A SIGNAL PROCESSING PERSPECTIVE WITH NORMALIZED SILHOUETTE IMAGE (NSI) AND SHAPE FOURIER DESCRIPTOR (SFD) TOWARDS HUMAN SILHOUETTE.

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DECLARATION

I hereby declare that this project report entitled

A SIGNAL PROCESSING PERSPECTIVE WITH NORMALIZED SILHOUETTE IMAGE (NSI) AND SHAPE FOURIER DESCRIPTOR (SFD) TOWARDS HUMAN SILHOUETTE.

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT :_____ Date:_____

(WONG POH LING)

SUPERVISOR :_____ Date:_____

(DR. ZURAIDA BINTI ABAL ABAS)

DEDICATION

To my beloved family, thanks for your support and caring during the completion of this project.

To my beloved supervisor, Dr.Zuraida Binti Abal Abas, thanks for supervising me once again and guide me along the completion of this project.

To my beloved classmate, housemate and other friends who sharing their knowledge with me during the completion of this project.

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I would like to thanks to my friends who are helpful and willing to share their knowledge with me.

ABSTRACT

This study is about the silhouettes in video frames are normalized and the shape of the region in video frames is described by a set of Shape Fourier Descriptors. Shape Fourier Descriptor describes the shape of an object by considering its boundaries which are the shape centroid and calculated by a particular formula through all the video frames after normalized the videos. This shows the changes of the objects with various actions can be recognized and characterized human or non-human in the video frames. Normalized Silhouette Image is significant before the videos are described in descriptors. It focuses in the region based on the object's ratio in images of the shape of the object and silhouette images are centred after segmentation process. This will reduce the burden of the process in extracting unnecessary part in whole videos. Various human action videos and animal videos are used for the training and testing in this study to make sure the system performed better.

ABSTRAK

Kajian ini adalah mengenai bayang dalam bingkai video supaya standard dan bentuk rantau dalam bingkai video digambarkan oleh satu set Bentuk Fourier Deskriptor. Bentuk Fourier Deskriptor ini menggambarkan bentuk objek dengan mempertimbangkan sempadannya iaitu sentroid bentuk dan dikira dengan formula tertentu melalui semua bingkai video selepas normalisasi terhadap video. Ini menunjukkan perubahan objek dengan pelbagai pergerakkan yang boleh diiktiraf dan mempunyai ciri-ciri sebagai manusia atau bukan manusia di dalam bingkai video. Normalisasi Bayang Imej adalah penting sebelum video menerangkan dalam deskriptor. Ia memberi tumpuan kepada rantau tertentu berdasarkan nisbah objek dalam imej daripada bentuk objek dan bayang imej yang berpusat selepas proses segmentasi. Ini akan mengurangkan beban proses ekstrak bahagian yang tidak perlu dalam keseluruhan video. Pelbagai video pergerakkan manusia dan video haiwan yang digunakan untuk latihan dan ujian dalam kajian ini untuk memastikan sistem mencapai prestasi yang lebih baik.

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3-D – Three-Dimensional

CCTV – Closed-circuit television

DFT – Discrete Fourier Transform

FFT – Fast Fourier Transform

FFTW – Fastest Fourier Transform in the West

FYP – Final Year Project

GUI – Graphical User Interface

RAM – Random Access Memory

VIP – Very Important Person

LIST OF ATTACHMENTS

CHAPTER I

INTRODUCTION

1.1 Introduction

Nowadays, vision-based in the field of the human movement analysis is growing based on a huge amount of the impressive application such as a surveillance machine by visual and machine interface with a human approach to recognize human with the machines. Recognition of the gesture and behaviour of human from movement is needed when human performed some task or activity. The gesture and behaviour of human are naturally presented through moving some part of the body to do tasks such as running, walking, hand waving, bending and others. Human motion can involve many of the moving silhouettes which consider as the changes of silhouettes. When a human motion is performed, it is a combination of individual silhouettes of a moving human in frames or images in a video. So, the feature extraction is needed to characterize and recognize human motions from videos which can be divided into many frames and images of human motion. This considered as Human Silhouette Recognition.

Silhouettes as well as edges and contours are used to fit human body in images because most of the body poses information remains in its silhouette. A recognition has taken place to identify the human silhouette through some methods. This human silhouette recognition can be used in Closed-circuit television (CCTV) to detect and identify the human motion when there it is needed to avoid the occurrence of some situation, suitable to monitor the processes in industrial manufacturing or traffic used in order to make sure the transports are in safe condition and others. CCTV can be

defined as a video surveillance which utilizing digital video recorders to record the surroundings of the environment for a period of time whenever it is crowded or uncrowded for the particular area. So, it is commonly used in many areas around the world. The recorded video on CCTV shows the movement of each human or non-human in the environment. Therefore, all the creatures' silhouettes in the video can be extracted by removing the background and noise in the video and track the body part of the human.

This project is focusing on how Human Silhouette Recognition presented by using the Normalized Silhouette Image (NSI) and Shape Fourier Descriptor (SFD) which shown the characterization and recognition of human and non-human in videos. Normalized Silhouette Image is where the images are being normalized based on the object's ratio in images of the shape of the object and silhouette images are centred after action segmentation. This normalized is done before the video is being processed to another stage. The images are not allowed to distort and without pre-processed. Shape Fourier Descriptor describes the shape of an object by considering its boundaries which is the shape centroid and calculate by a particular formula.

1.2 Problem Statements

It is hard to extract the silhouette image manually without using a computerized system. Sometimes, human make mistake in recognizing objects or things because there are many similarities in the objects that needed to be recognized and make human confuse about the similarities that occurred. If a recognition is needed in a long video and it is a waste of time to watch the video to recognize the regarding element in the video. A computerized system can be easily solve this kind of problem to avoid the wasting of time and recognition process slower.

There is a problem in characterizing human or non-human in some of the images. In this technological era, a higher accuracy of characterizing human or non-human can be presented with some computerized system. The analysis of human and non-human by computerized system is surpass the vision analysis of human. The

computerized system can assist humanity to characterize and recognize a huge amount of images or videos towards the human or non-human.

The problem of segmentation is, in some of the human movement will keep the profile in long videos. It is because a longer video is contained many of human silhouettes by frames and images and an action of each human may involve many of the frames. It is hard to separate different actions in different categories manually without using a computerized system. It is also to avoid the lost of original video after an action segmentation towards video and it is needed to keep both of the details where the action before segmentation and after segmentation of the video.

1.3 Objectives

- To investigate the deformations of human silhouette which clearly understand the moving part of a human body from a variety of silhouettes.
- To characterize and recognize human or non-human through the body pose and method that applied.
- To design and develop the computerized models based on the study using Shape Fourier Descriptor (SFD) by using MATLAB.

1.4 Scope

1.4.1 Software

MATLAB R2010a is the main software that used to develop the computerized models in this project. The file extension for video must be ".avi" and file extension for image is in ".jpg", ".jpeg",".png" and ".tif". The coding in MATLAB allowed to load video and perform the deformation of human silhouette which able to recognize

and characterize a human or non-human in videos. The MATLAB with newer version may unable to run the coding.

1.4.2 User

The project is useful for public or to whom may need it and it helps in crime prevention. The system helps to determine the human and non-human in a video recorder such as CCTV. It also can track the human behaviour through the video record in CCTV. The user such as employers are needed to track their employees' and outsiders' behaviour through the video record and this may prevent harmful incidence to be happened in the company or surroundings.

1.4.3 Hardware

This project may not able to apply in devices which have recorded video function such as CCTV, computer, notebook, camera and other devices. Those devices are more sophisticated and useful to recognize and characterize human and non-human in the video record that provided. This project only use a laptop with well installed MATLAB.

1.5 Project Significance

Users such as detective need to investigate the deformations of human silhouette which clearly understand the moving part of the human body from a variety of silhouettes. It is because it helps in interpreting the human movement and it makes the settle of some related crime cases faster than expected. For employers, this characterization and recognition through the body pose is significant to classify whether the employees or outsiders in the video is suspicious or not. It can avoid unexpected situation and harm to the company when the suspect was found early. Therefore, this kind of project is recommended to be developed.

1.6 Expected Output

The result decide whether the silhouette that provided is a human or non-human. Tracking the human behaviour through the body movement is involved. It helps to improve the characterization and recognition faster by using the computerized model with a higher accuracy. It will help to make a recommendation to the user and reducing the crime rate in the future when there is a computerized system with successfully characterization and recognition.

1.7 Conclusion

In this chapter, the general information regarding this project is narrated. It is the human silhouette recognition will be presented by using the Normalized Silhouette Image (NSI) and Shape Fourier Descriptor (SFD) methods. The development of this project is in the process to achieve the objectives. The literature review will be discussed in the next chapter and followed by methodologies and others.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

In this chapter, it is discussed regarding the literature review conducted and the methodology of this project that is needed when developing human silhouette recognition system. There are various techniques and methods can be learned from other researchers to detect the silhouette of human.

According to the literature review is about discusses published information in certain subject part or related topic. It may just a simple briefing which is a summary of the significant information of the sources with summary and synthesis combination. Synthesis is a reorganization and rearranging of the information. It can create a new interpretation or combine new interpretation with old interpretation. Besides that, synthesis may trace the intellectual development in certain areas which includes major discussion. Furthermore, all the knowledge that I had been gained which is regarding human silhouette recognition is mainly in this chapter because most of the research had been done by others and it is very beneficial to this project.

2.2 Facts and Findings