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1 Local Textural Patterns for Facial Feature Extraction

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Abstract

Over the last two decades shared and stored multimedia data are growing. Retrieving an accurate image has become a key challenge yet to be solved. we can solve this problem using texture patterns that reduce the gap between the actual image over the user expectation instead of using other low-level features. This chapter reviews some of the existing approaches and the recent achievements in different directions of the textural areas in CBIR. We present recent methods for collect features extraction through texture analysis, numerical illustration and similarity measurement. Further, some research issues arising out of the review of existing methods are discussed in comparisons of textural patterns and concluded with a few recommendations based on generic survey.

Keywords: Data center, energy efficiency, optimization, resource scheduling, PSO, GA.

1. Introduction

Facial expression analysis (FEA) is the challenging task over the area of Artificial Intelligence (AI) and computer vision. FEA demands in many applications such as criminals expression analysis, entertainment, surveillance in public transportation, patient mood analysis, student interest in online classes, customer satisfaction etc. probably statistical methods have been applying with the combination of classification algorithms such as ANN, SVM etc. but still

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expecting more accurate results. ⁴ Content Based Image Retrieval (CBIR) becoming more popular in web data mining methods. Which belongs to a research field of image analysis, also known as Query By Image Content (QBIC) and Content- Based Visual Information Retrieval (CBVIR). The key technologies image retrieval include: Image feature extraction, feature-based similarity calculation, semantically relevance feedback and image acquisition. It relates to machine vision, ⁷ pattern recognition, database technology and information retrieval studies[18]. ⁵ Content-Based Image Retrieval (CBIR) from unannotated image databases is a wide and versatile field of research interests. With fast and dramatic growth of internet culture, huge digital images produced by scientific, educational, medical, industrial, and other applications. To efficiently utilize this huge growing data, there is need of intelligent, accurate, effective, and efficient content based image retrieval system and image database management ³ systems. The problems of metadata based image retrieval and rapid growth in the quantity and availability of digital images motivates research into automatic image retrieval. In contrast to traditional images retrieval, Content Based Image Retrieval (CBIR) uses the information that is already available in the Image[19]. ²¹ CBIR either using local features such as color, texture, shape and spatial layout etc [20][21][22] using computer vision techniques among others or high level features like ⁵ soft computing techniques as neural networks, fuzzy logic and machine algorithms etc [23][24]. ¹¹ The idea of local patterns is adopted to propose the maximum edge positions is classified into two categories which are named as sign maximum edge position and magnitude maximum edge positions for ² octal patterns[3]. In CBIR using color edge detection technique, image is converted from RGB to YCbCr color space. After this on Y plane, canny edge detection technique is applied and then planes of an image are combined and again color space conversion from YCbCr to RGB is done. Image Histogram is calculated for each plane of resultant image. Finally discrete wavelet transform is applied on the Histogram to get feature vector of reduced size .Content Based Image Retrieval turning out to be more notorious in web information mining strategies. Which has a place with an examination field of image investigation,

called Query By Image Content (QBIC) and Content-Based Visual Information Retrieval (CBVIR). The key advances image retrieval include: Image feature extraction, feature based similitude estimation, semantically pertinence criticism and image procurement. It identifies with machine vision, design acknowledgment, database innovation and data retrieval studies[18]. Content-Based Image Retrieval (CBIR) from agitated image databases is a wide and flexible field of examination hobbies. With quick and sensational development of web society, colossal advanced images delivered by logical, instructive, therapeutic, modern, and different applications. To proficiently use this tremendous developing information, there is need of astute, exact, viable, and effective substance based image retrieval framework and image database administration frameworks. The issues of metadata based image retrieval and fast development in the amount and accessibility of advanced images persuades research into programmed image retrieval. Rather than customary images retrieval, Content Based Image Retrieval (CBIR) utilizes the data that is as of now accessible in the Image[19].

2. Problem Statement, Objectives, and Contributions

This thesis develops the techniques for optimizing the energy consumption in a cloud data center, evaluates and expose the limitations of the existing practices and tackles forecasting data center energy consumption for better planning and operations of the data centers and proposes a taxonomy on metrics available to analyze energy efficiency of the data centers. We have investigated the following research problems :

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To address these problems, we formulate the following research specific objectives.

1. The objective of the proposed research work is to analyze the image data to retrieve the correct image from the database helpful to retrieve the correct data from existing image database in crime analysis, online commercial

Figure 1: (a) 3 X 3 pixel format surrounding the center pixel and 8 neighboring pixels (b) differences among center pixel and surrounding pixels (c) Substituted with binary (0, 1) values

Figure 2: ¹ Calculation of LTP, the ternary patterns are split in to upper and lower patterns by substituting 1 for +1 to get upper binary pattern and 1 for -1 for lower binary pattern in both the cases 0 for 0s.

web sites and facial expression analysis useful to identifying the moods of a person to analyze the situation in many real world applications like medical, military, entertainment, crime etc.

- Directional Local Patterns are recommended to textural feature extraction ²⁸ for facial expression recognition and also mining the facial expressions to avoid the indiscriminant patterns.
2. local patterns are generated from the ¹⁹ low level features such as color, texture and shape. Textural pattern splay an imperative role to extract the local information like edges, texture of surface etc. Local patterns have been calculated from relationship of the pixel values of every pixel like LBP, LTP are calculated base on the first order calculation (difference) shown in Fig. 1 and Fig. 2. local binary patterns are proved better for face recognition but LBP is suffering from discrimination as shown in Fig. 3 (will get the same patterns for two cases) of pixel intensity values. Proposed work overcome this problem by dividing the range of differences based threshold value.
 - Classify and generalize the decision making process using suitable selection of algorithms such as machine learning algorithms and deep learning algorithms for facial emotional expressions to reduce the semantic gap without ambiguity.
 3. Retrieving the feature extraction is the prominent step in image retrieval

Figure 3: Example for generating same LBP (00100111) pattern for both textures with large and small intensity values

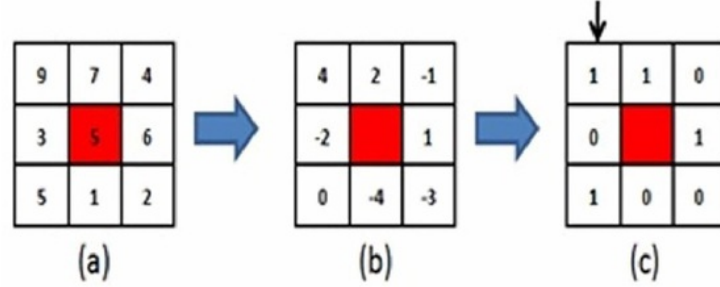


Figure 4: Query image (top left) feature images of Local Binary Pattern (LBP), Uniform LBP, Circulated LBP, Local Ternary Pattern (LTP), Directional Binary Code (DBC), Gabor filtered Transform (GT), LGMMEPOP (Local Gabored Magnitude Maximum Edge Positioned Octal (8) Patterns), LGSMEPOP (Local Gabor filter Signed greatest Edge Positioned Octal Patterns), and proposed method LDSMP (left side top corner image is query image)

that will be done by pattern generation as shown in Fig. 4 using different patterns. Furthermore, the next important step is classification of images like for our work expression classification i.e. happy, surprise, sad, disgust, angry, neutral etc. for this machine learning is proved better but still there is a gap so, we would like to enhance the usage of combinational algorithms and also applying deep learning algorithms to get better results compared to earlier.

- To improve the Facial Expression Recognition Rate, Precision and Recall to get better results in different applications.

The salient contributions of this thesis are as follows:

1. A Systematic Literature Review (SLR) on energy efficient data center management techniques (see Chapter 2).
2. A Modified Discrete Particle Swarm Optimization (MDPSO) approach for energy-aware virtual machine allocation and selection in cloud data centers (see chapter ??).

3. Thesis Organization

This thesis consists of 7 chapters including an introductory and a concluding chapter followed by Appendices. Content of this thesis can be broadly divided into 5 categories: literature review of the area, novel algorithms for dynamic VM placement and selection, novel algorithms for data center energy demand prediction, analysis of data centers metrics and evaluation of best practices for sustainable data centers as shown in Figure 5. The content of each of these chapters is summarized as follows:

Figure 5: Thesis Organization

Chapter 1 provides the motivation and importance of improving the energy efficiency in data centers. This chapter begins with the basics of data centers and discussion of energy efficient data center management strategies that include optimal VM placement and selection, demand forecasting, etc. Further, it presents the problem statement, objectives, and contributions.

Chapter 2 presents a literature review on energy efficient data center management techniques for data centers. To identify open challenges in the energy efficient virtual machine placement and selection and to facilitate further advancements, it is essential to synthesize the research in this area conducted to date. This chapter presents a literature review on the virtual machine placement and consolidation using soft computing techniques and applications of machine learning algorithms to monitor data center operations.

Chapter 3 presents three novel approaches for energy efficient virtual machine placement and a novel virtual machine selection mechanism for cloud data centers.

Technique 1: We describe a Modified Discrete Particle Swarm Optimization (MDPSO) approach.

Technique 2: Taking the recent advances in multi-core architectures, we develop a parallelized optimization algorithm called Interactive PSO-GA (IPSOGA).

Technique 3: Inspired by the imitating behavior of humans, we developed an Imitation Based Optimization (IBO), a swarm based approach for virtual machine placement. The first part of this chapter is published in **Soft Computing, Springer** [?].

Chapter 4 presents the following machine learning approaches for forecasting data center energy demand.

Technique 1:

Technique 2:

Chapter 5 presents ¹⁵ an analysis of metrics that are commonly used in data centers, starting from the power grid and going all the way up to the service delivery. Our work on analysis of metrics is published in **IEEE Transactions on Sustainable Computing** [?].

Chapter 6 describes ¹⁴ a set of best practices to improve the energy efficiency of the data centers which spans the categories of Energy Efficiency, Cooling, Air and Thermal management, Greenness, Storage, and Networks. The chapter provides efficient alternatives in daily operations of the data centers and costs saving opportunities. This chapter is broadly based on the contents of our paper that is accepted in **IT Professional, IEEE** [?].

Chapter 7 summarizes the contributions of the thesis and outlines the future directions.

4. abstract

Over the last two decades shared and stored multimedia data are growing. Retrieving an accurate image has become a key challenge yet to be solved. we can solve this problem using texture patterns that reduce the gap between the actual image over the user expectation instead of using other low-level features. This chapter reviews some of the existing approaches and the recent achievements in different directions of the textural areas in CBIR. We present recent methods for collect features extraction through texture analysis, numerical illustration and similarity measurement. Further, some research issues arising out of the review of existing methods are discussed in comparisons of textural patterns and concluded with a few recommendations based on generic survey.

5. Introduction

The-state-of-art escalation in the digital data production steadily due to the dominant use of internet and digital equipment in various fields such as medical [1, 2], entertainment, education, media, online business etc. becoming by keywords. This makes the system cumbersome to manage the abundant data is and human annotations as if in text- based systems. Therefore, here is a tremendous call for an efficient system to retrieve the precise images from the massive database rather than labels. Today Content based image retrieval (CBIR) system is the most well-known system for some applications, CBIR consists the important and essential steps such as feature extraction, relevance feedback, similarity measurements etc., and here feature extraction is the most prominent step in pre-processing that depends on the technique make use of extract the features from the only image like local data as color, texture, shape, human faces etc., further features are categorized into local features such as color features, layout, shape features and texture [3, 4] and high-level features such as faces, biometric, neural networks etc. To retrieve an accurate image with the help of one and only feature is arduous due to the probability of user taking photographs in any direction like several regions which include random

direction of capturing of image, optical device, uneven illumination and that of posing expressions, relevance feedback etc. [5, 6] so the system demands the combination of two or multiple features and filtering process. A general and upgraded survey is typified in the further sections.

6. Review of Local Textural Patterns for Facial Feature Extraction

The section presents the comprehensive survey on the local patterns such as LBP, LTP, LTRP etc. texture analysis and retrieval are important and to be in a tight corner in the field of CBIR. Textures are most useful in retrieving of tiles, facial expressions, fabric, clouds, animal skin etc.

Rui et al. [7] presented a survey on the image feature representation and extraction, multidimensional indexing, and system design. Moghaddam et al. [8] have improved the Gabor wavelet correlogram (GWC) for image indexing and retrieving and address the redundancy problem [8]. Further they proposed evolutionary group algorithm to optimize the weights which improve the evaluation measures [9]. Ojala et al. [10] used the G statistic metric to compare feature distributions and they derived the feature distribution using local texture operator on texture image. Ying Liu presents and analyzes high level features for CBIR such as machine learning tools, object ontology, semantic template, and neural networks to reduce the semantic gap (n.d.). Zhao et al. [11] developed dynamic texture for face recognition with facial expressions using the volume local binary patterns (vlbps). Lei et al. [12] used local binary pattern analysis to find the neighboring relationship and face representations are developed by convolving the face image with a Gabor filter bank. Chen et al. [13, 14] developed a fuzzy logic approach and color representation based on clustering in a given region. Ojala et al. [15] perform evaluation of the state of the art texture measures and local binary patterns (lbps) for texture retrieval. Zhang et al. [16] proposed high order LDP to retrieve the more required information and used several spatial relationships found in a given segment. Subrahmanyam et al. [17] combined local maximum edge binary patterns with Gabor transform. Amalgamation of color

and texture features used for feature extraction from an image in CBIR system that extended to retrieve sub images [18]. Majumder et al. [19] developed a deep neural network for automatic facial expression recognition that consist of autoencoders and classifier.

Local binary patterns (LBP) is a type of visual descriptor used in face recognition. The face image is divided into small regions and apply LBP to these local regions to extract local descriptor and finally combining all these local LBP features will give the global feature histogram [20]. Zhao et al. [11] modeled textures with VLBP, combining motion and appearance and co-occurrences of lbp operator on orthogonal planes. High-order Local Derivative Pattern(LDP) for face recognition and local binary patterns(LBP) to detain the more feature than that of the first-order derivatives [16].

References

- [1] P. Mitra, C. Murthy, S. K. Pal, Unsupervised feature selection using feature similarity, IEEE transactions on pattern analysis and machine intelligence 24 (3) (2002) 301–312 (2002).
- [2] Y. Zhang, M. Brady, S. Smith, Segmentation of brain mr images through a hidden markov random field model and the expectation-maximization algorithm, IEEE transactions on medical imaging 20 (1) (2001) 45–57 (2001).
- [3] Y. Deng, B. Manjunath, C. Kenney, M. S. Moore, H. Shin, An efficient color representation for image retrieval, IEEE Transactions on image processing 10 (1) (2001) 140–147 (2001).
- [4] B. S. Manjunath, J.-R. Ohm, V. V. Vasudevan, A. Yamada, Color and texture descriptors, IEEE Transactions on circuits and systems for video technology 11 (6) (2001) 703–715 (2001).
- [5] F. Jing, M. Li, H.-J. Zhang, B. Zhang, Relevance feedback in region-based image retrieval, IEEE Transactions on Circuits and Systems for Video Technology 14 (5) (2004) 672–681 (2004).

- [6] Z. Su, H. Zhang, S. Li, S. Ma, Relevance feedback in content-based image retrieval: Bayesian framework, feature subspaces, and progressive learning, *IEEE Transactions on Image Processing* 12 (8) (2003) 924–937 (2003).
- [7] Y. Rui, T. S. Huang, S.-F. Chang, Image retrieval: Current techniques, promising directions, and open issues, *Journal of visual communication and image representation* 10 (1) (1999) 39–62 (1999).
- [8] H. A. Moghaddam, M. Saadatmand-Tarzjan, Gabor wavelet correlogram algorithm for image indexing and retrieval, in: 18th International Conference on Pattern Recognition (ICPR'06), Vol. 2, IEEE, 2006, pp. 925–928 (2006).
- [9] M. Saadatmand-Tarzjan, H. A. Moghaddam, A novel evolutionary approach for optimizing content-based image indexing algorithms, *IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics)* 37 (1) (2007) 139–153 (2007).
- [10] M. Pietikäinen, T. Ojala, Z. Xu, Rotation-invariant texture classification using feature distributions, *Pattern Recognition* 33 (1) (2000) 43–52 (2000).
- [11] G. Zhao, M. Pietikainen, Dynamic texture recognition using local binary patterns with an application to facial expressions, *IEEE Transactions on Pattern Analysis & Machine Intelligence* (6) (2007) 915–928 (2007).
- [12] Z. Lei, S. Liao, M. Pietikainen, S. Z. Li, Face recognition by exploring information jointly in space, scale and orientation, *IEEE transactions on image processing* 20 (1) (2010) 247–256 (2010).
- [13] Y. Chen, J. Z. Wang, A region-based fuzzy feature matching approach to content-based image retrieval, *IEEE transactions on pattern analysis and machine intelligence* 24 (9) (2002) 1252–1267 (2002).
- [14] Y. Chen, J. Z. Wang, R. Krovetz, Clue: cluster-based retrieval of images by unsupervised learning, *IEEE transactions on Image Processing* 14 (8) (2005) 1187–1201 (2005).

- [15] T. Ojala, M. Pietikäinen, D. Harwood, A comparative study of texture measures with classification based on featured distributions, *Pattern recognition* 29 (1) (1996) 51–59 (1996).
- [16] B. Zhang, Y. Gao, S. Zhao, J. Liu, Local derivative pattern versus local binary pattern: face recognition with high-order local pattern descriptor, *IEEE transactions on image processing* 19 (2) (2009) 533–544 (2009).
- [17] M. Subrahmanyam, R. Maheshwari, R. Balasubramanian, Local maximum edge binary patterns: a new descriptor for image retrieval and object tracking, *Signal Processing* 92 (6) (2012) 1467–1479 (2012).
- [18] S. B. S. Murthy, G. Varaprasad, Detection of potholes in autonomous vehicle, *IET Intelligent Transport Systems* 8 (6) (2014) 543–549 (2014).
- [19] A. Majumder, L. Behera, V. K. Subramanian, Automatic facial expression recognition system using deep network-based data fusion, *IEEE transactions on cybernetics* 48 (1) (2016) 103–114 (2016).
- [20] T. Ahonen, A. Hadid, M. Pietikainen, Face description with local binary patterns: Application to face recognition, *IEEE Transactions on Pattern Analysis & Machine Intelligence* (12) (2006) 2037–2041 (2006).

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