Volume 2, No. 3, May-June 2011
ISSN No. 0976-5697
International Journal of Advanced Research in Computer Science
RESEARCH PAPER
Available Online at www.ijarcs.info

Content Based Image Mining Systems Using Search Engine

Priyanka Ahlawat Mann
Department of Computer Engineering
National Institute of Technology
Kurukshetra, India
mannpammy@gmail.com

Amit Kumar Gupta*
Department of Computer Engineering
National Institute of Technology
Kurukshetra, India
gkamit@rediffmail.com

Abstract: During the last decade, the exponential increase of multimedia and remote sensing image archives, the fast expansion of the world wide web, and the high diversity of users have yielded concepts and systems for successful content-based image retrieval and image information mining. Image data information systems require both database and visual capabilities, but there is a gap between these systems. Database systems usually do not deal with multidimensional pictorial structures and vision systems do not provide database query functions. In terms of these points, the evaluation of content-based image retrieval systems became a focus of research interest. We describe a generic image classification system with an automatic knowledge acquisition mechanism from the Web. The processing in the system consists of three steps. In the gathering stage, the system gathers images related to given class keywords from the Web automatically. In the learning stage, it extracts image features from gathered images and associates them with each class. In the classification stage, the system classifies an unknown image into one of the classes corresponding to the class keywords by using the association between the image features and the classes.

Keywords: Web image mining, image-gathering, image classification, image search engine, image database

I. INTRODUCTION

Due to the recent wide spread of digital imaging devices, we can easily obtain digital images of various kinds of real world scenes, so that demand for image recognition of various kinds of real world images becomes greater. It is, however, hard to apply conventional image recognition methods to such generic recognition, because most of their applicable targets are restricted. Henceforth, semantic processing of images such as automatic attaching keywords to images, classification and search in terms of semantic contents of images are desired.

So far, automatic attaching keywords [1,4,6] and semantic search [2] for an image database have been proposed. In these works, since images with correct keywords were required for learning an association between images and words, commercial image collections were used for learning, for example, Corel Image Library. However, most of images in commercial image collections are well-arranged images taken by professional photographers, and many similar images are included in them.

They are different from images of real world scenes taken by the people with digital cameras.

In this paper, we propose utilizing images gathered from the Web for learning of a generic image classification system instead of commercial image collections. In other words, this research is Web image mining for generic image classification. We can easily extract keywords related to an image on the Web (Web image) from the HTML file linking to it, so that we can regard a Web image as an image with related keywords. Web images are as diverse as real world scene, since Web images are taken by a large number of people for various kinds of purpose.

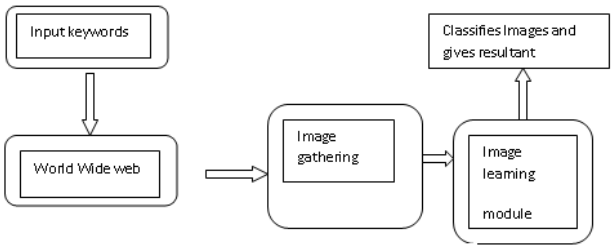

Figure 1: Proposed system

The processing in our system consists of three steps. In the gathering stage, the system automatically gathers images related to given class keywords from the Web. In the learning stage, it extracts image features from gathered images and associates them with each class. In the classification stage, the system classifies an unknown image into one of the classes corresponding to the class keywords by using the association between image features and classes. The system is constructed as an assembly of three modules, which are an image-gathering module, an image-learning module, and an image classification module.

II. IMAGE GATHERING

At first, we need to decide some class keywords, which represent classes into which unknown images are classified. For example, ``cow", ``dog" and ``cat". For each class keyword, we gather related images from the Web. To gather images from the Web, we use the Image Collector we proposed previously as an image-gathering module.

In the gathering stage, an image-gathering module gathers images from the Web related to the class keywords. Note that our image-gathering module is not called image ``search" but image ``gathering", since it has the following properties: (1) it does not search for images over the whole Web directly, (2) it does not make an index of the Web images in advance, and (3) it makes use of search results of commercial keyword-based

search engines for the class keywords. These properties are different from conventional Web image search systems such as Web Seer [5], WebSEEk [6] and Image Rover [7]. These systems search for images based on the query keywords first, and then a user selects query images from their search results. These three systems carry out their search in such an interactive manner. Our module is different from those in that our system only needs one-time input of query keywords due to automatic image selection mechanism. The details are described in.

III. LEARNING AND CLASSIFICATION

In the system, image classification is performed by image-feature-based search. First, in the learning stage, an image-learning module extracts image features from gathered images and associates image features with the classes represented by the class keywords. Next, in the classification stage, we classify an unknown image into one of the classes by comparing image features.

In our method of image classification, image features of not only a target object but also non-target objects such as the background are used as a clue of classification, since non-target objects usually have strong relation to a target object. For example, a cow usually exists with a grass field and/or a fence in a farm, and a lion usually exists in a savanna or a zoo. Although the number of combinations of a target object and non-target objects is large, we think that we can deal with this largeness by gathering a large amount of image from the Web and by using them for learning. Here, we do not set up "reject", and then all test images are classified into any class.

In the experiments, we can use two kinds of image features for learning and classification: color signatures and region signatures. A signature describes multi-dimensional discrete distribution, which is represented by a set of vectors and weights. In case of color signatures, a vector and a weight correspond to a mean color vector of each cluster and its ratio of pixels belonging to that cluster, respectively, where some color clusters are made in advance by clustering color distribution of a whole image. In case of region signatures, a set of feature vectors of regions and their ratio of pixels represents a region signature, where regions are made by an image segmentation method in advance to compute dissimilarity between two signatures.

In the classification stage, we employ the k-nearest neighbor (k-NN) method to classify an unknown input image into a certain class. The value of k is decided by preliminary experiments.

IV. CONCLUSIONS

The image mining has been a very new concept and has been of great interest for both the student and the researcher. In this system the keyword and phrases can be matched for faster image retrieval.

V. REFERENCES

[1] K. Barnard and D. A. Forsyth. Learning the semantics of words and pictures. In Proc. of IEEE International Conference on Computer Vision, volume II, pages 408--415, 2001.

[2] S. Belongie, C. Carson, H. Greenspan, and J. Malik. Recognition of images in large databases using a learning framework. Technical Report 07-939, UC Berkeley CS Tech Report, 1997.

[3] Y. Deng and B. S. Manjunath. Unsupervised segmentation of color-texture regions in images and video. IEEE Trans. on Pattern Analysis and Machine Intelligence, 23(8):800--810, 2001.

[4] P. Duygulu, K. Barnard, J. F. G. de Freitas, and D. A. Forsyth. Object recognition as machine translation: Learning a lexicons for a fixed image vocabulary. In Proc. of European Conference on Computer Vision, 2002.

[5] C. Framkel, M. J. Swain, and V. Athitsos. WebSeer: An image search engine for the World Wide Web. Technical Report TR-96-14, University of Chicago, 1996.

[6] Y. Mori, H. Takahashi, and R. Oka. Image-to-word transformation based on dividing and vector quantizing images with words. In Proc. of First International Workshop on Multimedia Intelligent Storage and Retrieval Management, 1999.

[7] Y. Rubner, C. Tomasi, and L. J. Guibas. The earth mover's distance as a metric for image retrieval. International Journal of Computer Vision, 40(2):99--121, 2000.

[8] S. Sclaroff, M. LaCascia, et al. Unifying textual and visual cues for content-based image retrieval on the World Wide Web. Computer Vision and Image Understanding, 75(1/2):86--98, 1999.

[9] J. R. Smith and S. F. Chang. Visually searching the Web for content. IEEE Multimedia, 4(3):12--20, 1997.

[10] K. Yanai, M. Shindo, and K. Noshita. A fast image-gathering system on WWW using a PC cluster. In Proc. of International Conference on Web Intelligence (LNAI 2198), pages 324--334, 2001.