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RESEARCH ARTICLE

IMAGE RECOGNITION VIA CODEBOOKS AND CONTOUR REINFORCEMENT

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ABSTRACT

This paper presents image recognition techniques which is widely studied by researchers with various methods such as the bag-of-visual-words model, Contour Reinforcement and LRSC. These features of images are followed by classifier training and evaluation. This paper presents two such methods for image recognition. When using codebooks technique for image recognition, local features are randomly selected to learn the codebook accordingly. We take input from user and classify the input on the basis of stored codewords in our codebooks. The test results demonstrate that by taking general and class specific codebooks with the images, we are ready to display the distinctions among various fine-grained classes. In our other method which is sketch-based image retrieval (SBIR) the most challenging part was to identify the similarity between a sketch and a picture. In order to overcome this drawback, we propose SBIR based salient contour reinforcement. We divide the image contour into two different types the global contour map and the salient contour map which is useful for searching the objects in pictures. Additionally, to support the two contour map a replacement descriptor is proposed specifically angular radial orientation partitioning (AROP) feature. It utilizes orientation info of the pixels of edges into contour maps to spot the spatial relationships. This AROP feature is economical and effective way to get false matches of native options between sketch and pictures, and may improve the retrieval performance.

Key words: Contour Reinforcement, Codebooks, Sketch based image retrieval (SBIR), Angular radial orientation partitioning (AROP).

INTRODUCTION

Development in the computer vision, mobile devices and internet have increased the demand for powerful and effective image retrieval techniques. As a typical problem image recognition is widely studied by researchers with various methods. In order to solve the specified problem two of such methods for image recognition is taken into consideration which is image classification using codebooks and sketch based image retrieval (SBIR).It represent images in a more discriminative way. Usually, local features are randomly selected to learn the codebook accordingly. Second, after the codebook is learned, each local feature is encoded accordingly with the learned codebook. This strategy works well for general image classification tasks.However, for the fine-grained classification task, there are more pieces of information that can be explored. In our other approach, we divide the image contour into two different types. The primary type is that the global contour map. The secondary that's referred to as the salient contour map is useful for searching the objects in pictures. Our AROP feature supports the two candidate contour maps in such economical and effective way to get false matches of native options between sketch and pictures, and may greatly improve the retrieval performance. The proposed method of codebooks uses codewords as the query which fulfil the user demands. It is difficult to precisely describe the content of the desired images using codewords when the user do not have the natural scene images and accurate textual descriptions to justify the search intention, there may be some difficulties in obtaining relevant images. To avoid these problems, the sketch-based image retrieval (SBIR) system is proposed. This system is more convenient for users, because the end user could simply draw a sketch and then use the sketch as the input for effective image retrieval. Hence For the above reasons, SBIR technology has become an active research area. SBIR methods uses is traditional draw-and-search systems, requires that the input sketch contains colour information and looks similar to a natural scene image. Although the research of these systems has achieved great progress, it is still not based on line drawings. Supported input is actually relatively thick coloured lines block. Additionally, this approach converts SBIR technology to CBIR technology. The user has to draw the sketch carefully and provide colours to make the sketch visually similar to the natural scene images. Then, CBIR fuses different features (such as shape, colour, and texture) together to perform a retrieval system. We used sparsely imperatives to model this relationship. Moreover, the incoherence with various codebooks furthermore, class-particular codebooks are together considered. In this paper the technique we proposed take input from user in the form of codewords and image and classify the input on the basis of stored codewords in our codebooks. The test results demonstrate that by taking general and class specific codebooks with the images, we are ready to display the distinctions among various fine-grained classes. In our other technique we proposed a SBIR approach using salient contour feature for the image extraction, which improve the accuracy

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by making the full use of contour and orientation. In order to solve the matching problem, we propose a novel angular radial orientation partitioning (AROP) feature. Compared with our preliminary work, there are some enhancements made in this paper. We enhance global and salient features for feature extraction by reinforcing the saliency map to improve the robust nature of SBIR. More experimental comparisons are conducted.

Literature Survey

The existing present systems include spatial pyramid matching for recognizing natural scenes categories by portioning the image into sub regions and generating histogram for the same. The spatial pyramid works efficiently rather than bag-of-visual-feature image representation (Yang, 2009). The ARP method based SBIR approach is first proposed in (Randomized). It refines the angular partitioning feature (Eitz, K. Hildebrand, 2011), using radial partitioning. The ARP feature is obtained by partitioning the image into $M \times N$ sectors, which uses the image center as the center of circles. N is the number of radius partitions and M is the number of angular partitions. The range of each angle is $\theta = 2\pi/M$ and the radius of successive concentric circles is □= R/N, where R is the radius of the surrounding circle of the image (Randomize). The contour is divided to $M = 8$ angular and $N = 4$ radials. Based on the obtained contour map of the original image, the corresponding edge pixel number in each sector is utilized to represent each sector. Randomized Visual Phrases for Object Search paper proposes a randomized approach to derive visual phrases in the form of spatial random partitions (Randomized Visual Phrases for Object Search).

This approach offers three benefits,

1. Provides robust local matching
2. Object localization is achieved which is better the sub image search
3. Allows a flexible trade-off between speed and accuracy by adjusting the number of partition times (Boiman, 2008).

This approach can also handle objects of different shape, size and orientation as well as cluttered backgroundsLearning Category-Specific Dictionary and Shared Dictionary for FineGrained Image Categorization (Ramirez, 2010), paper targets fine-grained image categorization by learning a category-specific dictionary for each category and a shared dictionary for all the categories. Such category-specific dictionaries encode subtle visual differences among different categories, while the shared dictionary encodes common visual patterns among all the categories. To this end, we impose incoherence constraints among the different dictionaries in the objective of feature coding (Ramirez, 2010 and Gao, 2014). In addition, to make the learnt dictionary stable, we also impose the constraint that each dictionary should be self-incoherent. Our proposed dictionary learning formulation not only applies to fine grainedclassification, but also improves conventional basic-level object categorization and other tasks such as event recognition (Zhang, 2013). Experimental results on five data sets show that our method can outperform the state-of-the-art scale invariant (Lowe, 2004), for distinctive fine-grained image categorization frameworks as well as sparse coding based dictionary learning frameworks. All these results demonstrate the effectiveness of our method.

Experimental Section

In our System, we are using general and class specific codebooks for storing different image datasets. While uploading the image in the codebooks, we are allowing the users to store the information related to the image in the form of codewords (reference keyword of each image). This codeword is used to classify and recognize the input image by comparing the input with stored general and class specific codebooks. Finally we display the resulting image on the basis of input given by the user.

The system architecture for the proposed method.

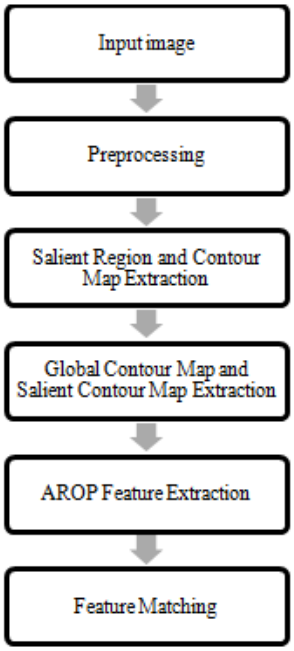

Fig. 1. Framework of our system

When users use the SBIR system, they mostly concentrate on finding the object in the sketch. In order to meet user requirements, the retrieval result of SBIR system should be the images that contain the same object or scene. In addition, they should be as simple as possible. For these purposes, we extract global contour map by reinforcing salient contour map.In a word, the global contour map can be used to find out the images that contain the same object and scene.

For performance evaluation we use precision of depth n defined as follows:

$$\text{Precision} = 1/z \sum_{m=1}^{z} \frac{1}{n} \sum_{1=1}^{n} \text{Rm (i)}$$

Where, Rm (i) is the relevance of the ith result for query m.
The PSNR functionimplements the following equation for the calculation of the Peak Signal-to-Noise Ratio (PSNR):

Decibels=20*log10 (1/ (sqrt (mean (mean (error_diff. ^2)))))
Peak signal-to-noise ratio is in decibels, returns a Scaler specified as per the image datatype. MSE mean square error is calculated. The representation of salient region and contour map feature is provided below. In our systems, we represent each image by AROP feature. AROP feature is an enhanced ARP feature. In angular radial orientation partition, there are two methods for radius partition.

a) Original Image **b) Salient Region**

c) Contour Map

Fig. 2. (a) The. Original image. (b) The salient region of the image. (c) contour maps

So, we first introduce the method of radius partition and then we introduce the AROP feature extraction. The ARP feature is obtained by partitioning the image into $M \times N$ sectors, which uses the image center as the center of circles where *M and N* is the number of angular partitions and radius partitions respectively.We extract the AROP features for the two types of contour maps: global contour map and the salient contour map. This local spatial information can narrow the scope of the match and enhance the accuracy rate.

RESULTS AND DISCUSSION

The problems mentioned for recognition of image is minimized by the novel approach proposed in this paper for fine-grained image classification by comparing code words with stored general and class-specific codebooks. The general codebook represents the universal information of all classes while each class-specific codebook encodes the distinctive character of each class. For the addressing of the SBIR (sketch based image retrieval), we first proposed two contour maps: global contour map and saliency map. The global contour map is used to filter the complex background and the saliency map is used to find the image of a common object. Then, we introduced an AROP feature that has higher performance between the sketch and profile based on two types of contours. In order to reduce the searching time, we computed the saliency map feature of similarity. We enhance global and salient features for feature extraction by reinforcing the saliency map in order to improve the robustness of SBIR. More experimental comparisons are conducted such as precision and peak signal-to-noise ratio (PSNR). Both of these classification experiments for fine-grained image are performed on several public image data sets and the results shows the effectiveness of the proposed method.

Conclusion

The encoded parameters can be made more consistent for fine-grained image representation. General codebook and a number of class-specific codebooks in combination with the encoding scheme is created. A novel fine-grained image classification method is proposed by comparing code words with stored general and class-specific codebooks. The general codebook represents the universal information of all classes while each class-specific codebook encodes the distinctive character of each class. To address the SBIR (sketch based image retrieval), we proposed two contour maps global contour map and saliency map. Then, an AROP feature is introduced that has higher performance between the sketch and profile based on two types of contours. In order to reduce the searching time, we filtered the complicated images using contour segment. Then, the saliency map feature's similarity is computed. The classification experiment is conducted on several public image data sets and the results show the effectiveness of the proposed method.

Future Scope

In future we can use various live image classification techniques that will enhance the recognition of image. The above mentioned live image classification techniques can be LRSC (low rank sparse coding), SIFT(Scale invariant feature transform), BoW(Bag of visual words), etc. The other proposed system can be evolved to create a databases of images of faces, any organization such as Police force can use the system to search and retrieve images of criminals or the government can use the system to keep tabs on targets. This will increase the optimization capabilities of our system as well as it will completely automate the image classification process.

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