International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137

Volume – 02, Issue – 03, March – 2017, PP – 21-23

EFFICIENT AND FAST IMAGE SEARCHES USING HASH CODES

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Abstract: In emerging technologies, faster image retrieval is very important for manipulation of data and images. The existing systems does not allow for easy and faster access of images. This becomes problematic when the size and number of images are large. Image processing is a method to convert an image into digital form and perform some operations on it in order to get an enhanced image or to extract some useful information from it. For faster retrieval of images, image hashing can be used. The image hashing is the conversion of images into a unique identification codes. The hash codes pave way for faster and secure retrieval of images. The core idea is to effectively extract the rich semantics latently embedded in auxiliary texts of images to boost the effectiveness of visual hashing without any explicit semantic labels. To achieve the expected outcome, a unified framework is developed to learn hash codes by simultaneously preserving visual similarities of images.

Keywords: Hashing, Hash code, Image processing, Image retrieval, Image search.

1. Introduction

Image hashing is a technique for deriving a content-based compact representation from input image, called image hash, which has successfully been used in real applications, such as retrieving the image, authenticating the image, digital watermarking, copy detection of image, indexing of image, image quality assessment and multimedia forensics.

2. Image retrieval

The multimedia assets controlled by various sectors are increasing in a phenomenal range with the emerging multimedia technologies. The number of image and video datasets are also increasing which initiates the need for effective research methods for easy and faster retrieval of images and managing the visual data in a such way that easy retrieval is possible. Image content descriptors are useful in image retrieval. Image content descriptors may be visual features such as color, texture, shape, and spatial relationships, or semantic primitives.

2.1. Conventional methods

Conventional information retrieval which was solely based text. The approaches which are used for retrieval of textual information are also used for retrieval of images in many ways .A image or video always has always been a attractive way for conveying information rather than texts. The versatility of image data over text has made the amount of visual data to be large and it is still expanding at a faster rate. The visual data has special characteristics and because of that content-based image retrieval methods have been introduced. The image retrieval techniques should be a integration of low-level features and high level features of the image. The low level visual features include detailed perceptual aspects .The general conceptual aspects of visual data are highlighted in high-level semantic features. Although these two features have been in use, They do not increase the effectiveness or efficiency for retrieving the images or managing the visual data .Research have been done for combining these two aspects of visual data but the gap between them is still huge. Other approaches like intuitive and heuristic methods also do not yield the expected performance .The need for finding the correlation and managing to combine low-level features and high level features. The major challenge is to bridge the gap between visual features and semantic features.

3. Image Segmentation

At first image blobs are separated and then filtered binary images are converted into separate regions. The process contains three steps. The step one is to fill up the black isolated holes and removing the white isolated holes. Generally white isolated areas are smaller than the minimum face areas in training images. The white regions are left with reasonable areas by filtered images. The step two is to convert some integrated regions to separate faces. This can be done by Roberts cross edge detection algorithm. This algorithm uses Robert cross operator to perform 2-d spatial gradient measurement on an image in a simple and faster way. By this we get highlighted regions of high spatial gradients which correspond to edges. Then these highlighted regions are converted into black lines. These black lines are eroded to connect crossly separated pixels.

3.1. Non-negative matrix factorization(NMF)

Non-negative matrix factorization(NMF) is also known as non- negative matrix approximation. It results yielded makes the inspecting of matrices easier. It is a group of algorithms in multivariate analysis and linear algebra where a matrix V is factorized into (usually) two matrices W and H, with the property that all three matrices have no negative elements. Non-negativity is inherent in the data considered for many applications such as audio spectrograms. The NMF is only approximated numerically. NMF is used for feature extraction, computer vision, document clustering, chemo metrics, audio signal processing and recommender systems.

4. Edge detection

In 1986, Canny considered the mathematical problem of deriving an optimal smoothing filter given the criteria of detection, localization and minimizing multiple responses to a single edge. He described that these assumptions is a sum of four exponential terms [3]. He also stated that this filter can be approximated by first-order derivatives. Also Canny introduced the notion of non-maximum suppression. Given the pre smoothing filters, edge points are defined as normal points. In these normal points, gradient magnitude assumes a local maximum in the gradient detection.

4.1. Threshold and Link Hashing

fAt an image point, in order to decide whether edges are present or not threshold is applied. The lower the threshold value, the more edges will be detected. The result will be detected increasingly susceptible to noise and also to pick out irrelevant features from the images. In contrast, a high threshold values may miss subtle edges. This will result in fragmented edges [4]. In general, the resulting edges will be thick when edge threshold is applied to gradient magnitude image. Moreover some type of edge thinning post-processing is needed. When edges are detected with non-maximum suppression, by definition the edge curves are thin and the edge pixels can be linked into edge polygon. This can be done by edge linking (edge tracking) procedure. In order to handle the problem of appropriate threshold for threshold, a commonly used approach threshold with hysteresis is used. By this method, multiple thresholds can be used to find edges.

5. Color Segmentation Comparison

For face detection in color images, skin color detection is popularly used and is a very useful technique. There are many techniques for reporting locating skin color regions in the image given as input [5]. Although the input color image are in the RGB format, the color components in color space such as the HSV or YIQ are usually used in these techniques. The RGB components may be affected by lighting conditions, so it produces different results during different lighting conditions and face detection may fail. There are many color spaces but YCbCr is the component which saves the computation cost and computation time. In the YCbCr color space, Y component contains the luminance information and Cb and Cr contains the chrominance information. Therefore, the luminance information can be easily de-embedded.

5.1. Detection output

In the process of skin color detection, each pixel was classifies as akin or non-skin. This was based on its color components. Based on mean value, the detection window for skin color can be determined. The color segmentation can also be applied to a training image. Some non-skin objects are inevitably observed in the result ass their colors fall into the skin color space.

6. Proposed model

To meet both rotation robustness and good discriminative capability, efficient robust image hashing is used in the proposed model. This algorithm is based on ring partition and a non-negative matrix factorization (NMF)[2]. By ring partition, novel construction of secondary image is achieved. This secondary image is invariant to image rotation. This makes our algorithm resistant to rotation. MNF is an efficient technique for learning parts-based representation. The more information about local image content, an image hash contains, the more discriminative the image hash.

7. Advantages

- Is resistant to changes
- Is not easily corruptible
- Is fast, flexible, versatile and accurate.
- Does not take much overheads when computing.
- The results are discriminative.

8. Future Enhancements

Further the models may be extended in the future as web services to serve as global image search and indexing models and search engines thus making searches faster and less time consuming apart from lesser computation and communication overheads

9. Conclusion

A robust image hashing with ring partition and invariant vector distances, which has good rotation robustness and reaches a desirable discrimination. Since ring partition is unrelated to image rotation, our ring-based statistical features, extracted from the CIE color space, are rotation-invariant and stable. This leads to that our hashing can resist image rotation with any angle. An important contribution of our work is the observation that vector distance is invariant to commonly-used digital operations, which provides our hashing efficient compression while keeping our hash discriminative. As the hashing has good robustness and desirable discrimination, it can be applied to many applications, such as duplicate image retrieval and image indexing. Many experiments have been conducted for validating the efficiency of our hashing. The results have shown that our hashing can resist commonly-used digital operations to images, including rotation with any angle, reach desirable discriminative capability and be sensitive to visual content changes. ROC comparisons with some popular hashing algorithms have been also conducted, and demonstrated that our hashing is much better than the compared algorithms in classification performances between robustness and discrimination

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