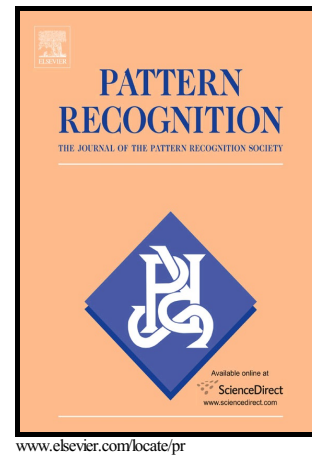


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Jhony K. Pontes, Alceu S. Britto, Clinton Fookes, Alessandro L. Koerich



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A Flexible Hierarchical Approach For Facial Age Estimation Based on Multiple Features

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Abstract

Age estimation from facial images is increasingly receiving attention to solve age-based access control, age-adaptive targeted marketing, amongst other applications. Since even humans can be induced in error due to the complex biological processes involved, finding a robust method remains a research challenge today. In this paper, we propose a new framework for the integration of Active Appearance Models (AAM), Local Binary Patterns (LBP), Gabor wavelets (GW) and Local Phase Quantization (LPQ) in order to obtain a highly discriminative feature representation which is able to model shape, appearance, wrinkles and skin spots. In addition, this paper proposes a novel flexible hierarchical age estimation approach consisting of a multi-class Support Vector Machine (SVM) to classify a subject into an age group followed by a Support Vector Regression (SVR) to estimate a specific age. The errors that may happen in the classification step, caused by the hard boundaries between age classes, are compensated in the specific age estimation by a flexible overlapping of the age ranges. The performance of the proposed approach was evaluated on FG-NET Aging and MORPH Album 2 datasets and a mean absolute error (MAE) of 4.50 and 5.86 years was achieved respectively. The robustness of the proposed approach was also evaluated on a merge of both datasets and a MAE of 5.20 years was achieved. Furthermore, we have also compared the age estimation made by humans with the proposed approach and it has shown that the machine outperforms humans. The proposed approach is competitive with current state-of-the-art and it provides an additional robustness to blur, lighting and expression variance brought about by the local phase features.

I. INTRODUCTION

The human face conveys important perceptible information related to personal characteristics, including identity, gender, ethnicity and age [16]. Currently, age can play an important role in many applications such

Jhony K. Pontes and Clinton Fookes are with the Image and Video Research Laboratory, Queensland University of Technology, Brisbane, Queensland 4001, Australia (e-mail: jhony.kaesemodelpontes@hdr.qut.edu.au and c.fookes@qut.edu.au)

Alessandro L. Koerich is with Department of Software Engineering and IT, École de Technologie Supérieure, Montreal, H3C 1K3, QC, Canada (e-mail: alessandro.koerich@etsmtl.ca)

Alceu S. Britto Jr. is with the Pontifical Catholic University of Paraná, Postgraduate Program in Computer Science, Curitiba, 80215-901, PR, Brazil (e-mail: alceu@ppgia.pucpr.br)

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