

Accepted Manuscript

Title: On the estimation of face recognition system performance using image variability information

Authors: Muhammad Aurangzeb Khan, Costas Xydeas, Hassan Ahmed



PII: S0030-4026(17)30206-1
DOI: <http://dx.doi.org/doi:10.1016/j.ijleo.2017.02.063>
Reference: IJLEO 58879

To appear in:

Received date: 8-8-2016
Revised date: 17-2-2017
Accepted date: 17-2-2017

Please cite this article as: Muhammad Aurangzeb Khan, Costas Xydeas, Hassan Ahmed, On the estimation of face recognition system performance using image variability information, Optik - International Journal for Light and Electron Optics <http://dx.doi.org/10.1016/j.ijleo.2017.02.063>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

On the Estimation of Face Recognition System Performance using Image Variability Information

Muhammad Aurangzeb Khan^a, Costas Xydeas^b, Hassan Ahmed^c

School of Computing and Communication
Infolab21, Lancaster University, Lancaster, LA1 4WA, United Kingdom

^aaurangzebniazi@gmail.com

^bc.xydeas@lancaster.ac.uk,

^ch.ahmed@lancaster.ac.uk

¹**Corresponding Author** is currently working as Assistant Professor in Electrical Engineering Department at COMSATS Institute of Information Technology, Islamabad, 44000, Pakistan. Phone: +923355211600 and this work is a part of authors' PhD research done at Lancaster University, United Kingdom.

Abstract

The type and amount of variation that exists among images in facial image datasets significantly affects Face Recognition System Performance (FRSP). This points towards the development of an appropriate image Variability Measure (VM), as applied to face-type image datasets. Given VM, modeling of the relationship that exists between the image variability characteristics of facial image datasets and expected FRSP values, can be performed.

Thus, this paper presents a novel method to quantify the overall data variability that exists in a given face image dataset. The resulting Variability Measure (VM) is then used to model FR system performance versus VM (FRSP/VM).

Note that VM takes into account both the inter- and intra-subject class correlation characteristics of an image dataset. Using eleven publically available datasets of face images and four well-known FR systems, computer simulation based experimental results showed that FRSP/VM based prediction errors are confined in the region of 0 to 10%.

Index Terms— Face recognition (FR), Signal Variability in image face datasets, Facial Variability Measure and its relationship to FR performance.

same time, have the potential to increase similarity between the images of different subjects. Of course in both

1. INTRODUCTION

Face Recognition (FR) has been adopted over the last three decades as the primary methodology of biometric identification and verification systems. Major characteristics which provide FR with an edge over other biometric techniques are its relatively high accuracy and non-intrusiveness nature. As a result, a plethora of face recognition techniques have been proposed; a detailed survey of such FR schemes can be found in [1-8].

Furthermore, face recognition systems usually operate in one of two modes: i) Verification (FV) and ii) Identification (FI). Face verification is a one-to-one matching process in which an input (query) face image is compared against the stored template of only one person whose identity is being claimed. On the other hand, face identification involves one-to-many comparisons between an input face image with the stored templates of a number of individuals. There are several areas where FR is applied in the form of FV or FI, e.g. in access control, surveillance, criminal justice systems, smart cards etc. see [8]. However, when employed in real life application, FR system performance is affected significantly by large intra-person and small inter-person amounts of input image variabilities which often characterize a given application domain. Furthermore, this apparent dependency of FR system performance stems from the way face images are captured. Now, and in order to test the performance of FR systems, numerous sets of face images have been created and are publically available, each using different image capture criteria and constraints [9]. Table-1 presents several well-known face image datasets, each created with its own image capture specification.

The usual image capturing conditions that count for different types of image face variability are related to:

- Illumination
- Pose
- Expression
- Makeup
- Facial attributes i.e. mustache, beard, glasses,
- Age

In addition to the above types, the amount of variability allowed per type, during image capturing, is also of importance. Consider for example the type of variability “pose” (see table 2) which can vary from 0 to ± 90 degrees. Large variations in pose can create severe visual changes between images taken of the same person, whereas, at the

cases FR becomes a more challenging task with adverse implications in FR system performance. This general

Download English Version:

<https://daneshyari.com/en/article/5026124>

Download Persian Version:

<https://daneshyari.com/article/5026124>

[Daneshyari.com](https://daneshyari.com)