Review Article

An Overview: Automatic Image Annotation of Natural Scene Images Using Image Processing Techniques

Prof Varsha S Jadhav* and Dr Jagadeesh D Pujari

Department of Information Science and Engineering (ISE), SDM College of Engineering and Technology, Dharwad, Karnataka, India

*Corresponding Author: Prof Varsha S Jadhav, Assistant Professor, Department of Information Science and Engineering (ISE), SDM College of Engineering and Technology, Dharwad, Karnataka, India

Abstract

   The aim of this review article is to provide an idea of the research that is focus on automatic image annotation techniques. Nowadays, several and more images are available on the internet, However, to find an essential or required image for an ordinary end user is a very important and most challenging task. The major problem associated with automatic image annotation is closely related to that of content-based image retrieval method and process and many researches on different image retrieval methods are employed and carried out in the past several years. All the methods uses. Traditional methods focused on content based image retrieval. However, there have been widespread current studies shows that there is a semantic gap connecting content based image recovery and image semantics which are understandable by all the end-users. The typical method of bridging the semantic gap is through the technique of the automatic image annotation (AIA) and which analyzed by extracting extracts semantic features using machine learning tools and techniques. In this review we have focused on latest development in the process of image retrieval and provide a comprehensive survey on overview on automatic image annotation.

   Keywords: Automatic Image Annotation (AIA); Techniques; Image retrieval; digital images; CBIR, Segmentation

Introduction

   Automatic image annotation has been studied broadly by researchers for years. AIA is outlined because the method by that AIA system mechanically assigns data within the kind of text or key word or description to a digital image.

   Several methods are employed in image retrieval systems to arrange, modify and find pictures of interest from web information. These tasks which may be thought to be a sort of multi-class image classification with variety of categories which may be equal with some vocabulary, AIA can be observed also as a multi-class object recognition challenge task and also open challenge in computer vision. The importance of these focused researches has magnified with the expansion of the digital pictures with huge collections. An important quantity of digital footage is generated every year associate degreed therefore there's a necessity for an economical image management system that's capable to quick looking, browsing by topic or tagging images. Content-based Image Retrieval (CBIR) has been considered for several years. The accuracy of CBIR systems continues to be not enough for current desires. Searching for images by content remains a difficult and very also a challenging task. A several text retrieval system can be employed for locating and connected documents which contains several keywords. Several search engines or tools like Google can also offers the possibility to search for specified images using different approach which includes surrounding text and file name. This image search is predicated on text retrieval as a result of the content of the image is neglected. For such reasons which are typically search performed doesn't yield desired or satisfactory results. In order to avoid this downside the researchers are trying to find in our own way to looking for pictures.

An attainable approach which is a matter description from the image or a picture and then uses text retrieval for desired one. A different approach is to mix two modalities which is an example of text and other visual options for the compartmentalization of pictures. Image retrieval supported text is typically referred to as Annotation based mostly Image Retrieval ABIR Method. These ABIR Methods also pose some draw-backs. The Researchers focusing on CBIR have also identified several limitations. The limitation is that ABIR needs manual image annotation that is time intense and another limitation is that human annotation is subjective and generally it's troublesome to explain the image contents by different ideas.

An AIA system can also solve some of the limitation. The other limitation remains always as a general question and a unresolved drawback for pc vision. AIA is observed as the leading edge of various scientific fields including image analysis, machine learning and also on information retrieval. Usually image analysis relies on feature vectors and also the coaching of annotation ideas relies on machine learning techniques. Automatic annotation of recent pictures is feasible solely once the training section is completed. Science with rapid development in the area of digital cameras, we have witnessed great interest and promise in automatic image annotation as a hot research field [1]. The Image Annotation process are required to use machine-driven wherever the sturdy tagging is needed to stay annotate image for creating it economical to supply higher results whereas querying those image annotated information Image annotation task consists to assign a set of semantic tags or labels to a novel image based on some models learned from certain training data [2].

Automatically assignment keywords to photographs is of nice interest because it permits one to index, retrieve, an understand large collections of image data. Many techniques are planned for image annotation within the last decade that provides affordable performance on commonplace datasets [3,4] the photographs comprise valuable discourse info set in nearby region or within the image itself. This discourse data is nothing however the knowledge associated with or in context of image which was used for compartmentalization the pictures and additionally in image retrieval system. A picture is a resemblance of past memories which is cherished by every individual all their life [5]. Automatic image annotation is playing crucial role in modern science, over the past years the numbers of pictures being captured and shared to the public domain have grown exponentially. There are many factor are accountable for such a expansion. The digital cameras authorize persons to click, arrest, revise, accumulate and distribute high superiority images with great simplicity compare to the old film cameras. Now with low price of memory and fixed disk drives. And also the attractiveness of social network sites like Face book, have known the consumer an supplementary interest to contribute to photos online with their associates across the world and with this rapid growth, arises the need to perform effective exploitation (like penetrating, retrieval etc...) on images and essential for relevant image data.

Several search engines retrieve relevant pictures by text-based looking out while not mistreatment any content data. However, recent investigation indicates there's a linguistics gap between content based image recovery and picture linguistics perceivable by humans. Semantic gap may be delineating as the deficient in of chance between knowledge which extract from the visual information and therefore the interpretation that a similar data have for a user in a particular context or situation [5,6]. Automatic image annotation [AIA] is the process by which a computerized system which is automatically designated metadata in the form of text or keywords to a digital image [6,10]. Automatic Image Annotation is also known as linguistic indexing or automatic image tagging. This application of computer performance is used in image retrieval systems to systematize and recognize position images of interest from a database.

Annotation techniques are regarded to distinguish or categorize as a multi-class image with number of large classes as large as terminology size. In general the image analysis in the form of characteristic machine learning technique can be practical to words that are preparation annotation to apply robotically annotation to novel or intended images [6,7]. Automatic image annotation has been a challenging research thrust area in recent years which is due to its potential impact on both image understanding and semantic based image retrieval. In future the number of images being captured and shared online will be developed elevated or exponentially.

The descriptions which are captured area afterward accessed for the aim of looking out, categorization and recovery process. Hence these images must be labeled with suitable key terminology phrases or words so that the requisite action process can be performed very proficiently. Automatic Image classification is a

method which connections satisfactory keywords from a known set of words or phrases supported by the association to the content of the image [8,9]. Automatic image annotation technique can be based on a variety of substance which can either it can visualize or observe the images different methods such as texture bases, color strength or faces involved into the images [2,11]. Next the features are grouped into the cluster and then annotation is done based the category.

Figure a

Figure b

The biggest challenge faced in image annotation method is how we can contact the low-level features and high-level linguistic concept both collectively. In the Automatic image annotation the preferred image feature are extracted by color, surface, nature and which will be used to generate blobs-token by alignment in to a comparable segmentation and then analysis between several keywords and along with blob-tokens to unseen semantic. The diverse automation methods which are paying attention to annotate the datasets and how they are useful in classify to query a process data and to release the uncertainty work load will condense the process time. It compares diverse annotation techniques on various parameters like segmentation, feature extraction technique and also clustering etc. Furthermore several numbers of models have been rectified by this approach. Image Annotation or labeling on the image routinely required its indexing which uses various bases, the linguistics is the simplest way to differentiate anywhere they have specific. Automatic linguistic indexing of images is important to content-based image recovery and PC object based detection, the statically replica specify about the auto annotation of the images [9,11].

Automatic classification which is based on the tag calculation on processing the images and predicting the tagging on them based on their burden, proportions sort of facial appearance but such variety of category can be lack in accurateness but it is proficient in the case comparable type of image datasets. An important amount of digital pictures are being generated every year and thus there is a urgent need for an efficient image organization or system that is capable to fast searching, browsing by topic (e.g. using Google Picasa or tagging images (e.g using Flikr Content-based Image Retrieval (CBIR) has been studied for several years. A text recovery system may be used for specifying allied documents from a huge quantity of documents containing keywords. Search engines like Google and other web browser offers the likelihood to go looking for pictures exploitation encompassing text and file name.

In the literature search it is revealed that there are numerous challenges such as long computation time, lack of redundancy, static explanation and several mapping issues, it is important to improve, overcomes the challenges and provide a best solution in less time. Novel automatic image annotation methods along with image retrieval which are basically designed for tagging the web images and retrieving them. It can extract the contextual information from resources or web pages. Then this type of information which is text processed to extract the important keywords from the document are very essential. Then each of word which will be assigned to a mass depending on its incidence in the specific document. Then the terms with the lowest weights are selected and allotted to the respective corresponding image.
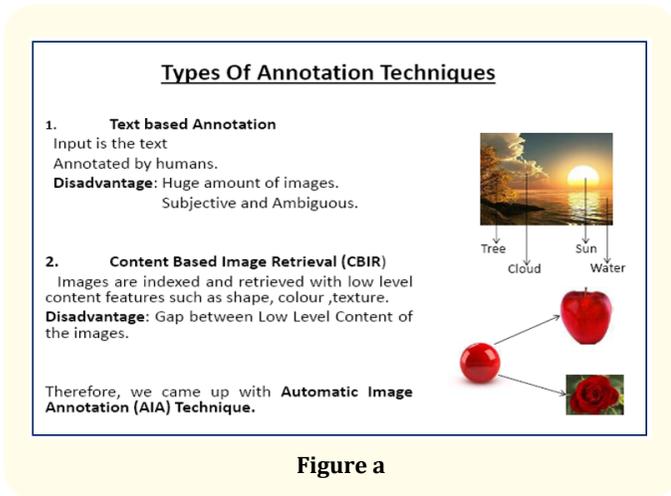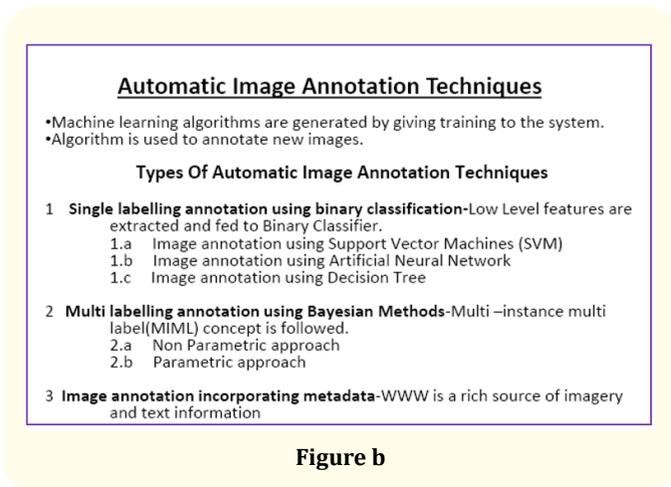
This point of reference also contains a huge size image collection which comprises various and sensible images, includes an annotation verbal communication which are very well different criteria for the objective segmentation and annotation of images. Because the quality of an image area and the process time of the segmentation process are significant factors for the annotation practice use segmentation algorithm based on a hexagonal arrangement which also proved to assure necessities a improved quality and a lesser operation time. Each recognized novel image will be annotated with exact concepts from ontology and produced preliminary from the information provided by the standard, the hierarchical group of the language and the spatial associations flanked by the regions.

The data shows that contextual information located nearby the image can be used for image annotation. It also indicates that how with the help of contextual information to overcome the drawbacks of the accessible technique such as semantic gap and mistaken annotations. It also signifies or overcomes the word sparseness flaw that occur in other systems while image annotation. Quite a few flaws in the usage of background information such as: 1) It is biased to the author's point of vision, information and skill. 2) Practice of such information is forever quiet challenging annotation system.

Methodology/Models

Generative model
Discriminative model
Graph model

1. **Generative Model**: It is based on sample data to discover out unseen fact, It can calculate joint likelihood allocation on visible data or sample data in order to find out text for annotation.

2. **Discriminative Model**: This models use machine learning for discovery annotation word (w) on given unannotated image features (x) provisional likelihood in this models can be shown in P(w/x). This representation straight allot word to image on unobserved data does not generate sample data like generative model.

3. **Graph Model**: Graph representation exchange the concept as vertices and association among these as edges. Hence AIA problem can be converted into graph model. These models have greater impending of development.

The major steps of annotation are as

- Segmentation into regions
- Clustering to construct blob-tokens
- Analyze connection between key vocabulary and blob-tokens
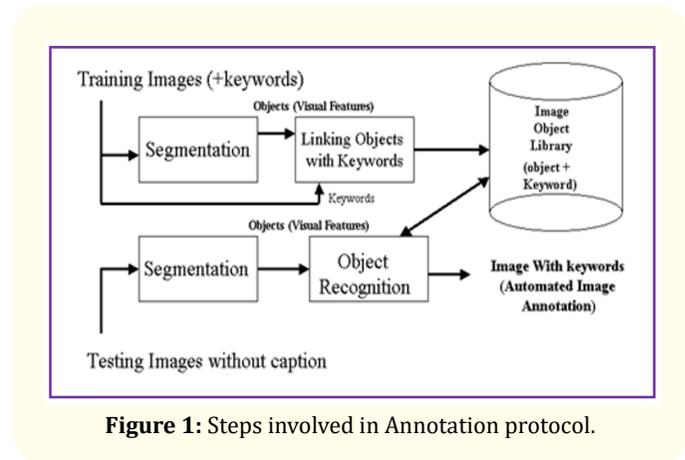- Auto Annotation

Figure 1: Steps involved in Annotation protocol.

- **Segmentation into regions**: The regions based image segmentation is essentially as a pixel based image segmentation development. Segmentation moves toward is examined as a nearest pixel of seed points and after determining the pixels are added to the regions.

- **Clustering to build blob-tokens:** The blobs are creating from the image features using clustering. Some probabilistic models allow us to forecast the likelihood of generating a word given the blobs in a figure.

- **Analyze communication among key vocabulary and blob- tokens:** Keywords and blob-tokens and identified the relation between blob-tokens and keywords. Hidden semantics are identified and the objective of crossing point for search automatic image annotation is mostly to assist image retrieval by supplying users with a text based.

- **Auto Annotation:** Annotate the image routinely and also calculates the distance between the given image object. If productively images can be retrieved in a way that is almost similar to search of text documents as many people perform on Google.

Flow chart or steps involved in annotations techniques

- Segmentations into regions
- Clustering to construct blob- tokens
- Analyze correspondence between key words and blob-tokens
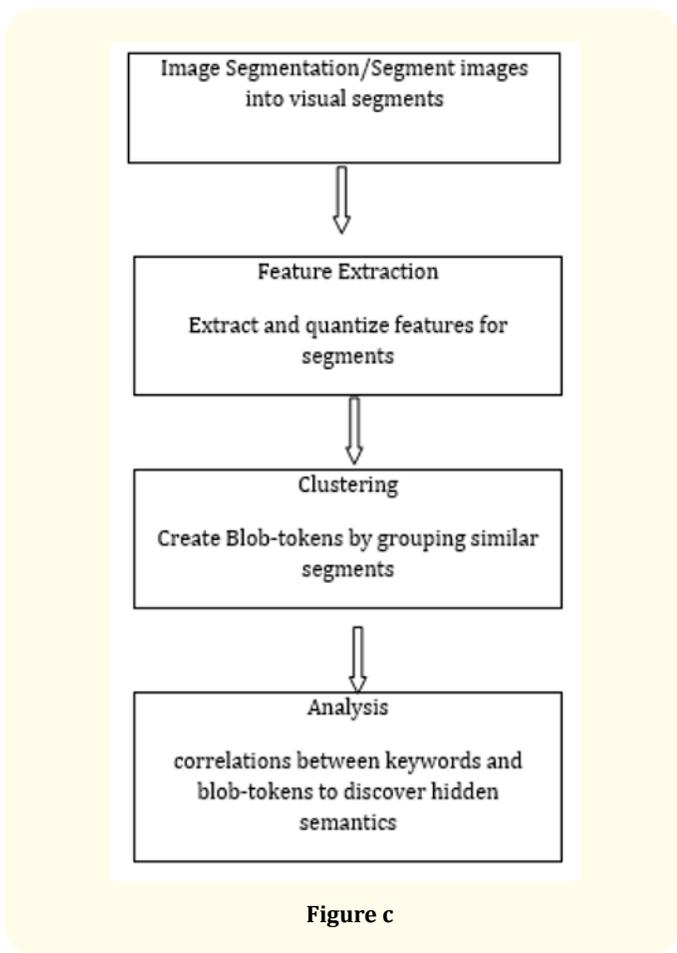- Auto Annotations

Figure c

Application Automatic Image processing in different domain

Scene Analysis

- Involves segmentation based on low level features like color texture and shape features.
- Identification of patterns/Object recognition
- Efforts to reduce semantic gap
- The manifestation through texture identification techniques based on Haralick texture features, Wavelets and Gabor filters. Color signatures are also to be used. Shape based analysis is expected to enhance the recognition process.

Various concept identification

- Using scene analysis techniques mentioned above, various concepts need to be recognized.
- Recognition framework needs to be built based on soft computing techniques and other artificial intelligence (AI) techniques.
- On the recognition framework neural networks and deep learning algorithms are to be experimented
- The general framework described above need to be tailor maid for various applications like outdoor scenes, gallery images, animal and bird pictures, fruits images etc…
- Bench marked image sets be used for validation of these algorithms.

Conclusion

Automatic Image Annotation of natural scene images using Image processing techniques may essentially important to content-based image retrieval, Computer objects recognition. Digital libraries, Web searching. Facial image annotation, it can be potentially applied to many allied areas, including biomedicine, military, education.

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