New Approach for Re-Ranking of Images

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Abstract— In today's world there is an increasing demand of image search so there is a need for an efficient image search engine. So image retrieval is an important task and moreover images retrieved should map with the query the user has typed. Efficient retrieval of images matching with query must be given prime importance. Most of the search engines use text based search for retrieval of images and few use visual search. If text search and visual image content features are combined together for the retrieval of images it will fetch accurate images and enhances user satisfaction. To map user's intention to the image, a re-ranking framework is used that learns different visual semantic spaces for different query keywords through keyword expansions. The images are retrieved based on query keywords, the visual features of the retrieved images are then extracted. Images are then re-ranked by comparing their semantic signatures obtained from the visual semantic space specified by the query keyword. Thereby, improving the efficiency of image search.

Key words: Visual Semantic spaces, Keyword expansions, semantic signatures

I. INTRODUCTION

Image search engine developed either use text or image features for retrieval of images. Most of the image search engines use text for retrieval of images which retrieves relevant images along with some irrelevant results. For eg. if query is "lotus" images retrieved are of "lotus flower", "lotus car", "lotus pod", and "trypophobia (pathological fear of objects with irregular patterns of holes, such as beehives, ant hills and lotus seed heads [8])". But images retrieved using textual search do not map to user's search intention.

Moreover, many image search engines, now use content based image retrieval using relevance feedback. In this approach the user selects the image from textual search and the visual similarities between selected image and other images is computed and then the images are re-ranked according to it.

In the proposed approach, images are re-ranked based on semantic signatures[1]. Given a query keyword input by a user a pool of images relevant to the query keyword are retrieved by the image search engine. The user then selects a image, which is relevant to the user's search intention, from the pool of images retrieved. The images are then re-ranked based on their visual similarities with the query image. This is done by computing visual features of images.

The advantage of using proposed image re-ranking approach is that the user will get top k accurate results. This new approach significantly improves both the accuracy and efficiency of image re-ranking. This approach also overcomes the drawback of the traditional search technique by considerably reducing the rate of false images.

II. EXISTING IMAGE SEARCH

The existing approach use for image search is shown in Fig. 1.

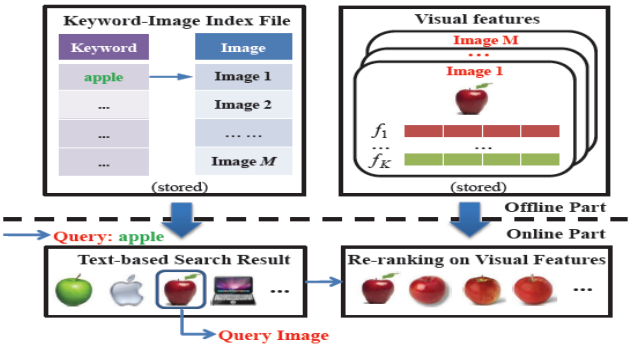

Fig. 1: Existing image search

The existing approach used for image re ranking uses keyword-image index file. The images are retrieved according to the query typed in by the user.

The user selects one of the image relevant to the search intention and the images are re-ranked based on visual features.

This is done by online comparing visual features of the images that are computed and stored [2]. So, the efficiency of image re-ranking is less

III. APPROACH

The diagram shown in Fig. 2, gives an overview of proposed approach. Nowadays there has been plenty of research for pattern matching and image recognition. There also have been a lot of works on using predefined concepts or attributes as image signature. N. Rasiwasia, P. J. Moreno, and N. Vasconcelos [5] mapped visual features to a universal concept dictionary. C. Lampert, H. Nickisch, and S. Harmeling [7] used already defined attributes with semantic meanings to detect novel classes.

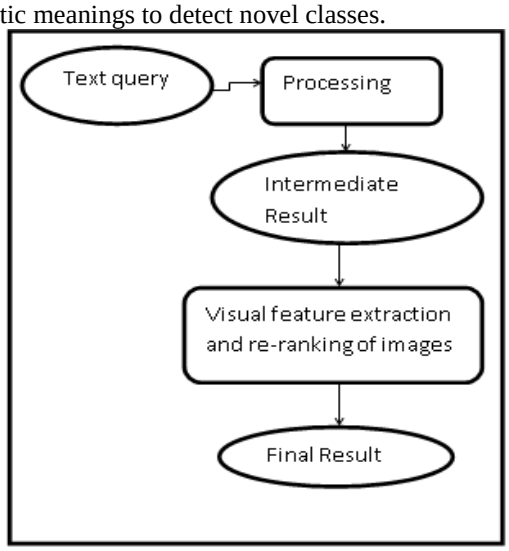

Fig. 2: Approach of image re-ranking

For a query given by the user, the keyword undergoes keyword expansion followed by visual semantic spaces for different query keywords individually and automatically.

For example, if the query is keyword is "palm", the semantic concepts of "mountains" and "rivers" are unlikely to be relevant and can be ignored. Instead the semantic concepts of "palm tree", "part of human body", "palmtop" will be used to learn the visual semantic spaces related to "palm". The visual features of images are then projected into their related visual semantic spaces to get semantic signature. The intermediate results consisting of single image from each of the reference classes generated based on the semantic spaces are displayed. User then selects one of the image which satisfies his search intention i.e. just one-click feedback [2]. Later, the images are re-ranked by comparing their semantic signatures obtained from the visual semantic spaces of the query keyword.

IV. METHODOLOGY

The block diagram of the re-ranking technique is shown in Fig. 3. It has offline and online parts. In the offline stage, reference classes (which represent different concepts) related to query keywords are automatically discovered and their training images are automatically collected in several steps [3,4]. For a query keyword (for example palm), automatic selection of a set of most relevant keyword expansions (such as palm tree and palm Sunday) is performed utilizing both textual as well as visual information. This keyword expansion defines the reference classes for the query keyword. The images obtained by keyword expansions are less ambiguous as compared to images retrieved by original query.

To obtain training example automatically the images retrieved by keyword expansion are used by search engine. The retrieved top images are used as training examples of the reference class after removing outliers. Some reference classes (for eg. "apple laptop" and "apple macbook") have similar visual features and semantics. Such redundant reference classes are removed to improve re-ranking efficiency.

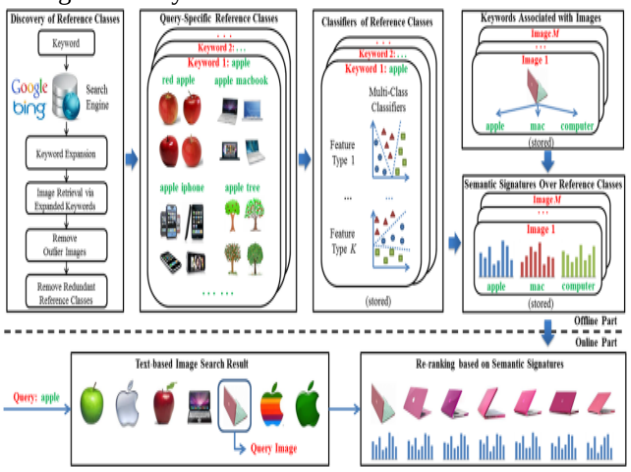

Fig. 3: Block diagram of new image re-ranking framework.

For measurement of semantic signature, the semantic correlation between reference classes is determined. The reference class of each keyword forms the basis of its semantic spaces. A multi-class classifier on textual and visual features is computed and stored offline. If there are k types of features they can be combined to train a single classifier which extracts one semantic signature of an image.

An alternative is to have k classifier for k type of features. This can increase accuracy but increases storage requirement.

An image can be associated with multiple keywords and can have different semantic signatures. These are computed and stored offline.

In online stage, when the user types in the query a pool of images is retrieved based on the textual information. The user clicks on the image which best matches the user's search intention. Depending on the image selected by the user, the images are re-ranked by comparing their semantic signatures with the semantic signatures of image selected by the user.

The efficiency obtained by the re-ranking system is more and also this technique is cost efficient.

V. CONCLUSION

Image re-ranking using query-specific visual-semantic signatures framework proposes the visual features of images which are projected into their related visual semantic spaces automatically learned through keyword expansions at the offline stage. This approach significantly improves the accuracy of image re-ranking thus satisfying the user by retrieving top k-results.

REFERENCES

[1] X. Wang, Ke Liu and X. Tang. Web Image Re-Ranking Using Query-Specific Semantic Signatures , IEEE Trans. April 2014.
[2] X. Tang, K. Liu, J. Cui, F. Wen, and X. Wang, Intent search: capturing user intention for one-click internet image search, IEEE Trans. on PAMI, vol.34, 2012
[3] J. Philbin, M. Isard, J. Sivic, and A. Zisserman. Descriptor Learning for Efficient Retrieval. In Proc. ECCV, 2010.
[4] D. Tao, X. Tang, X. Li, and X. Wu. Asymmetric bagging and random subspace for support vector machines-based relevance feedback in image retrieval. IEEE Trans. on Pattern Analysis and Machine Intelligence, 2006.
[5] N. Rasiwasia, P. J. Moreno, and N. Vasconcelos. Bridging the gap: Query by semantic example. IEEE Trans. on Multimedia, 2007.
[6] Y. Cao, C. Wang, Z. Li, L. Zhang, and L. Zhang. Spatial-bag-of-features. In Proc. CVPR, 2010.
[7] C. Lampert, H. Nickisch, and S. Harmeling. Learning to detect unseen object classes by between-class attribute transfer. In Proc. CVPR, 2005.
[8] www.definitions.net

