236	261
SARAWAK	81	79	77	71	94	117	129	136	139	204
TOTAL/JUMLAH	**1,217**	**1,386**	**1,431**	**1,479**	**1,760**	**1,931**	**2,431**	**3,098**	**3,409**	**3,626**

Sumber/ Source:

- *Perangkaan Wanita, Keluarga dan Kebajikan Masyarakat (2006). Kementerian Pembangunan Wanita, Keluarga dan Masyarakat*
- *Pemberitahuan Pertanyaan Bagi Bukan Jawab Lisan Dewan Rakyat (2010). Rujukan: 2517*

Figure 1.2: Statistic rape cases in Malaysia [2]

Some researcher feels that Human Pedestrian Detection for Surveillance System can helps to reduce and to helps the police to catch the criminal and give them the prove to sentencing the criminal.

All of these are the evidence why we need the “Human Pedestrian Detection in Surveillance System”. From these evidence, it given great token to introduce the system and enhance the usage of the system. To overcome the crime activity that being spread on the pedestrian walk or can be said the spread of the street crime, maybe this system can be one of the suitable system to used and can increase the features of the surveillance system.

1.2 Introduction

Nowadays, researchers are focusing on exploring the computer vision field. As known, the goal of computer vision is for the computer to understand the scene that being recorded through eyes of the camera [3]. This statement had shown the close relationship between the computer vision and surveillance system. Video surveillance system is being used excessively over recent year, it shows that the visual surveillance is playing an important role in this day. It also creates new avenue for research in detecting, analyse and interpret the behaviour object in the video. Automatic video surveillance system become more important because it can contribute to many fields and application. It can be used in home security, traffic control and urban surveillance. With the rapid growth in the technology of camera, the video and image analysis is becoming more popular and have highly demand in market due to the wide application of it.

The demanding of surveillance system has created new section for human pedestrian detection for surveillance system. This system will help in monitoring of the pedestrian that pass by the surveillance system. Human detection can help us to analyse human behaviour, can helps to count human and can be used for security purpose. Figure 1.3 shows the example how human is detected in a video or image.

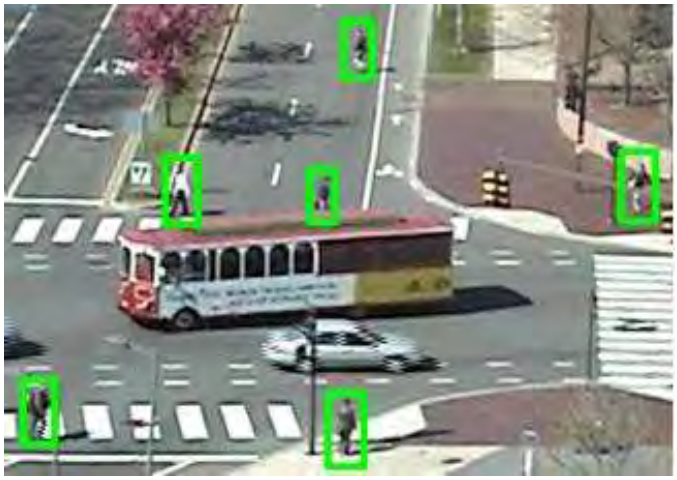

Figure 1.3: Human detection system

The fundamental part in this system is object detection. Object detection is defined as the process to find the desired object in image or videos. It will extract the features to detect the object(human). It has been used widely in surveillance fields such as human machine interaction and traffic control security system. In this system context, we need to detect human pedestrian in each frame by frame videos or image sequences.

Object segmentation is also one of the fundamental thing to create this system. Object segmentation is the process of highlighting the target object from the videos or image sequences. In this task the object that we want to highlight is human and area around it, therefore the segmentation should focus on the pedestrian. Segmentation and detection can be beneficial in many field such as person recognition, tracking human, motion analysis and pose estimation.

Lastly, object classification is the important part in order to successfully doing this system. in the pedestrian walk, maybe there are animal that will pass by the surveillance camera. So, after the system detected the object that pass by the camera it need to select and compare it with the database whether it human or not according to their size. If the object that pass through is not human, the system should not detect it.

1.3 Problem Statement

Video surveillance system is important in these day because as known many crime activities, terrorism and violence occur nowadays. Thus, the human pedestrian detection in surveillance system is important in order to monitor and overcome this problem. This system can be used in the pedestrian walk to monitor and analyse if the one of the listed social crime occur. The problem that will faced is how to detect human and eliminate all other entities and analyse the findings. Other than that, the distance of the camera and the entities also can affect the result. Maybe the system cannot detect the entities if not within the specific range. In addition, light intensity also can influence ability of the camera in recording the surveillance area. As known, human body have many joint and the body can articulate at the joint. This means that human body can vary with changing of viewpoint, change poses and change the position of the body part. Besides, human wears variety type of clothes colour and style. They may wear accessories that can be difficult to find the universal representation of human class.

1.4 Objective

This project will embark on the following objective:

1. To developed an algorithm for human detection.
2. To detect human pedestrian that pass by the surveillance area.
3. To analyse the performance and accuracy of the human detection system

1.5 Scope and Limitation

In this project, some pedestrian walk in UTeM will be choose as a workspace and a camera will be place and record the entities that pass by it. The web cam will record and send the recording data to the computer and computer and will shows the result of the video. The recorded footage be able to detect the "positive entities" which is human and eliminate the "negative entities" which is not human. This video will be able to form detection bounding box around the human and being analyse it frame by frame. This project will focus on how to detect human pedestrian and analyse the data. This project will take some of the pedestrian walk in UTeM as its environment.

1.6 Report Outline

This report consists of five main chapters. This report is started with Chapter 1 which is the introduction. Chapter 1 contains the overview of the project, researches background, problem statement, objective, scope, and the expected outcome of the project. It briefly discusses what is the project is about and what the result and aim of the project. It continues with Chapter 2 that is the literature review. Chapter 2 elaborates the literature review related to the project that from the finding such as internet, journal and books. Each of the fact, technique, result and analysis is described based on comprehensive study in reference to various reliable materials and previous researches. Next is methodology which is the Chapter 3. Chapter 3 explains the methodology of the project and covers all the planning, methods and procedures that are used in carrying out the entire project. It also includes the tools that used to make the project success. Chapter 4 will cover for the result and analysis. In Chapter 4 the result will be shown from the experiment that being setup. From the result, deep discussion and analysis are conducted. Lastly, Chapter 5 which is conclusion will get and the project achievement and will proposed some future recommendations.