

Variants of Local Binary Pattern: A Review

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Abstract

In everyday life, image data, such as information, processing and computer vision, play a significant role in many applications; such as image classification, image segmentation and image retrieval. A preferred attributes that has been applied in a lots of picture applications is texture. This was forming an image using an array of pixels. Texture played a significant part in image segmentation and image detection and retrieval. In addition, ranked the classifications of the texture then local binary pattern are coming. The LBP method seemed to work very effectively in real time. In the LBP method, comparing the values of the central pixels with the values of the neighbouring pixels and to attribute the binary values on these values. In this paper providing an overview for the local binary model and their benefits.

Keywords: Local binary pattern, texture classification, facial recognition, histogram

1 Introduction

The world is evolving rapidly, with digital technologies such as social media and the photo-sharing platform rapidly developing and becoming increasingly popular. Millions of pictures are taken every day with different views and uploaded to different cloud services as well as downloading from the cloud. For an effective search of the images in the huge database, this is possible because of the indexing of the images, this process was known as image data retrieval [1]. When we talk about retrieval, there are two kinds of retrieval, text-based image retrieval and content-based image retrieval (CBIR).[2] The CBIR system is most widely used domains for recovering digital information. Designing an effective and accurate CBIR method in images is the primary topic for the researcher's perspective. Where the researcher wants to work on the theme of recognising forms and using artificial intelligence working for facial expression. The CBIR receives the image per user request and then uses a descriptor to retrieve the query image characteristics. To obtain the most similar image, the search image is compared to the entire image database [1] and the most similar images in the database are selected for transmission to the user. CBIR are divided into colour, texture and shape. In this article using local binary models and their strains, we refer to texture and facial classification.

2 Texture Classification

Texture is a fundamental exterior characteristic of all natural surfaces and is pervasive in natural images. The classification of textures plays an important role in the recognition of patterns and computer vision.[1] Various new methods for classifying textures have been proposed over the past thirty years. Many applications represent the texture classification, like facial recognition, analysis and understanding of medical images, industrial inspection, and texture classification.[3] It analyses the pixel intensities of a picture regardless of the color distinguishes itself by the texture feature. Various images processing having the properties of finesse, grossness, depth, regularity, many more associated with the texture.



3 Local Binary Pattern (LBP)

Local binary model (LBP) was simply to convert pixel values into their binary code and compute their weight by comparing the central pixel value and their neighborhood values. When comparing which is less than the central value assign the value of binary zero and which are more or equal to this then assign the binary value one. It has a higher precision rate and is very efficient to label pixel values. LBP being popular because of its simple calculation in different texture descriptors.[2]

It's very classical approach for differing structural and statistical models in the classification of textures. LBP has a property when it comes to real-world applications, its robustness to the resulting monotonous grey scale changes caused, like shade and blur and changing brightness. Another important property is its computer simplicity, which can analyse images in difficult settings in real time. [2] LBP has been applied in various areas of image processing: remote sensing, image recovery, fingerprint recognition, facial image analysis, motion analysis and environmental modelling. Although significant progress has been made, the majority of LBP variants still have significant limitations, mainly noise sensitivity.[3]

In the LBP method, comparing the values of the central pixels with the values of the neighbouring pixels and to attribute the binary values on these values, Thresholding does in the vicinity 3 x 3 of each pixel with the central value and considering the outcome as a binary number. Histogram of these 28 = 256 different tags can then serve as a textural descriptors. This operator, used in conjunction with a simple local contrast measurement, performed very well in the unsupervised texture segmentation [3]. After this, numerous related approaches were developed for the segmentation of texture and texture of colors.

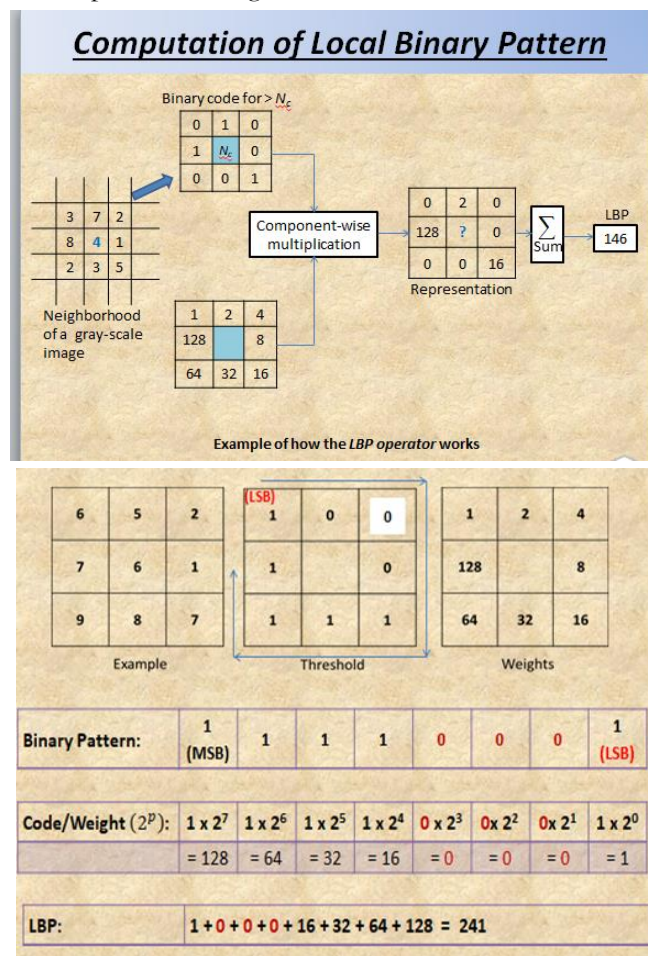


Fig. 1. Example of a Local binary pattern. (Calculation technique)

4 LBP Variants

In 2016, Ravi Kumar Y B [4] introduced Local Binary Pattern (LBP) of an input image with Gabor filter and a new technique for extracting non uniform Local Binary Pattern from an input image. In the technique, more finely textured details which are hidden in the input image can be extracted from non-uniform LBP. This gave better results than uniform LBP. In the method, Gabor filters are combined with non-uniform LBP instead of uniform LBP to help in understanding textural similarity of input image. Some uniformity in the extracted data from an input image is converted to a non-uniform LBP. This helps in getting more finely textured details of an input image. There are drawbacks of using individual face descriptors like yielding low percentage of results and extracting less information in the input image by extracting face features. New techniques are employed and analysed to measure the facial similarity among relatives and to increase the model capability and accuracy over a dataset.

A new face recognition technique based on LBP was proposed by Shu.Liao[5] which gave the highest recognition accuracy in low image resolution and normal environments. The novel contributions made by the proposed approach are: (i) elongated neighbourhood distributions (ELBP) which are anisotropic structures of the facial image are captured effectively as compared to conventional LBP. (ii) AMDGM (Average Maximum Distance Gradient Magnitude) is proposed which embeds grey level difference information between reference and neighborhood pixel in each ELBP. (iii) AMDGM and ELBP features are complement of each other.

A feature description algorithm based on multi resolution fusion and weighted neighbor contribution is proposed by Hui Zeng[6]. Weighted neighbour contribution strategy is designed by sampling point's neighbour based on which the WNCCS-LBP (Weighted Neighbour Contribution Centre Symmetric LBP) is constructed. To solve stability of feature regions under different resolution, a multi resolution fusion strategy is presented. Combination of CS-LBP and WNCCS-LBP, MFCS-LBP (Multi resolution Fusion Centre Symmetric LBP) is presented based on the strategy of multi resolution fusion.

Bing Yang,[7] In this report, for textural classification, we applied an easy, optimal and multi-resolution descriptor - Noise Tolerant and Binary Rotation Invariant. While staying robust to radiance variations, rotationally changes and noise, here our suggested descriptor, very solid and simple to construct. To draw near, we are developing new and easy to use approach we Computation of the pre-binary mean - for calculating a local binary descriptor based on the traditional LBP addressing. As we know points are sampled in round adjacent manner, but by mean across several adjoining pixels in the circle we put the number of cells in a single and small LBP histogram sustained. Here, we do not consider pre-apprenticeship, no text on the glossary, and no regulatory elements to deal with the different databases.

Mahmood Sotoodeh, In this report[8], to explore discriminatory characteristics for the recovery of the colour picture we try to adopt for two approaches. Local textured descriptors provided, setup on Radial Mean Local Binary Design, are known as Color Radial Mean Local Binary Pattern and Prototype Data Model. As we know for texture classification, we applied Colour Radial Mean Local Binary Pattern which is a solid noise descriptor used to explore textural attributes of greyscale images. The Radial Mean finished Local Binary Design which is actuated at the color space channels for the first descriptor, independently. After that, chaining the histogram of the Color Radial Mean Completed Local Binary Pattern every channel's components to obtain the final descriptor. Afterward, to improve the performance of the applied technique, for characteristic weighting we can use the Particle Swarm Optimization algorithm.

Li.Liu [9], categorized a new texture descriptor which is Median robust extended LBP. This technique consists of comparing the median of the local image to the gross strength of the image. IT can capture macrostructure and microstructure by effectively comparing the median of the image on a universal

sampling design. An evaluation of the baseline data sets reveals the remarkable performance of MRELBP against cutting-edge algorithms.

Ying Liu(2019), in this paper, color areas and local binary design tailing classes used to express a counterfeit detection. An image is split into overlooking blocks. Localized binary design tailing classes are enumerated for every block. Lab color space is segregated into 16 areas which form the plane using a dimensional and b dimensional. Imbricating block with actual local binary design tailing class and color area going to search in similar block areas, hence they are sorted into various areas. At last, we try to analyses the areas in relation with multi-area and the same time the tempered area or portion analysis, and the tiny hole is engaged by morphologic procedure. Our technique has nice performance in that it evolved detection accuracy and decreases execution time beneath several challenging circumstances, which illustrated by our experiment result.

VARIANTS OF LOCAL BINARY PATTERN

Variants of LBP	DESCRIPTION OF DIFFERENT TYPES OF LOCAL BINARY PATTERN		
	Description	Application & dataset using	Advantages
Improved LBP	Combining LBP technology with Gabor filters.	Facial Analysis Kinface W	LBP with Gabor produces accurate results in relation to the individual features of the face.
Elongated LBP	To average the gradient amplitude of the maximum range, take the grey level difference between a reference pixel and the surrounding pixels	Facial expression ORL & FERET	Increased efficiency and ruggedness for automatic capture functions.
Median LBP	Comparison of the median image on a universal sampling design and capture of the microstructure and macrostructure.	Texture Analysis Outex	Situation without noise(Gaussian) and exhibits striking robustness.
Weighted Neighbour centre symmetric LBP	By taking N pixels evenly spaced on a circle, take the sampling point and mean gray values assign their weights and convert each weight into binary codes.	Texture Classification Corel	Improve robustness with image rotation and blurring when scaling changes.
Dominant CLBP	The dominant central pixel represents a grayscale of the textured picture and transforms into binary code by thresholding.	Texture classification CuRet	DCLBP is more effective and quieter than dlbp.
Pyramid based LBP[10]	Construct each frame pyramid level to extract the characteristic and enhanced for the face descriptor.	Face recognition ORL & FERET	Very efficient and robust for positioning variability.

Variants of LBP	DESCRIPTION OF DIFFERENT TYPES OF LOCAL BINARY PATTERN		
	Description	Application & dataset using	Advantages
BRINT LBP	When averaging before binary, the points are sampled in the circular neighbourhood.	Texture classification Outex	Effective, robust to add noise, illumination and invariant rotation and able to encode a large number of scales.
Blind LBP[11]	The images are divided into multiple regions with the same texture and colour in which similar block is looked for.	Forgery detection CMM data	Time consumption was lower due to reduced research has been improved.
CRMCLBP	Average radial pattern applied to the channel of the color space and obtained by concatenation of the histogram of the components of each channel.	Texture Classification Corel 10K	Creation of permissible image exchange seeking recovery speed and accuracy

Jinwang.Feng (2015), Suggested a new approach [12] in texture classification to extract image characteristics. This feature is obtained through the dominant modelling of the traditional model technique (LBP) operator, where the image rotation is more robust, to reduce the noise of gray scale changes and equalize the histogram. On the dominant Approach, the central pixels and local dominant pixels transform into their sign and their magnitude form, these serve to represent the local area of the texture image. The dominant center pixels represent the gray scale of the images, which are converted to binary code by a global threshold.

5 Conclusion

The local binary model takes not only because of their simplicity and computer complexity, but also for rotation invariance, scale invariance in the gray level and a few other advantages are considered. LBP was achieved various good results and frequently used in predicting and detecting image matching as well as car tracking, and biological image processing. In this article, the main idea of the LBP method is utilized for texture analysis and facial analysis and recognition. Here discussed various local binary model and its benefits to compare all models.

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