



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**MOTION TRACKING SYSTEM USING
COMPUTER VISION WITH OPENCV SOURCE SOFTWARE**

This report submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology
Telecommunication (Hons.)

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

.....

(Project Supervisor)

ABSTRAK

Pada era sekarang “motion tracking” ini digunakan secara meluas untuk beberapa bidang, terutama bidang autonomi. “Motion tracking” juga telah digunakan untuk sistem keselamatan juga. Di luar Negara misalnya Amerika Syarikat telah menggunakan “motion tracking” untuk kegunaan ketenteraan. Objektif projek ini adalah untuk melakukan “motion tracking” perisian menggunakan OpenCV. “Motion tracking” kamera akan mengesan dan menjejaki pergerakan objek. Projek ini merangkumi kajian sebelumnya yang berkaitan dengan tajuk sebagai rujukan untuk melakukan “motion tracking” projek. Hasil kerja sebelum ini merangkumi dalam kajian lapangan, cara kerja dan penelitian yang digunakan adalah berdasarkan pada takat projek ini. Skop projek pula hanya merangkumi berasaskan melalui cara warna, optik aliran dan ekstraksi ciri pengolahan gambar teknik. Cara kerja dipilih untuk menggunakan “motion tracking” ini adalah deteksi tepi aliran di bawah teknik optik dan warna yang berdasarkan teknik segmentasi. Methodologi dipilih berdasarkan penyelidikan yang telah dilakukan sebelum ini dan teknik yang lebih efisien.

ABSTRACT

Nowadays motion tracking widely used for some field, especially autonomous field. The motion tracking also has been used for securities. At the Oversea for example United States of America use the motion tracking in army usage. This project purpose is to do the motion tracking using the OpenCV software. The motion tracking is the camera will detect and track the object movement. This project will include the research for the related previous work as a reference to done the motion tracking method. The related previous work will cover in the literature review, the method used are research based on the scopes of this project. This scopes project is only cover the color based, optical flow and feature extraction image processing technique. The methodology chooses for this motion tracking use is edge detection under the optical flow technique and the color based will used the segmentation technique. The methodology chooses is based on the research has been done and the techniques is efficiencies and many of the work done by using this techniques.

DEDICATION

Specially dedicated to my beloved father Zainal Abideen bin Sutan Mydin and my mother Hanim binti Hamzah who are very concern, understanding, patient, and supporting. Thanks for everything to my supervisor Puan Aziean binti Mohd Azize and my co-supervisor Encik Mohd Anuar bin Adid for their constructive guidance, encouragement and patient in fulfilling our aspiration in completing this project, to my sister, and all my friends. I also would like to say thanks for everything. The work and success will never be achieved without all of you.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter will describes and simple briefly about the motion tracking and OpenCV definition. This chapter discusses about the problem statement of the motion tracking, objective and scope of the project

1.2 Project Briefing

This project purpose is to research about motion tracking using the OpenCV software. OpenCV is an open source computer vision library. OpenCV was designed for computational efficiency and with a strong focus on real time applications. Besides, written in optimized C and can take advantage of multicore processors. Meanwhile, the motion tracking will track and detect the object movement by using a camera. Motion tracking assists in tracking the movement of objects and transferring the sensed data to an application for further processing. Motion tracking includes capturing the motions of objects matching with its stored motion template. Furthermore, motion tracking is a common requirement for many real world applications, such as video surveillance, games and medical applications. The tracking is based on Colours based technique, Camshift technique with back projection. Colour base technique consists of the RGB space, Greyscale space and the Hue, Saturation and Lightness Space. Meanwhile, camshift is the basis for the object tracking algorithm in OpenCV. It combines the basic camshift algorithm with

an adaptive region-sizing step. The camshift is a simple step function applied to a color probability map. This main project will include the research on the motion tracking method to be done by detection by a camera. The movement on the camera vision range will be tracking on.

1.3 Motion tracking

Motion tracking is track the movement of an object and then apply the tracking data for that movement to another object such as another layer or an effect control point to create compositions in which images and effects follow the motion. Besides, motion tracking is the process where the vision of image or videos detected. The movement on the camera vision range will be tracking. The information of the tracking can be as simple as the position of the body in space or as complex as the deformations of the face and muscle masses. Motion tracking for computer character animation involves the mapping of human motion onto the motion of a computer character. The mapping can be direct, such as human arm motion controlling a character's arm motion, or indirect, such as human hand and finger patterns controlling a character's skin color or emotional state.

1.4 Open Computer Vision

OpenCV project was initially an Intel Research initiative to advance CPU-intensive applications, part of a series of projects including real-time ray tracing and 3D display walls. OpenCV was designed for computational efficiency and with a strong focus on real time applications. It is written in optimized C and take advantage of multicore processor. Beside that OpenCV automatically uses the appropriate IPP library at runtime if that library is installed. One of OpenCV goal is to provide a simple to use computer vision instructure that help people build fairly sophisticated vision application quickly. OpenCV is one of kind software installed to create, to

program, and to run with a device to process an image or videos. OpenCV can be viewed as signal processing applied to higher dimensions of image and videos. OpenCV library usually used the C and C++ to programming the database. The OpenCV is optimized and intend for real time applications.

1.5 Problem Statement

Motion Tracking is used to track the motion of objects and applying that data to 3D object through the compositor. One of problem that occur is tracking by using human eyes only cannot be tracking easily. So the computer vision and software is needed to tracking up the object accurately. Beside that, on how colour identification can be detected. This can be overcome by using threshold technique, Threshold is to separate out regions of an image corresponding to objects which we want to analyze. This separation is based on the variation of intensity between the object pixels and the background pixels. Furthermore, finding failure by using one of technique only. For this project the combination between these three techniques which is colour based technique, camshift technique with back projection also will be combining. This is because every technique is for different function. Based from the related previous project they all have finding the failure if do only one technique to get the motion tracking. This is because the motion tracking need these three techniques basically. However in these three techniques they also have the divide technique to do that can be chosen for motion tracking. The motion tracking will use these three techniques with their sub techniques.

1.6 Objective

Main objective of this project is to:

- 1) To study technique on how motion tracking worked
- 2) Develop a vision based system for detect motion or movement of the object
- 3) To created and implement a programming using opencv source software for motion tracking

1.7 Scopes

The motion tracking have many type and ways to be done. However for this project the scope of project is to do the motion tracking of object based on the colours based technique, the camshift and back projection also the feature extraction image processing technique for the this project of motion tracking methodology. Fuethermore, the object is being list as tennis ball which have round shape and contrast colour, powerbank which have rectangle shape and grey color. Beside, tracking also been done with two different color and shape with identify as oil bottle. In every frame, only one object can be tracked in this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter will review and discuss available literature on Motion Tracking using OpenCV software. This section will be including the motion tracking technique and related previous projects. This reviews also explain about motion tracking. Then, the OpenCV will be discussed in this chapter.

2.2 Motion Tracking

Motion tracking definition will be discuss on this title. The motion tracking technique also will be describe in this topic. The technique will be divide into a few sub topic depend on the scope of the motion tracking research and many more will be discuss in this topic.

Motion tracking do by following a point that that designate through a tracking tool and extrapolate the motion across the time that the point is in view. Motion tracking includes capturing the motions of objects matching with its stored motion template. A central thread of computer vision research is the development of algorithm or system to track the position and orientation of a target object or objects within images or image sequences. Tracking may also be used in robot arm applications either to provide guidance to surgical robot (Ginhoux et al. 2003, and

Zhang and Payandeh 2002) or to select an optimal grasp for picking-up object (Han and Kuc 1998). Over the years, a vast number of algorithms have been proposed for object tracking, and there are large numbers of applications that require such algorithms to track different target in different conditions (Maurin et al. 2005). For example, to guide an autonomous vehicle in a simple or complex environments (Kia and Arshad 2005, and Asif et al. 2005) or it may be used to track vehicle for collecting the traffic data from highway scenes (Kastrinaki et al. 2003) or even to detect human in a surveillance system (Collins et al. 2000a).

2.2.1 Definition to Motion Tracking

Motion tracking assists in tracking the movement of objects and transferring the sensed data to an application for further processing. Motion tracking includes capturing the motions of objects matching with its stored motion template. The perfect motion tracking system is described as tiny, self-contained, complete, accurate, fast, immune to occlusions, robust, wireless and cheap. But in reality, such a tracking system is not feasible. Motion tracking enhances human-computer interaction and plays a vital role in computer animation of a 3-D model. It provides real-time information, and the amount of animation data produced by motion tracking within a given time is large. Motion tracking requires specific hardware and software programs to capture and process the data. Beside, motion tracking used is combining elements filmed separately, such as adding video to the side of a moving city bus or a star to the end of a sweeping wand, animating effects to follow a moving element, such as making a moving ball glow and many more.

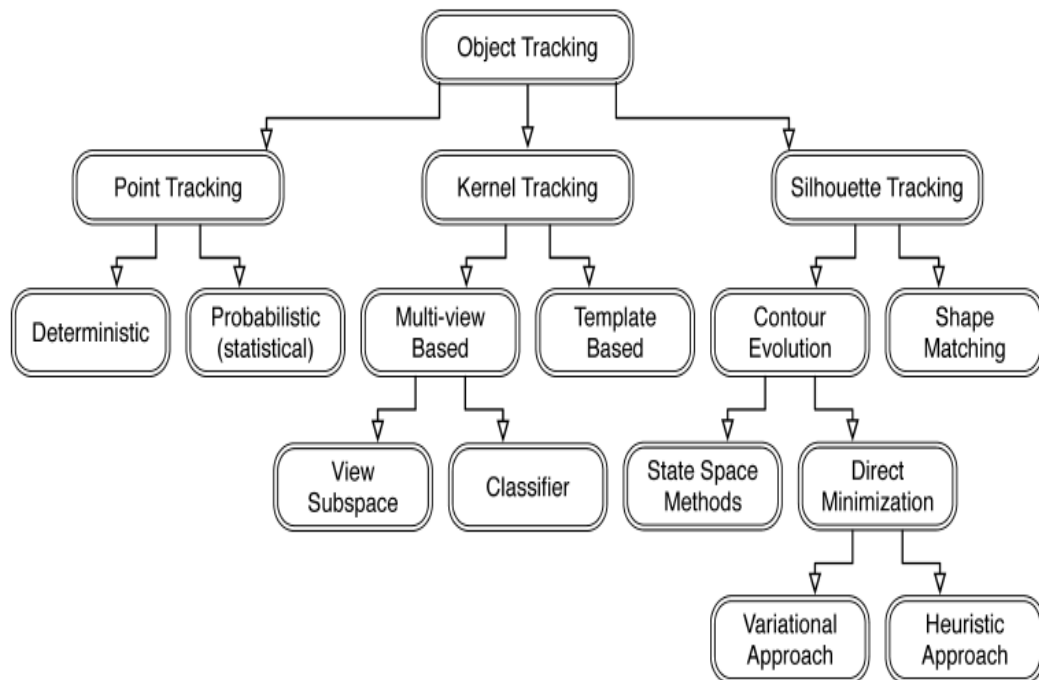


Figure 2.1: The class of the motion tracking

Matsuyama, (2008) said that the motion tracking is a common requirement for many real world applications, such as video surveillance, games, cultural and medical applications example like using for motion and behaviour study. Simple object can be detected and tracked using various image features such as color regions, edges, contours, or texture. On the other hand, complex objects such as human faces require more sophisticated features to handle the multiple possible instances of the object class. Statistical methods are a good alternative. A statistical model learns different patterns related to the object of interest like motion tracking of the different views of human faces, including good and bad samples.

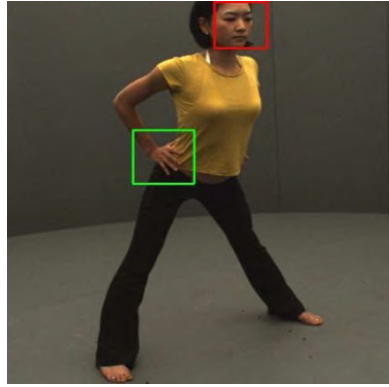


Figure 2.2: Show that the motion tracking of face detection. The red box is the box of reorganization progress where the face have been detect and not identified yet. The green box shows that the object has been identified and recognized

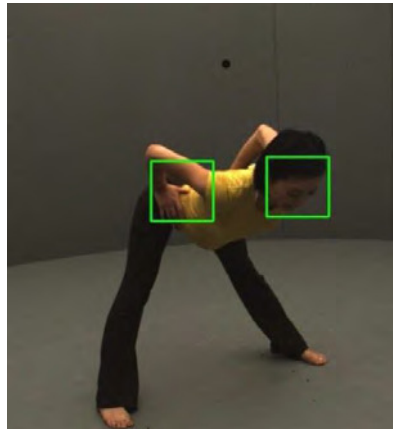


Figure 2.3: Show the object (face) has been identified and recognized. From red the boxes change to green. The box will follow and track the face everywhere as long as in range

Paulus, (2009) said that the aim of motion tracking is to detect and track moving objects through a sequence of images. Motion tracking becoming a key ingredient for further analysis of video imagery. For instance, information about the location and identity of objects at different points in time is the basis of detecting

unusual object movements or coordinated activities. With motion tracking, you can track the movement of an object and then apply the tracking data for that movement to another object such as another layer or an effect control point to create compositions in which images and effects follow the motion

2.3 Motion Tracking Techniques

The science of motion tracking is fascinating because of its highly interdisciplinary nature and wide range of applications. The technique of motion tracking is the big impact of the way motion will be tracking and detecting. The motion tracking technique usually being used is color based, feature extracting, and optical flow based for the tracking method. Beside there have many more of motion tracking technique. However the technique named above is related with this project and most popular usage nowadays. The technique of the motion tracking choose also depend on the task of motion tracking. Every technique has their own algorithm and own characteristics. The algorithm of motion tracking will make the result of the motion tracking output implement.

2.3.1 Optical Flow Based

A. A. Shafie (2009) said that optical flow is the distribution of apparent velocities of movement of brightness patterns in an image. Optical flow can arise from relative motion of objects and the viewer. Consequently, optical flow can give important information about the spatial arrangement of the objects viewed and the rate of change of this arrangement. Optical flow gives a description of motion and can be a valuable contribution to image interpretation even if no quantitative parameters are obtained from motion analysis. Optical flow can be used to study a large variety of motion moving observer and static objects, static observer and