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Review on Methods of Content Based Image Retrieval

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ABSTRACT :

In the era of content based image retrieval the retrieval result should be improve by the time passes. So the research focuses on reducing the 'semantic gap' between low level features and high level human perception. In this paper, we cover the comprehensive survey of the recent technical achievements in high-level semantic-based image retrieval.

This survey covers different aspects of research in area, including low-level image feature extraction as well as similarity measurement and also deriving high-level semantic features techniques. Here we have cover state-of-the-art techniques in detail. This state-of-the-art techniques has main three categories. (i) by using object ontology. (ii) by using machine learning. (iii) by using relevance feedback.

KEY WORDS:

Content based image retrieval; high level semantics; Semantic gap.

INTRODUCTION:

In today's time the multimedia is very popular. Specially the images. Image retrieval has a big obstacle to produce efficient result and that is 'semantic gap'. We can define Semantic gap as the gap between low level visual features and high level user perception. when we reduce the 'semantic gap' we will get more appropriate result. For this we are having some of techniques which are given in this paper.

Reducing the 'Semantic Gap':

Here we are mainly focusing on the state-of-the-art techniques. For the reduction the semantic gap can be classified in different ways from different point of view.

For example first one is by allowing for the application domain, they can be classified as those targeting at artwork retrieval, scenery image retrieval ,WWW images retrieval, etc. In this paper, we concentrate on the techniques used to derive high-level semantics and identify three categories as follows.

(1) By using object ontology to define high-level concepts. (2) By using supervised or unsupervised learning methods to combine low-level features with query concepts. (3) Introducing RF into retrieval loop for nonstop learning of users' intention. Many systems exploit one or more of the above techniques to implement high-level semantic-based image retrieval. For example, (3) is often used with (1) and (2).

Object-ontology is an approach to reduce semantic gap. In a several cases, semantics can be easily derived from our routine language. For example, sea can be described as 'lower, uniform, and blue region'. In systems using such simple semantics, initially, different intervals are defined for the low level image features, with each interval corresponding to an transitional-level descriptor of images, for example, 'light blue, medium blue, dark blue'.

These descriptors form a simple language, is called 'object-ontology' which gives a qualitative definition of high-level query concepts. The images of the database can be classified into different categories by mapping such descriptors to high-level semantics (keywords) based on our knowledge, for example, 'sky' can be defined as region of 'light blue' (color), 'uniform' (texture), and 'upper' (spatial location).

A typical example of such ontology-based system is presented in HongLiu's research paper is given Fig.1

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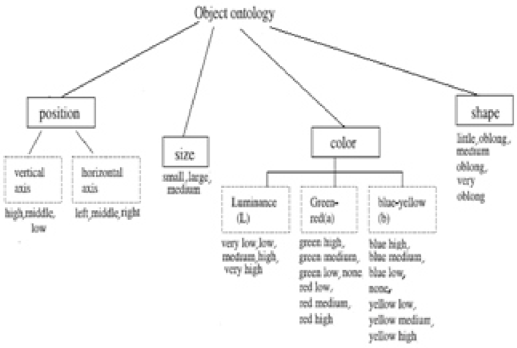

Fig.1 Object Ontology used

Machine learning is used to derive high-level semantic features. It is a formal tool. This is can divide in supervised machine learning and unsupervised machine learning. The goal of supervised learning is to forecast the value of an outcome measure like semantic category label on the bases on a set of input measure. In unsupervised learning, there is no outcome measure, and the objective is to describe how the input data are structured or clustered.

Supervised learning such as support vector machine (SVM), Bayesian classifier are often used to be trained high-level concepts from low-level image features. With strong theoretical basics available, SVM has been used for object recognition, text categorization, etc. and is considered a good quality candidate for learning in image retrieval system. SVM is originally designed for binary classification.

Unsupervised learning unlike supervised learning in which the occurrence of the outcome variable directs the learning process, it has no measurements of outcome, this task is rather to discover how the input feature are structured or clustered. Image clustering is the typical unsupervised learning technique for retrieval function. It plan to group a set of image data in a way to maximize the similarity within clusters and minimize the similarity between dissimilar clusters.

Each resultant cluster is linked with a class label and images in same cluster are supposed to be similar to each other. The conventional k-means clustering and its differences are often used for image clustering refer D. Stan, I.K. Sethi's paper, k-means clustering.

Object recognition techniques for image retrieval is In computer vision with applications in image annotation, surveillance and image retrieval Object recognition in images is a significant problem. Supervised or unsupervised object recognition algorithms have been developed freshly which can be used for semantic-based image retrieval. It is shown in R. Fergus, P. Perona, and A. Zisserman's paper. Here from unlabelled and un-segmented cluttered scenes an unsupervised scale-invariant learning method is presented to learn and recognize object class models.

In this technique, objects are modeled as flexible constellations of parts and a probabilistic representation is used for all aspects of the object: shape, appearance, occlusion and relative scale. In recognition, this model is used in a Bayesian manner to classify images. The flexible nature of the model is demonstrated by excellent results over a range of datasets including geometrically constrained classes and flexible objects. It is recognized that most users like to retrieve images based on objects in images.

Relevance feedback is an on-line processing which tries to learn the users' intentions. It is a powerful tool conventionally used in text-based information retrieval systems. It was introduced to CBIR during mid 1990s, with the purpose to get user in the retrieval loop to bridge the 'semantic gap' between what queries represent and what the user thinks. By continuous learning through interaction with end-users, RF has been shown to give significant performance improvement in CBIR systems. A typical scenario for RF in CBIR is given in Fig 2.

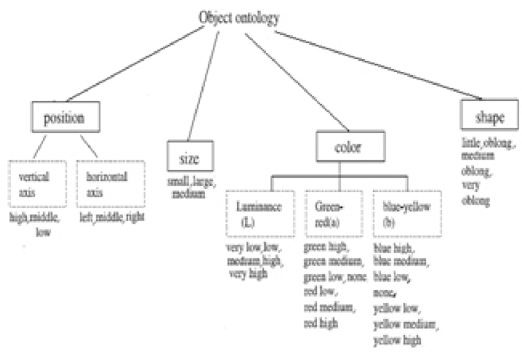

Fig 2. shows steps of relevance feedback technique.

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Steps of operation shown in Fig. 2 :

(1) The system gives primary retrieval results through query-by-example, sketch, etc.

(2) User judges the above results as to whether and to what degree; they are relevant or irrelevant to the query.

(3) Machine learning algorithm is applied to learn the user' feedback. Then go back to (2).

(2)–(3) are repetitive till the user is satisfied with the results. Fig shows a simple diagram of a CBIR system with RF. A typical approach in step (3) is to regulate the weights of low-level features to put up the users' need. In this way, the load of denoting the weight is removed from the user. Examples of such systems are given in Yong Rui, Thomas S. Huang, Michael Ortega and Sharad Mehrotra's research paper.

SUMMARY:

After describing above methods we can summarize all in given manner which is shown in Fig. 3.

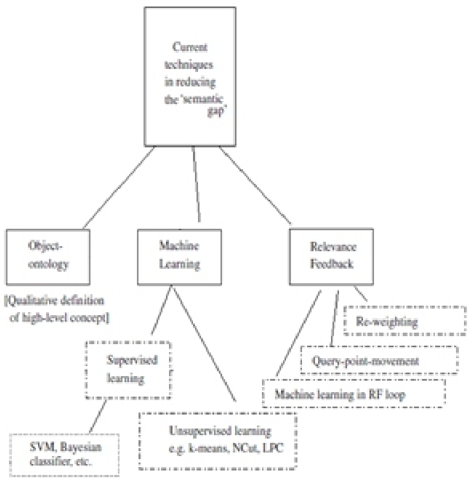

Fig. 3 Summary of current techniques to reduce 'semantic gap'

CONCLUSIONS:

In the field of image retrieval the retrieval is improved by reducing semantic gap by above methods.

Here first method which is object ontology. It used to define high level concepts in retrieval system. It is efficient method but it has limitation that it is domain specific. Another method is machine learning. This method is very efficient but it is tough to implement. Last method is relevance feedback. It improves retrieval accuracy because it uses user's perception of an image for retrieval. But Most recent systems requires about five or even more iterations before it meets to a stable performance level, but users are generally impatient and may give up after two or three tries.

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