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Illumination invariant face detection

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Illumination Invariant Face Detection

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Dedicated to

Leonard and Sylvia

Declaration

This is to certify that the work reported in this thesis was done by the author, unless specified otherwise, and that no part of it has been submitted in a thesis to any other university or similar institution.

Alister Cordiner
6th July 2009

Abstract

The purpose of face detection is to process input images in order to determine the locations of any faces in the image. Faces are complex objects and detecting them remains a challenging task for computer vision systems, despite the relative ease with which humans are able to do so. One of the major difficulties faced by face detection systems is challenging illumination conditions, such as low level lighting and cast shadows. This thesis reviews the state of the art face detection methods (with particular emphasis on the method of Viola and Jones) and explores methods of overcoming adverse illumination conditions. These methods can be broadly classified as invariant features, normalisation and variation modelling. Four novel approaches to overcoming illumination that fall into these 3 categories are proposed in this thesis, namely: (i) log-ratio Haar-like features; (ii) DC Haar-like features; (iii) local variance normalisation; and (iv) classifier fusion. Furthermore, a new type of feature called the *generalised integral image feature* (GIIF) is proposed as an alterative to Haar-like features. The GIIF method is not specifically related to illumination invariant face detection, but instead applies to the more general task of face detection and is therefore presented as a separate chapter. Experimental results on standard face databases are provided for all of the proposed methods to verify that they achieve improved accuracy.

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Contents

List of Tables

List of Figures