A Survey: Image Indexing and Retrieval Using Automated Annotation

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Abstract: *As in today's world we are surrounded with lots of images. And to find a required image within set of images is a challenging task. Initially there were many techniques for image retrieval. So many research is also been done in this field with some limitations. Now to resolve those limitations we came up to Automatic Image Annotation (AIA) which helps in extracting features using techniques of machine learning. AIA is the process in which it automatically assigns labels to images.*

Keywords: *Automatic Image Annotation, Image Indexing, Image Retrieval, Segmentation, Feature Extraction.*

1. INTRODUCTION:

Automatic Image Annotation is also known as linguistic indexing or automatic image tagging. Automatic Image Annotation is a process by computer system which automatically assigns meta-data in the form of keywords to a digital image. The goal of AIA is to automatically assign some keywords to an image that can well describe the content in it. Given an image collection and a dictionary of keywords, a computer assigns keywords to each image automatically.

Automatic Tagging based on the tag prediction on processing the images and predicting the tagging on them based on their weight, dimensions sort of features but such kind of tagging can lack in accuracy but it is efficient in the case similar kind of image dataset. For Automatic Image Annotation many features extraction method and classifiers can be used to obtain good results. The parameter that is to be improved or enhanced into this proposed work is accuracy and it is been carried out by some better experiments with good results obtained from the image datasets used in this. In Image retrieval systems, Automatic object recognition and annotation are very important tasks to be performed.

Earlier, objects within images were annotated manually, but nowadays it not practical as abundance of information is available. Image annotation is a process in which computer system assigns a keyword to the object within the image. It provides better results than Content Based Image Retrieval (CBIR). As we know AIA assigns useful keywords to an unlabelled image. The main aim is to overcome the issue of semantic gap between the low level features and high level features.

2. AIA TECHNIQUES:

Automatic image annotation is a method in which it associates some keywords an the image, that will describe the content of the image and that too without human intervention. This task has been, and stills, the subject of many studies. There are several ways to deal with the problem of automatic image annotation. A recent review on automatic image annotation techniques is presented in [15]. Using machine learning methods from examples of annotated images, most automatic image annotation techniques aim to learn the relationship between keywords and visual features.

The learned relationships are then used to assign keywords to non annotated images. Automatic image annotation has been introduced in the early year 2000. The first works and efforts to reduce the semantic gap, such as [16, 17] have focused on providing mechanisms and methods for mapping low level features using global descriptors. More advanced approaches, such as [18, 19], are able to manipulate the categorization to more specific scenes. While using global or local visual descriptors, the approaches proposed in [6, 8, 12–14, 20, 21], consist in association of keywords with objects in an entire image while keeping the keywords classified on a list according to their posterior probabilities given the visual information. Another type of region based annotation approach is the task of generating the most specific correspondence between words and image structures [22]. The approaches proposed in which are based on the detection of objects or concepts, aim to build a set of specific concept.

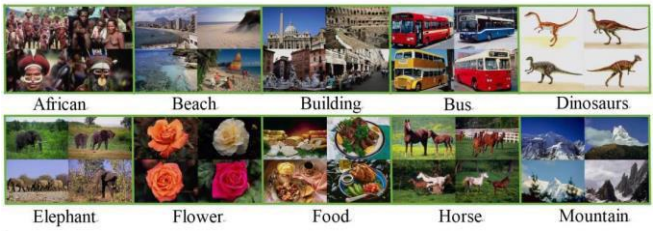


Fig.1

They identify and locate the concepts recognized in the processed images by predicting the label of each concept detected from the annotation vocabulary. Some approaches have addressed the problem of semantic annotation using supervised learning techniques. The formulation of the automatic image annotation as a supervised learning problem has been proposed in [14]. It consists firstly in performing a learning phase.

Therefore, Bayesian classifiers [17], Support Vector Machines, the multi instance learning [14] statistical models, k-NN, and artificial neural networks are often used to learn high level concepts (semantic content) from low -level features (visual content). Other approaches have tried to solve the problem more generally through unsupervised learning. Usually, these approaches use probabilistic models to explain the co-occurrence between image features and semantic labels. The authors in [11] proposed to use the model of Latent Dirichlet Allocation (LDA) and graphical models to learn a joint distribution model of keywords set and image regions.

In the same context, the authors in [13, 41] proposed to use Latent Semantic Analysis (LSA) and probabilistic Latent Semantic Analysis (PLSA) for image annotation. As stated in [42], to deal with a large semantic space consisting of a large number of categories of concepts, the classification process can be improved by the use of visual or semantic hierarchies. Several recent approaches have proposed to use hierarchical structures to solve the problem of dimensional scalability by using a large scale automatic image annotation.

All these categories of approaches are not optimal in general, but each one of them can be adapted and adjusted over a given image annotation problem. Most of them are based on the prior image segmentation into regions which are assumed to represent the objects contained in the image. These objects will be classified and annotated by the most suitable semantic concepts. However, these methods still suffer from some problems due mainly to the image segmentation that is not always obvious and evident. Indeed, due to the fact that segmentation algorithms use low level predicates to control the homogeneity of regions.

The segmentation results are not semantically compact. So the combination of different description and classification approaches with the fusion and grouping of adjacent regions can improve the accuracy of the image annotation system. The objects composed from several regions of different colors will be segmented by this way as one compact region easy to classify and annotate correctly.


OBJECT LABELS: TRACKS, TRAIN, CLOUD, SKY, TREES, SNOW, POLAR BEAR
SCENE LABEL: SCENE TRAIN, TRANSPORTATION SCENE POLAR BEAR, WILD LIFE, ARCTIC
Fig. 2. Examples of images and their annotation at object and scene levels.

3. ANNOTATION SYSTEM:

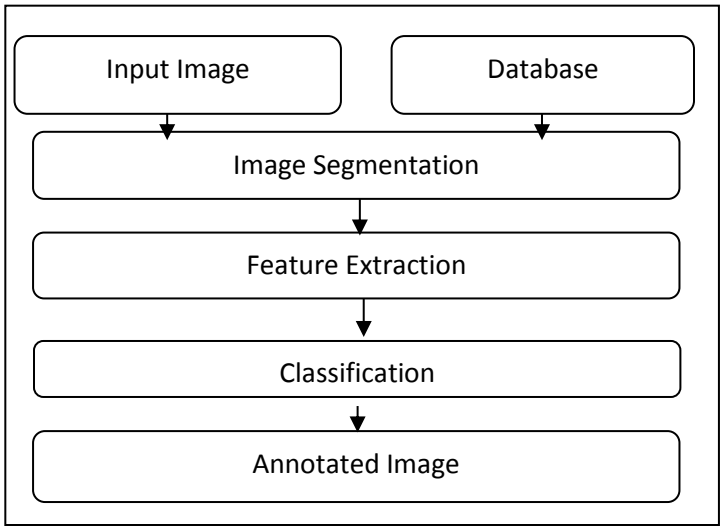
Annotation method is a type of multi class image classification. Typically, image analysis in the form of extracted feature vectors and the training annotation words are used by machine learning techniques to attempt to automatically apply annotations to new images. There are some tasks need to be followed for this annotation system.

3.1 Image segmentation

3.2 Feature Extraction

3.3 Image Classification and Annotation

Segmentation and classifier together need to be used for better and improved results, it is very important. The block diagram of the semantic image annotation system adopted in this work is shown in (Fig.1).



3.1 Image Segmentation

Usually, the features vector extracted from the entire image loses local information. Therefore, it is necessary to segment an image into regions or objects of interest and use of local characteristics. Image segmentation is a method that localizes and extracts an object from an image or divides the image into several regions. It plays a very important role in many applications for image processing, and still remains a challenge for scientists and researchers. So far, the efforts and attempts are still being made to improve the segmentation techniques. With the improvement of computer processing capabilities, there are several possible segmentation techniques of an image: threshold, region growing, k_means, active contours, level sets .

3.2 Feature Extraction

Feature extraction will be done through Haar cascade by extracting the Haar features of particular object. The original image will be captured into several parts that correspond to objects in a scene, the feature vector must be extracted carefully from the set of images to preserve the content representation of the entire image. Therefore, the feature extraction task can decrease the processing time. Not only it enhances the retrieval and annotation accuracy, but the annotation speed as well, since a large image database can be organized according to the classification rule and, therefore, search can be performed. In the feature extraction method, the representation of the image content must be considered in some situations such as: translation, rotation and change of scale. This is the reason that justifies the use of colour histograms, moments, texture and GIST descriptors for feature extraction method from the segmented image. All these features are extracted for all the images in reference database and stored with keywords in features database. For more precision and accuracy in the annotation system, they can be combined together and feed to the input of the classifier. This combination costs more time for training the classifiers due to the size of the resulted features.

3.2.1 COLOR-HSV.RGB
3.2.2 MIST
3.2.3 SHAPE
3.2.4 TEXTURE
3.2.5 HAAR-FEATURES

3.3 Image Classification and Annotation

The aim of classification is to allocate an object represented by a number of feature vectors into one of a finite set of classes from the reference database. In order to classify unknown patterns, a certain number of real-time images has been taken as training samples which are available for each class and used to train the classifier. The learning task is to compute a classifier or model that approximates the mapping between the input output examples and correctly labels the training set with some level of accuracy. This can be called the training or model generation stage.

After the model is generated and trained, it is able to classify an unknown instance, into one of the learned class labels in the training set. More specifically, the classifier calculates the similarity of all trained classes and assigns the unlabeled instance to the class with the highest similarity measure.

Therefore, image annotation can be approached by the model or the classifier generated and trained to bridge the gap between low level feature vectors and high level concepts; a function is learned which can directly correspond the low level feature sets to high level conceptual classes. There are several types of classifier that are used singly for

classification. Each classifier is found suitable to classify a particular kind of feature vectors depending on their characteristics. The neural networks, Support vector machines (SVM) and K_Nearest Neighbor classifiers are used together in this paper. Each classifier votes for one class. We obtain the final class of the object by combining the votes of each classifier.

4. CONCLUSION:

In this paper, techniques and approach is based on Haar-Cascade classifier and is used in this annotation system. This approach for annotation gives good result. This method and classifier used together to classify and annotate the input image. It assigns the keywords to the selected object within an image from the database. Experimental analysis has been done of this system for checking the performance. The experiment results are showing that the proposed system gives good results for image that are segmented. However, to increase the accuracy and precision image segmentation remains a challenge that needs more attention.

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RFERENCES:

1. M. Oujaoura, B. Minaoui, "A Semantic Hybrid Approach Based on Grouping Adjacent Regions and a Combination of Multiple Descriptors and Classifiers for Automatic Image Annotation1",ISSN 10546618, Pattern Recognition and Image Analysis, 2016, Vol. 26, No. 2, pp. 316–335. © Pleiades Publishing, Ltd., 2016.
2. Pranoti P. Manea and Narendra G. Bawaneb,"An Effective Technique for the Content Based Image Retrieval to Reduce the Semantic Gap Based on an Optimal Classifier Technique1",ISSN 1054-6618, Pattern Recognition and Image Analysis, 2016, Vol. 26, No. 3, pp. 597–607. © Pleiades Publishing, Ltd., 2016.
3. Jiajun Wu1, Yinan Yu2,Chang Huang2, Kai Yu, "Deep Multiple Instance Learning for Image Classification and Auto Annotation",©2015 IEEE.
4. Marina Ivasic-Kos a,n, MiranPobar a, SlobodanRibaric b,"Two-tier image annotation model based on a multi-label classifier and fuzzy-knowledge representation scheme",2015ElsevierLtd.
5. Bin Xu, Student Member, IEEE, Jiajun Bu, Member, IEEE, Chun Chen, Member, IEEE,"EMR: A Scalable Graph-based Ranking Model for Content-based Image Retrieval",IEEE Transactions on Knowledge and Data Engineering, VOL. 27, NO. 1, JANUARY 2015.
6. Jing-Ming Guo, Senior Member, IEEE, and Heri Prasetyo, "Content-Based Image Retrieval Using Features Extracted From Halftoning-Based Block Truncation Coding", IEEE Transactions on Image Processing, VOL. 24, NO. 3, MARCH 2015
7. Baoyuan Wu a, SiweiLyu b, Bao-GangHu a, QiangJi,"Multi-label learning with missing labels for image annotation and facial action unit recognition",2015ElsevierLtd.
8. Jing-Ming Guo, Senior Member, IEEE, Heri Prasetyo, and Jen-Ho Chen,"Content-Based Image Retrieval Using Error Diffusion Block Truncation Coding Features",IEEE Transactions On Circuits And Systems For Video Technology, VOL. 25, NO. 3, MARCH 2015.
9. Dhatri Pandya1, Prof. Bhumika Shah2,"Comparative Study on Automatic Image Annotation",International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 3, March 2014).
10. Mingbo Zhao a,b, Tommy W.S. Chow b, Zhao Zhang a,⇑, Bing Li c,"Automatic image annotation via compact graph based semi supervised learning",2014 Elsevier B.V.
11. Himali Chaudhari , Prof D.D.Patil,"A Survey on Automatic Annotation and Annotation Based Image Retrieval",(IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014.
12. Ashitha Jose,Sreekumar K.,"Optimization Methods used for Automatic Image Annotation/Retrieval: A Survey",International Journal of Computer Applications (0975 – 8887) Volume 132 – No.12, December2015.
13. Adnan Siddiqui,Nischcol Mishra,"A Survey on Automatic Image Annotation and Retrieval",International Journal of Computer Applications (0975 – 8887) Volume 118 – No.20, May 2015.

14. Dong ping Tian1,Baoji, Shaanxi,"A Survey of Refining Image Annotation Techniques",International Journal of Multimedia and Ubiquitous Engineering Vol.9, No.3 (2014).
15. Tuhin Shukla,Nishchol,"Automatic Image Annotation using SURF Features",International Journal of Computer Applications (0975 – 8887) Volume 68– No.4, April 2013.
16. Reena Pagare,Anita Shinde,"A Study on Image Annotation Techniques",International Journal of Computer Applications (0975 – 8887) Volume 37– No.6, January 2012.
17. NARENDRA GALI1 ,B.VENKATESHWAR RAO2,"Color and Texture Features for Image Indexing and Retrieval",International Journal of Electronics Communication and Computer Engineering Volume 3, Issue (1) NCRTCST, ISSN 2249 –071X,2012.
18. Dengsheng Zhang n, Md.MonirulIslam,GuojunLu,"A review on automatic image annotation techniques",& 2011 Elsevier Ltd.
19. Antonio Torralba, Bryan C. Russell, and Jenny Yuen,"LabelMe: Online Image Annotation and Applications",vol.98, No. 8, August 2010 | Proceedings of the IEEE.
20. Zhixin Li1, Zhenjun Tang1, Weizhong Zhao2, Zhiqing Li2,"Combining Generative/Discriminative Learning for Automatic Image Annotation and Retrieval",International Journal of Intelligence Science, 2012, 2, 55-62
21. Gustavo Carneiro, Antoni B. Chan, Pedro J. Moreno, and Nuno Vasconcelos, Member, IEEE,"Supervised Learning of Semantic Classes for Image Annotation and Retrieval",IEEE Transactions On Pattern Analysis And Machine Intelligence, VOL. 29, NO. 3, MARCH 2007.