RESEARCH ARTICLE OPEN ACCESS

Content and Tag Based Image Retrieval System using Automatic Image Annotation

Sachin Shinde1, Pranita Sethiya[2], Ravindra Jain[3], Akash Raghuwanshi[4]
Rekha Sugandhi[5]
B.E[1, 2, 3&4], Professor [5], Department of Computer Engineering,
MIT College of Engineering,
Pune-38, India

ABSTRACT
The main objective of this paper is to design a Content and Tag Based Image Retrieval System using Automatic Image Annotation that will help in organizing a large database of images. We propose to build a system that will detect objects from images and retrieve images containing the similar objects from database and organize those images by attaching tags, thus keeping them organized for ease of access. The proposed system involves Content Based Image Retrieval with interpretation of objects using different features. The proposed system will first extract features from image and compare those features with the existing set of object images, so as to detect what objects are present in the image, thus finding out all the tags related to the image. Then the user will be asked to verify the tags attached and also to add more tags if required. Then the image will be saved to database with appropriate tags. The saved dataset object images will get updated time to time by removing the object images which are found inappropriate using a accept to reject ratio calculated based on the user feedback.
The proposed system will consist of an image input or a text query which will be used to find the similar images from the user's database. User can add new annotations which will be added to the database for future use.
Keywords- Image Annotation, Content Based Image Retrieval (CBIR), Tag Based Image Retrieval (TBIR), Object Recognition, Object Detection.

I. INTRODUCTION

The internet has witnessed a great success of social media and with this success, increases the number of digital data in the websites, especially images. With the advent of Big Data, the digital data is increasing day by day and thus the need to organise this data. Images contribute a lot to this vast amount of digital data.

Image annotation or image tagging, is the process by which metadata is added to a digital image in the form of captioning or keywords. For this task humans interpret an image using their background knowledge and the capability of imagination. Besides for object recognition, which try to understand a very limited number of objects in images, most works about image annotation focus on learning a mapping (e.g. translation, joint probability, image classification) between images and words given a number of training images [2, 3].

Object Recognition uses image processing, Image Processing [3] is any form of signal processing for which the input is an image and the output may be an image or some data related to the image. Images have certain properties which can be used to perform many operations, one the interesting property is Feature, and feature is one the most important starting point for many computer vision algorithms. Feature detection is a low-level image processing operation. Feature Extraction is a special form of dimensionality reduction. Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately.

An image retrieval system is a computer system for browsing, searching and retrieving images from a large database of images. Most common methods of image retrieval use techniques such as content based image retrieval or use metadata attached with the image such as captions or keywords, i.e. using annotations. Manual Annotation is a laborious job and requires lots of time. Thus, Automatic Image Annotation plays an important role here.

Automatic image annotation is the process by which a computer system automatically assigns metadata to the image in form of tag or keywords.

In this paper we will be creating an automatic image annotation system using Content Based Image Retrieval (CBIR) and Tag Based Image Retrieval (TBIR). Here "tag" refers to the textual metadata attached to the image and "content" refers to colours, shapes, textures and any other information that can be derived from the image.

In this paper, we focus on organising the images by adding metadata to the images by using intelligent object recognition with user feedback. The whole process includes various steps and an existing dataset for reference which will keep on improving and increasing based on quantity and quality to provide efficient results when querying for images. The process includes various algorithms used for efficient and fast object recognition which plays a very important role in tagging images and refining the efficiency of system.

II. PROBLEM STATEMENT

The process of digitisation does not in itself make image collections easier to manage. Some form of cataloguing and indexing is still necessary – the only difference being that much of the required information can now potentially be derived automatically from the images themselves. One of the main problems faced with data set of images was the difficulty of locating a desired image in a large and varied collection. While it is perfectly feasible to identify a desired image from a small collection simply by browsing, more effective techniques are needed with collections containing thousands of items. An easy way to comply with this difficulty is Automatic Image Annotation System. Here we are implementing an Automatic Image Automation System which will use object/pattern recognition in an efficient way to create a system that will keep on evolving into a better system based on user feedback.

III. PROPOSED SYSTEM

A. Overview

The proposed system will take an image query or a keyword as input and display all the similar images to the given input query image or show images which are related to the keyword. System will accept the query image and perform object recognition on it using the dataset which user can create afterwards or use the existing dataset provided. After performing object recognition, system will add tags to the input image. Based on these added tags images having the tags will be retrieved from the database and will be displayed to the user. User will also be displayed the tags that were added to the image and user will be asked for feedback and also for any additional tags he wants to add. If the user deletes or invalidates any of the tags, the object image which caused that tag to happen is rated down and when user finalises the tags the image is added to the database with the tags and the objects recognised in the image and added to the dataset for improving the dataset in terms of size and quality. These object images are also saved in a database with two parameters attached to every object image, one is the number of times the tag produced by this image is accepted and second the total number of times this object image is used for identifying tags. If any object image reaches very low accept value after certain number of tries that object image is deleted from the database. This keeps the dataset very efficient and thus making the system much more efficient.

B. Database Design

In the proposed system we require two databases, one database is used to store the path of image with the appropriate tags attached to the image in the form of Coma Separated Values (CSVs) and another database is used to store the information about the object images with three columns first is the path of the image object, second is the number of times the tag produced by this image is accepted and third is the total number of times this object image is used for identifying tags. Database for the proposed system can be designed in any database management system.

C. Implementation Details

The proposed system is implemented on an android device. The system will provide the user with four choices which are - train the system, tag images automatically, search images by keyword, search image by image/pattern. In train the system choice, the user is asked to tag an image manually by selecting the region on the image, then the image is added to the database with the added tags and the tagged regions are cropped individually and saved to the dataset of object images and are added to the database. In tag image automatically choice, the system takes the input image and performs object recognition on the image using the dataset and then assigns tags for image and shows it to the user asking for users feedback, user can then validate the tags and also add more tags if required. The object image database is updated with user feedback and the queried image is added to the database with the specified tags after the user feedback. The choice search image by keyword takes into account the tags attached to the images that are already present in the database. When the user enters the keyword query, the system looks into the database for images having similar tags and then makes a list all those images and displays them to user. Search by keyword gives very accurate results as the images present in the database are all annotated using user's feedback and thus making the result very efficient. The choice search by image/pattern uses the two concepts, firstly it applies the similar operation to tag image automatically choice, i.e. the system performs the object recognition on the queried image using the image dataset and then assigns tags to the queried image based on result of object recognition. After receiving the tags of the queried image, the system then performs the operation in the choice search by keyword i.e. it looks into the database for the images having similar tags and makes a list of those images and displays them to the user. The efficiency of the complete process is based on the user feedback and the efficiency of the object recognition [9] algorithm used.

1) *Object Recognition*: Object Recognition in computer vision is basically identifying objects in an image or video based on existing information provided to the system. For performing object recognition we are using OpenCV [8]. OpenCV is an open source Computer Vision [9] written with many image processing algorithms. OpenCV provides an easy way of doing object recognition. Object Recognition using OpenCV involves several steps, firstly we scale down the image to appropriate resolution depending upon the hardware we are working on then we convert the image to RGB format then a Feature Detector Algorithm is applied which extracts the key-points from the image i.e. features from the image, then a Descriptor Extractor Algorithm is applied which gives

descriptors which are used for matching the similar portions in image using Descriptor Matcher Algorithm which provides us with number of matches that are present in images. Using the above steps we perform the object recognition.

IV. ARCHITECHTURE OF PROPOSED SYSTEM

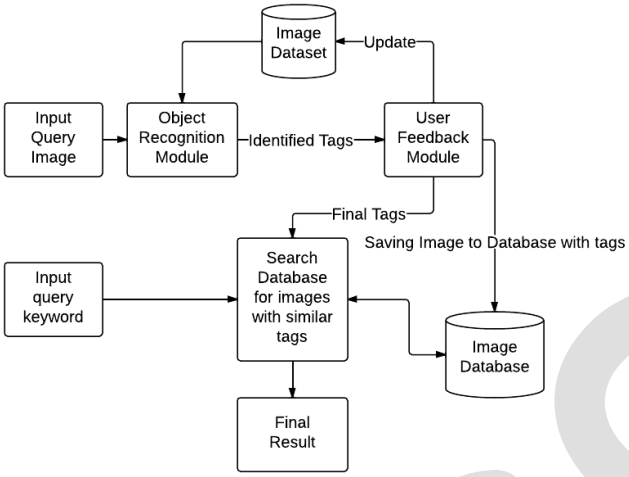

Fig. 1 Architecture of the proposed system.

Fig. 1 shows the architecture of the proposed system, the main parts of the architecture include the two databases, object recognition and user feedback module.

According to architecture user can input either a query image or a keyword query, if the user enter input query image then first object recognition is performed on the input query image using the image dataset and then user feedback module collects the feedback from user and create the final list of tags for the image and accordingly updates the image dataset, also saving the queried image into the image database with final tags after the user feedback. Then the list of final tags is used to search the image database for images with similar tags and then the final result is displayed to the user which is the list of images similar to input query image. If user goes for the keyword query, then the list of input keywords is used to search for images that have similar tags from the database and then final result are displayed as the images having tags same as input keyword query. Fig. 2 displays a typical user interface framework and a scenario of the object recognition and relevance feedback system.

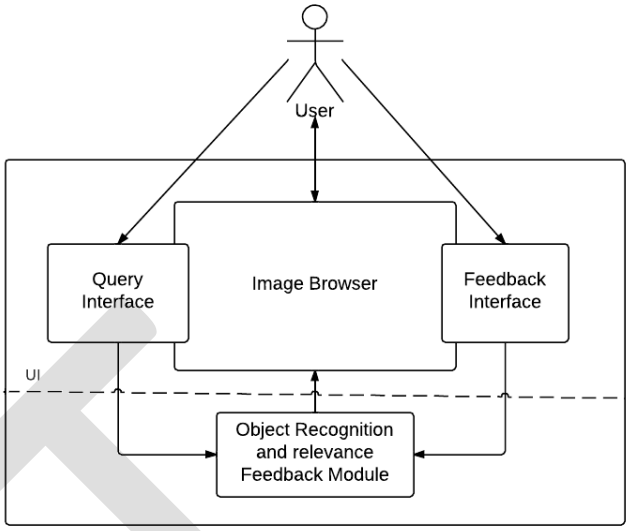

Fig. 2 A typical user interface framework and a scenario of the object recognition and relevance feedback system.

A typical user interface will have a query interface into which user can enter its query, an image browser which will show the images currently in database and also the final result after giving an input query and a feedback interface which will allow the user to give its feedback on the displayed results. The object recognition and relevance feedback module will work in background which will update the database as needed.

V. CONCLUSIONS

In this project the design and development of a Content and Tag Based Image Retrieval System is described. Thus we presented a system which will be able to search through similar images in the database using the queried image. We introduce a technique for content-based image retrieval. We built a sizable collection of photos, and use the object recognition to find and attach tags to images and then retrieve similar images from the user's database.

We have built this system on android platform and tested the implementation on image database containing 1000 images, for indexing it takes more time if the database is larger. The same system can be implemented on any system. The user feedback mechanism helps in machine learning and thus making the system more and more efficient with its use.

The test based on the proposed strategy shows that this approach is very efficient as compared to manually annotating images and more accurate than the simpler version of automatic image annotation. However, the performance of this system relies heavily on the performance of CBIR, object recognition and relevance user feedback algorithm, especially when there is no initial annotation in the database at all. For those queries system will depend on the user feedback and might give a low performance, some initial manual annotation is necessary for this algorithm to work properly. CBIR and user feedback together work to find much more relevant

results to be shown in the retrieval results and provides the user with choice of giving feedback and validating results. The annotation efficiency is hence improved.

ACKNOWLEDGMENT

We express our profound gratitude and deep regards to our guide Prof. Rekha Sugandhi for her exemplary guidance, constant supervision and encouragement throughout the course of this project.

We would like to pay special gratitude to the HOD of our department Prof (Dr.) Prasanna Joeg for his constant encouragement. We offer our sincere thanks to project coordinators Prof. Sukhada Bhingarkar and Prof. Jayshree Ghorpade for their constant support and valuable guidance. We are also thankful to all the staff members of the Computer Department for their co-operation.

Lastly we would like to thank our family members and friends for their moral support and motivation.

REFERENCES

[1] Philippe Henri Gosselin and Matthieu Cord, "Active Learning Methods for Interactive Image Retrieval," IEEE Trans. On Image Processing, Vol. 17, No. 7, July 2008.

[2] N. Freitas, D. Forsyth and etc. "Matching words and pictures," In Journal of Machine Learning Research, 2003.

[3] G. Carneiro and N. Vasconcelos. "A database centric view of semantic image annotation and retrieval," In SIGIR, 2005.

[4] Liu Wenyin, Susan Dumais, Yanfeng Sun, HongJiang Zhang,Mary Czerwinski and Brent Field, "Semi-Automatic Image Annotation," *In Proc. INTERACT '01, IOS Press (July 2001).*

[5] Karthikram, Mailaivasan, Parthiban, Ganesh, "Tag Based Image Retrieval (TBIR) using Automatic Image Annotation," in *IJRET. Volume: 03 Issue: 03 | Mar-2014*.

[6] Lei Wu, Rong Jin, Anil K. Jain, "Tag Completion for Image Retrieval," IEEE, March 2013

[7] The IEEE website. [Online]. Available: http://www.ieee.org/

[8] OpenCV documentation [Online]. Available: http://opencv.org/documentation.html/

[9] Wikipedia [Online] Available: http://www.wikipedia.com/

[10] Roland M • orzinger, Robert Sorschag, Georg Thallinger, and Stefanie Lindstaedt, "Automatic Image Annotation using Visual Content and Folksonomies".

[11] Xirong Li, Le Chen, Lei Zhang, Fuzong Lin, Wei-Ying Ma, "Image Annotation by Large-Scale Content-based Image Retrieval," MM'06, October 22–27, 2006, Santa Barbara, CA, USA.