GENDER ESTIMATION BASED ON FACIAL IMAGE

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Specially dedicated to my family for their supports and eternal love.

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ABSTRACT

Although gender classification has attracted much attention in psychological literature, relatively few machine vision methods has been proposed. However it has been extensively studied in the context of surveillance applications and biometrics. This project is mainly concern with gender classification using purely image processing technique. The way of doing this is by extracting the differences between male and female facial features. Obviously the classification base on a single feature is not adequate since humans share many facial properties even within different gender group. So multilayer processing is needed. This project is working as expected with specified scope of project. Although not many varieties of facial images have been considered like colored hair the basic techniques should be just the same. The proposed methods can be extended to various purposes especially in speeding up the processing time in database searching. The refinement of this project in other hand can lead to more accurate and reliable result by considering other facial properties like eyes, nose and eyebrows.

ABSTRAK

Bidang pengecaman jantina telah menjadi satu topik yang diberikan perhatian dalam pengajian psikologi. Namun begitu yang sedikit pendekatan melalui teknik pengelihatanyang telah diperkenalkan. Bidang ini sebenarnya telah dipelajari secara mendalam dalam konteks keselamatan dan biometrik. Projek ini adalah berkisar tentang pengecaman jantina melalui teknik pemprosesan imej semata-mata. Ini dilakukan dengan mengenalpasti perbezaan di antara ciri-ciri muka lelaki dengan perempuan. Adalah terbukti bahawa pengkelasan berdasarkan satu ciri sahaja adalah tidak tepat memandangkan manusia mempunyai ciri-ciri muka yang hampir sama walaupun dari kelas jantina yang berbeza. Oleh kerana itu pengkelasan secara berperingkat diperlukan. Projek ini berjaya sepertimana yang diharapkan; berdasarkan skop yang telah ditetapkan. Walaupun tidak banyak jenis-jenis muka yang diambil kira seperti warna rambut yang berlainan dari asal, teknik yang digunakan sepatutnya masih lagi sama. Kegunaan projek ini boleh dikembangkan kepada pelbagai tujuan terumanya untuk mempercepatkan process pencarian dalam pangkalan data. Dengan sedikit pengubahsusian, projek ini semestinya akan menghasilkan satu system yang lebih tepat; dengan mengambil kira ciri-ciri muka manusia yang lain seperti mata, hidung dan kening.

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ς_i	ith Gaussian basis function
c_i	Center
σ^2	Variance
b	Bias term
ω	Weight coefficient
$T(x,y)$	Template of an image
$S(x,y)$	Region within the image
W	Width dimension
H	Height dimension
μ_T	Mean value of the template
μ_s	Mean value of the sub image
M	Mask

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LIST OF ABBREVIATIONS

GUI   Graphical User Interface

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CHAPTER I

INTRODUCTION

1.1   Introduction to Face Recognition

Face is one of the most important biometric features of a human. A human can recognize different faces without difficulty. Yet it is a challenging task to design a robust computer system for face identification. The inadequacy of automated face recognition systems is especially apparent when compared to our own innate face recognition ability. Human perform face recognition, an extremely complex visual task, almost instantaneously and our own recognition ability is far more robust than any computer's can hope to be. Human can recognize a familiar individual under very adverse lighting conditions, from varying angles or viewpoints.

While research into this area dates back to the 1960's, it is only very recently that acceptable results have been obtained. However, face recognition is still an area of active research since a completely successful approach or model has not been proposed to solve the face recognition problem. The next generation surveillance systems are

expected to take human face as input pattern and extract useful information such as gender information from it.

1.2   Problem in Face Recognition System

To date, most face recognition systems have had at most a few hundred faces. This could be a problem when the size of database increases. Larger database means longer computational and processing time. The identification of gender can help the face recognition system to focus more on the identity related features, and limit the number of entries to be searched in a large database, improving the search speed In other words estimation will be done on the input image and recognition of image is done only in the estimation group. Theoretically this method will cut the processing time almost to half.

1.3   Introduction to Gender Estimation

Gender classification based on facial images is difficult mostly because of the inherent variability of the image formation process in terms of image quality and photometry, geometry, and/or occlusion, change, and disguise. Few attempts have been made to perform gender classification starting in the early 1990s where various neural network techniques were employed for classifying the gender of a (frontal) face.

The interest on gender estimation has two folds. First, one can apply the gender

estimation procedure prior to face recognition in order to split the face space into two. Second, because of the nature of the problem, one can apply same methodology to other class specific face processing tasks like race and age estimation. Thus, by arriving at a robust gender estimation scheme, one can hope to propose solutions to similar face tasks as well.

1.4   Objective

One of the most challenging tasks for visual form ('shape') analysis and object recognition is the understanding of how people process and recognize each other's face, and the development of corresponding computational models. The objective of this project is therefore to write a Matlab code in such a way that it can recognize the gender of a person from given frontal image. The algorithm will be a combination of various proposed method along with some other features . Finally, this project hopefully can be a relatively good gender classifier as other proposed methods.

1.5   Scope of Project

Gender classification of a person based on only a frontal view image is something a human can easily accomplish. It can be decided by the person's hair, nose, eyes, mouth and other properties with relatively high degree of accuracy. However this will be a problem when it comes to automating the processing using a computer program. This project therefore is to solve this matter. The gender estimation algorithm

will be done via Matlab image processing tools. In this project it is assumed that the background of the facial image is not complex and there is only a single face on it. Further each image is assumed in a same size, the image quality and resolution is assumed to be sufficient enough, the illumination is uniformed and the input images are colour images. Transvestite (male/female that change the appearance to opposite sex) is not considered in this project. However no restriction on wears, glasses, make-up, hairstyle, beard, etc imposed

1.6   Project Outline

The project is organized into six chapters. The outline is as follows;

Chapter 1 - Introduction

This chapter discusses the objectives and scope of the project and gives a general introduction to facial recognition and gender estimation technology.

Chapter 2 - Literature Review

This chapter is about previous work regarding the facial detection, facial feature extraction and gender estimation. A few techniques will be reviewed briefly. Major differences between male and female facial feature will be described. Lastly some of important image processing technique will be discussed.

Chapter 3- Methodology

Chapter 3 elaborates the techniques and steps taken to complete the task. A few algorithms is proposed to be applied in this project.

Chapter 4- Results

The final result of this project are shown and discussed in this chapter. Some analysis of the results and each algorithm applied are also included.

Chapter 5-Conclussion

This chapter consists of conclusion for this project. It also describe the problems arises and suggestion for future improvement and works.

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