UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF 3D FACE RECOGNITION USING MAPPED DEPTH IMAGE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Computer Systems) with Honours. The member of the supervisory is as follow:

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Co-supervisor: MOHD ANUAR BIN ADIP

ABSTRAK

Pada zaman yang serba canggih kini, dapat kita lihat penggunaan biometrik terutamanya dalam proses pengecaman dan pengenalan wajah manusia berkembang secara meluas. Sistem ini kebanyakannya digunakan di dalam bidang keselamatan dimana ia membolehkan orang ramai merahsiakan maklumat peribadi mereka. Seperti yang kita tahu, semua pengguna menginginkan perkara atau maklumat peribadi dijaga dengan selamat dengan menggunakan sistem keselamatan yang boleh dipercayai. Penggunaan kata laluan pada masa kini sememangnya tidak lagi relevan kerana adakalanya maklumat peribadi seseorang itu boleh dogodam begitu sahaja malah tanpa mereka ketahui. Pastinya orang ramai menginginkan satu sistem atau cara yang lebih mudah dan fleksibel. Jadi, tesis ini dibuat untuk memperkenalkan antara cara lain yang boleh digunakan untuk sistem keselamatan. Sistem berikut ialah proses pengecaman muka dalam bentuk tiga dimensi dengan menggunakan perisian MATLAB. Langkah petama, mengambil gambar wajah dengan menggunakan Kamera Zed Stereo. Selepas menangkap imej, pengesanan wajah akan mengesan imej input muka dan pengekstrakan ciri dari muka. Terakhir, imej yang digunakan akan dikesan untuk mengenali wajah dan menukarkannya ke bentuk 3D. Secara keseluruhannya, cara ini lebih tepat dan selamat berbanding dengan 2D.

ABSTRACT

Nowadays, as we can see the usage of biometric especially face recognition was widely developed. Facial recognition mostly being used in security system to allow user to protect their personal information. All the users wanted their own personal things or information to be secured with a trusted security system. The normal security that commonly used nowadays like password are no longer relevant and can be hacked and people also preferred an easier and flexible way. So, this project is made to introduce the other ways for security system which is face recognition that can recognize the user successfully by using mapped depth image in MATLAB. The human face will be captured by using Zed Stereo Camera. After captured the image, face detection will detected the face input image and features extraction from the face. Finally, the image captured is used and convert them to 3D. Overall, this method is more accurate and more secure than 2D.

DEDICATION

This Thesis is dedicated to my parents Mr. Ku Aziz Bin Ku Mat Esa and Mrs. Siti Mariam Binti Mat Hussein in the moral support during my studies. For my sibling too, thank you for the knowledge and information sharing that you guys gave. I really appreciate it. Special thanks to my supervisor Mr. Khairul Azha Bin A. Aziz and Mr. Ahmad Fauzan bin Kadmin for all the guidance and supervision during my completion of the project. And also to all my beloved friends who keep giving me spirit and always help me to complete this project. Thank you.

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TABLE OF CONTENTS

LIST OF TABLE

CHAPTER 2

LIST OF FIGURES

CHAPTER 1

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will discuss all the overview about mapped depth image that uses for 3D face recognition which are includes background project, objective and scope of the project. The objectives will solve all the problem statement that has being declared in problem statement.

1.2 Project Background

In this era, the usage of biometric especially in security is very important to ensure the important information of individual is safe and not easily being hacked. Because of that, the techniques in authentication has been increased. In science, biometric is refer to recognizing and determining an individual. (Abhilash Kumar Sharma et al., 2015) state that, biometric authentication or biometric traits are divide for two type which are physiological and behavioral. In physiological are includes face, fingerprint, hand iris and DNA where for behavioral are keystroke, signature and voice. This method are more secure than password and cannot be lost or forgotten. It is also difficult to share, copy and distribute because of, it belongs to someone and never be same with others.

This project focuses on 3D face recognition. For past 3 decades, the usage of 2D image of face recognition has been actively researched and presented. But, this method appear with sensitive to variations in pose, illumination and expression. This

project also made to introduce and highlight about 3D face recognition which have many advantage compare to 2D face recognition which is the illuminating has less effect on the depth information. The variation facial pose also will not lose any information. 3D data have more clues to handle expression.

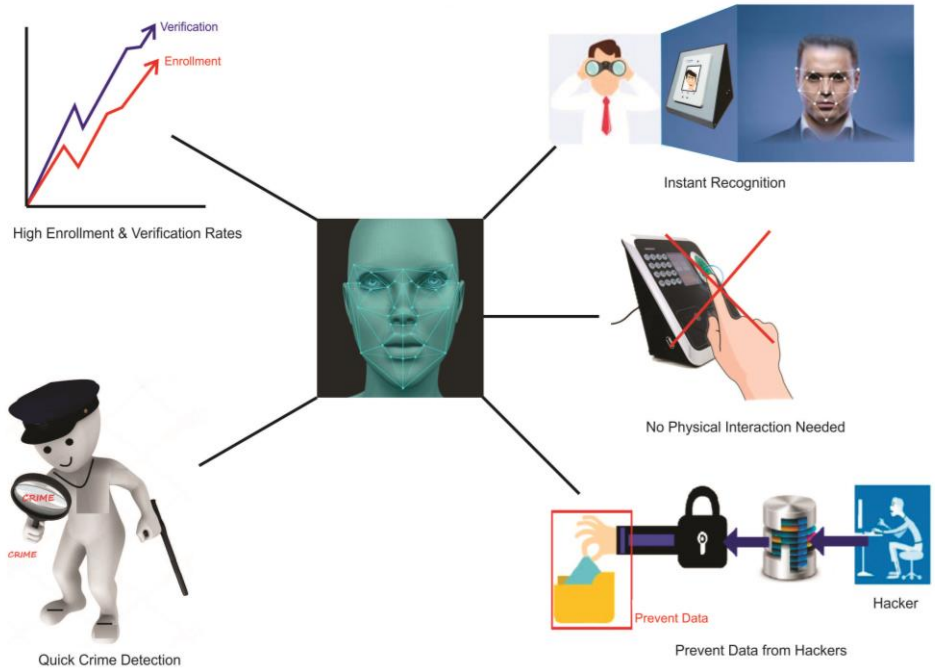

Figure 1.1: Block diagram of function 3D face recognition

So, this project is made to develop the 3D face recognition by using mapped depth image where it can help people to prevent the data from hackers. The image will be captured by Zed Stereo Camera and then extract all the features from face in MATLAB.

1.3 Problem Statement

Everyone wanted their personal information and place to be secure with a trusted security system. The normal security that usually people use is no longer safe because there are many people out there who can hack and find out user's personal information easily. Especially in banks, there are some cases that have happened where, the password of bank card one the user has been hacked. He also loses all his money, but in the end still the scammer cannot be identified. So, face recognition system is being research to make the system more advanced.

The main objective for this project is to develop 3D face recognition by using mapped depth image. Like a previous explanation, mostly this method is used for security and 3D face recognition have many advantage or benefit for user that can help people secure in identification. It is automated in time tracking system which are accurately for report attendance and absence without any human error and the identification process is more fast and accurate. In security, the access will be denied if that person is not in the system. From that, it show that this method which is 3D face recognition can be prove that using this method is more accurate compare with 2D.

1.4 Project Objective

The objectives of this project are stated in below:

1- To develop of 3D face recognition by using mapped depth image with MATLAB.

2- To analyze the system performance in term of reliability and accuracy.

1.5 Scope of Project

This project scope had include the understanding of 3D face recognition and how to develop it by using mapped depth image in MATLAB. To solve the problem statement that has been state previous, stereo vision is used to capture the input or image for convert it into 3D. In this research, the main software to develop the face recognition is MATLAB.

1.6 Project Methodology

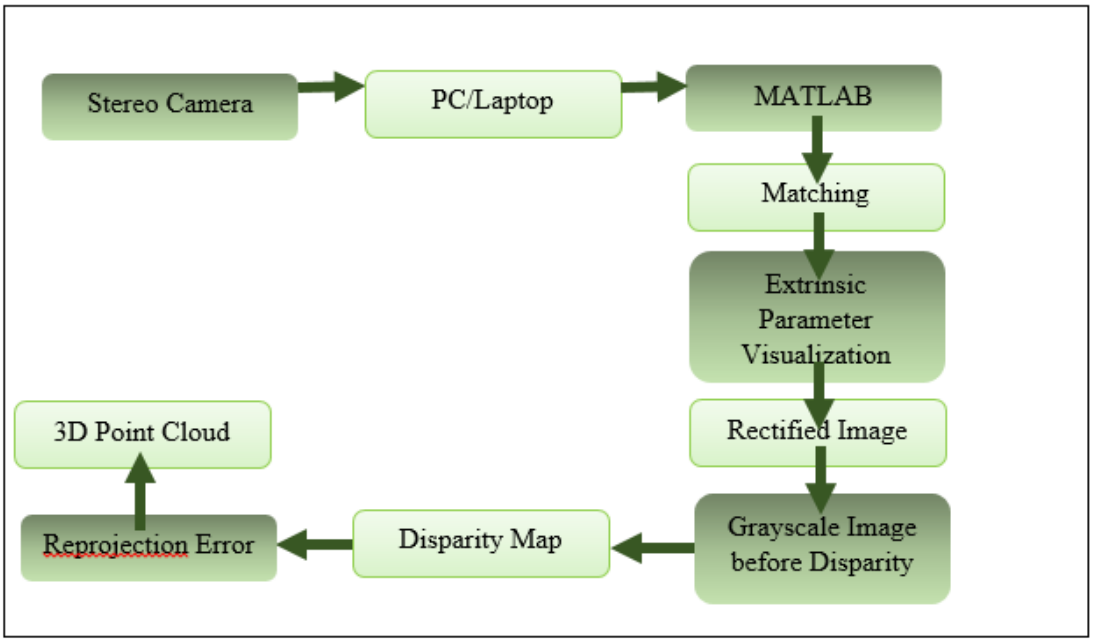

Figure 1.2: Block diagram of the project

This project which is 3D face recognition system will be successful if follow the correct method from the block diagram and procedures that have been plan. The function of the methodology actually, is to make sure the project is done in the right time which is on the dateline, run smoothly and happen like the expected outcome.

The process to develop this project is follow the project flow chart and how the MATLAB works to give the output which is how to scan face or identify human face by using mapped depth image. The purpose for this project is more to illustrate the idea and upgrade functions in human identification system.

From the flow chart, it shows overall about the creation of this project by follow the project method for successful achievement. The flowchart shows from the first step until the end of this project. In other words, it shows the process and showing step by step until the project done. It also shows the selection of software and hardware for this project. This means, the flowchart or the methodology is very important to make sure the development of the project is going smoothly and systematically.

Besides, the proposed method all the measurement needs for this project. It also shows how to analyze and test the project until there is no error. The figure above shows the diagram of the project. Zed Stereo Camera will capture human face and then extract all the feature from face by using MATLAB software.

1.7 Thesis Organization

This report consists of five chapter that will describe about the flow of the project.

1- Chapter 1:

In this chapter, it shows the briefing or the first plan for the project. It is included project background, the objectives, the problem statement, project scope and project of methodology.

2- Chapter 2:

In this chapter, it discuss about the usage and observation of the previous project that suitable to apply in the project. This chapter also covers the concept, theory and characteristic of the component use.

3- Chapter 3:

For this chapter, the detail about the development of the project will be discuss. It includes the step and procedures to complete the project. In this chapter too, the schedule of details report will be discuss to make sure the objective can be achieve.

4- Chapter 4:

This chapter will shows the result and discussion of the project where all the simulation and data analysis will be include in this chapter. Other than that, the hypothesis, discussion and conclusion are include in chapter four.

5- Chapter 5:

Lastly, this chapter will be conclude about the whole of project based on the recommendation and discuss a little bit of how to improve the performance based on the output.

CHAPTER 2

LITERATURE REVIEW

This chapter will be discussed regarding this project, which reveals the knowledge that gained from reference book, journal, articles, newspaper and websites that contain application, research work, technique used, material use and hardware design. Literature review is very important to make sure the project work successful and it help to identify the problem. Face recognition is one of the methods from biometrics, the advantages and disadvantages of other methods from biometrics also will be discussed.

2.1 Image Processing

A digital image processing is a pixels where it represent of two dimensional image and its work as a finite set of digital values. Digital image processing also focus on major task which is to improve the pictorial information for human gaze. Transformation of image in order to remove irrelevant information for problem give is aims to image processing (Dimitris K. Iakovidis, 2015). For example to remove hair of skin. After processing, image analysis will be applied and involves the image contents for automatic recognition information within the image. Typically color in digital images is represented by using RGB model. This RGB model considers that pixels take value space where it generate by responses of three camera sensor.