International Journal of Synthetic Emotions
Volume 11 • Issue 1 • January-June 2020

Hybrid Features Extraction for Adaptive Face Images Retrieval

Adel Alti, LRSD Laboratory, Computer Science Department, Sciences Faculty, University Ferhat Abbas Setif-1, Setif, Algeria
https://orcid.org/0000-0001-8348-1679

ABSTRACT

Existing methods of face emotion recognition have been limited in performance in terms of recognition accuracy and execution time. It is highly important to use efficient techniques for improving this performance. In this article, the authors present an automatic facial image retrieval combining the advantages of color normalization by texture estimators with the gradient vector. Starting from a query face image, an efficient algorithm for human face by hybrid feature extraction provides very interesting results.

KEYWORDS

Color Normalization, Gradient Vector, Similarity Distance, Texture Estimators

1. INTRODUCTION

Information Technologies (IT) is a crucial communications framework for transferring a large number of facial images in computer networks. The dilemma of searching the relevant facial images was a tedious issue in a large video material. This problem has brought the attention of experts and researchers to come up with new innovative solutions to address these issues.

Content-based face image indexing and retrieval have been widely used as an effective solution that could help to achieve video/image transmission with rate control. It consists of finding relevant images in a large video (Karmakar, 2019). Current systems combine various features to improve discrimination and classification. Other systems such as Photobook (MIT's Vision and Modeling Group) and VisualSEEK (Columbia University Center) involving the user by different interaction modalities to refine their researches. These systems offer search results where the query is made up of the whole image. In fact, VisualSEEK is known to be particularly efficient to cope with high image data spaces. Indeed, it helps to improve emotions recognition, ameliorate search result and enhance flexibility within the possibility of designating an object of the image (Ashraf et al. 2018).

This work focuses on feature-based emotions image indexing and retrieval. The main steps of emotions classification system are feature extraction: the extraction of distinctive facial features, classification: categorizing the extracted data (patterns) through a learning process. Our challenge in this paper is to build computational models that select relevant features and apply similarity models to detect accurately relevant requested images. The end goal of this research is to build user-aware preferences to automatically respond and adapt to human needs. To reach this goal, we choose to work with a standard dataset specially designed for emotional recognition. We mainly focus on

DOI: 10.4018/IJSE.2020010102

Copyright © 2020, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

the problems related to linear transformations (rotation, scaling and translation) on images, or by structuring the content of the image. We propose feature-based modeling approach that combines gradient vector and normalized steering kernels from each color channel with estimators of the covariance. The proposed methodology combines the advantages of color normalization by texture estimators with the gradient vector.

The paper is organized as follows: the next section reviews the state of the art of recognition and search models. In section 3, we introduce the proposed methodology for features modeling and selection. The similarity evaluation strategy is presented in section 4. Classification results, as well as discussion and main findings, are exposed in section 5. Section 6 summarizes our contributions and concludes the paper.

2. RELATED WORK

Considerable works have been carried out on content-based image indexing. Existing works of content-based image retrieval using dominant colors as well as the complexity of their content. They use generic attributes such as color, shape or texture (Israel et al. 2004; Zhou et al. 2017;). Other systems use XML schemas to search for images on their semantic and visual content (Hong & Nah, 2004). These visual primitives can be categorized into three main types: color-based descriptors, texture-based descriptors and shape-based descriptors. Histograms (Boujemaa, Boughorbel, &Vertan, 2001) and Color Angles (Wang et al. 2010) are typical examples of the first type. In particular, color angles (Wang et al. 2010) are considered one of the most powerful discriminative algorithms that were applied to diverse classification problems including face recognition. In fact, color angles, are known to be particularly efficient to cope with high dimensional data spaces (Costa, Humpire-Mamani, & Traina, 2012). However, the problem with color angles is the fact of being frame-based classifiers i.e. they are inherently unable to model pixels dependencies.

Co-occurrence matrix (Eleyan & Demirel, 2011) is another well-known discriminative technique for texture-based descriptors and face recognition. Gabor filter (Abhishree, Latha, Manikantan, & Ramachandran, 2015), Wavelet transformations (Ashraf et al. 2018) are other types of models that are known to be part of the transform-based domains and especially part of the texture ones. In spite of having less discriminative power than Color Angles and other discriminative classifiers, they have the advantage of modeling efficiently sequences and temporal data due to their internal network configuration. This property has made Color Angles very popular in the face recognition literature (Wang et al. 2010). For instance, Color Angles were applied in (Mahoor, & Abdel-Mottaleb, 2008) for multimodal face modeling and video indexing in a smart environment.

Other proposed texture analysis and classification techniques such as Fourier Mellin Transform (Goecke, Asthana, Pettersson, & Petersson, 2007), algebraic moments (De Siqueira, Schwartz, & Pedrini, 2013), contour models (Bouhini, Géry, & Largeron, 2013) were designed to detect specific situations and classification results were quite interesting. Other face recognition studies applying Fourier Mellin Transform can be found in (Derrode, & Ghorbel, 2001). However, it seems difficult to find attributes that can model an image according to all of their aspects described above. More recently, in (Karmakar, 2019) proposed a retrieval technique for medical images, the main idea is to find the requested data based DWT domain, where a simple linear function is used for that. Comparison and analysis of algorithms for image retrieval on a large images dataset was done.

The major problem with all these approaches is the non-consideration of all images features retrieval. Lot of queries on lack of exploration of information available about the various image features and the various computing signatures that lack exploration. The association between face images and the investigative signatures was not studied for deriving useful satisfaction. To cope with this limitation, other approaches are based on the combination of three descriptors-based techniques for extracting the image features, which are the aim of our approach.

8 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/hybrid-features-extraction-for-adaptive-face-images-retrieval/252222

Related Content

Coordinating Massive Robot Swarms
Bruce J. MacLennan (2014). *International Journal of Robotics Applications and Technologies (pp. 1-19).*
www.irma-international.org/article/coordinating-massive-robot-swarms/132540

Kinodynamic Motion Planning for a Two-Wheel-Drive Mobile Robot
Kimiko Motonaka (2018). *Handbook of Research on Biomimetics and Biomedical Robotics (pp. 332-346).*
www.irma-international.org/chapter/kinodynamic-motion-planning-for-a-two-wheel-drive-mobile-robot/198058

Interactive and Collaborative Virus-Evolutionary CNC Machining Optimization Environment
N. A. Fountas, N. M. Vaxevanidis, C. I. Stergiouand R. Benhadj-Djilali (2015). *Robotics, Automation, and Control in Industrial and Service Settings (pp. 110-141).*
www.irma-international.org/chapter/interactive-and-collaborative-virus-evolutionary-cnc-machining-optimization-environment/137696

Computing Nash Equilibria in Non-Cooperative Games: An Agent-Based approach
Alfredo Garro (2013). *International Journal of Intelligent Mechatronics and Robotics (pp. 29-42).*
www.irma-international.org/article/computing-nash-equilibria-in-non-cooperative-games/103992

Perception Effects in Ground Robotic Tele-Operation
Richard T. Stone, Thomas Michael Schniedersand Peihan Zhong (2018). *International Journal of Robotics Applications and Technologies (pp. 42-61).*
www.irma-international.org/article/perception-effects-in-ground-robotic-tele-operation/232730