National Conference on 'Advances in Engineering, Technology and Applied Sciences' - NCAETAS-2019
© 2019 IJSRSET | Volume 5 | Issue 6 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099

A Survey on Image Retrieval Techniques for Capturing User Intention

Ms. Pooja S. Junonkar, Mr. Nitin N. Janhwe
Computer Science and Engineering, Chandrapur, Maharashtra, India

ABSTRACT

Web search engines are been used in large scale for image retrieval. Largely used web-search engines (like Google, Bing, etc) mostly rely various based image search. User enters a query in this search engines and gets images as result. This provides us with random and noisy results as outcome. This search does not provide user's intent result. User has to go through all the obtained images and select the required image suitable to user's intent. This increases complexities of users. To overcome these complexities many of the different image techniques are researched. In this paper, we present a novel internet image search approach. This paper contains various image retrieval techniques that may prove profitable for capturing user's intension. Some techniques are textual- based, some are color-based, and some are shape-based, while some may be combination of above. Some techniques search images offline, while some searches online. But the intension of all the techniques is to capture user's intention. In the further context, we discussed various techniques of image search for effective image retrieval technique.

Keywords : Query image, Search Engines, Image Retrieval, Algorithms, Re-Ranking, User Intention, Image Search.

I. INTRODUCTION

We are familiar with many search engines (e.g.; Google image search, Bing image search, I Like image search) which are used in large scale for commercial use. Many of the search engines still works on the textual based image extraction technique. User enters a query keyword related to their intent image and gets bulk of image as output. Some of the images from this bulk are related, while some are unambiguous. In short, keywords provides users intent in short. To remove this unambiguousness, many research techniques are introduced. Semantic gap between the image tags are removed in order to recover intent gap. Blogs are created to separate negative images and positive images. Large amount of user's metadata is collected from social media sites related to query. Visual feature extraction of query image and database image is obtained and most matched featured images are displayed. Various re-ranking techniques to arrange the images according to query. Feature extraction of a part from query image and comparison with features of database images. With visual feature extraction, keyword expansion is done to obtain effective matched images. Extraction on the basis of color features are obtained and then re-ranked for resultant images.

This are the various technique, surveyed in this paper. These techniques tried to capture user intention in very efficient and less effort pattern. These techniques tried to remove the complexities that are suffered by the user while searching for intent image from database images. The detailed discussion of each technique is as below:

II. LITERATURE SURVEY

A. Clustering Algorithm [9]

A cluster is a collection of data points that are similar to one another within the same cluster and dissimilar to data points in other clusters. Clustering method is used for unsupervised classification, where data points of same group are clustered together. Cluster analysis itself is not one specific algorithms but the general task to be solved. It can be achieved by various algorithms that differ significantly in their notion of what constitutes a cluster and how to efficiently find them. Popular notions of clusters include groups with small distances among the cluster members, dense areas of the data space, intervals or particular statistical distribution. The goal of clustering is to remove the semantic gaps between the images.

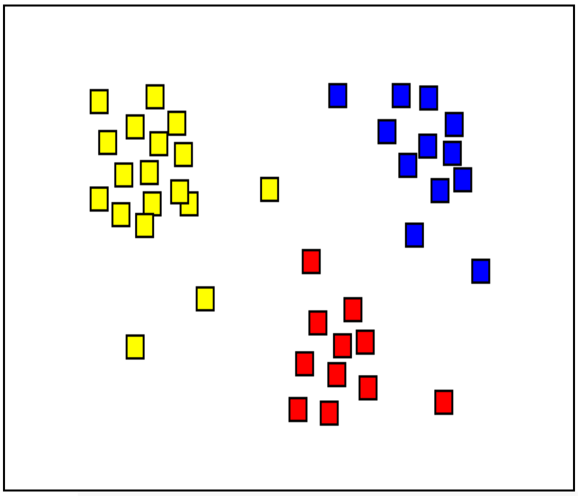

Figure 1. The result of a cluster analysis shown as the coloring of the squares into three clusters.

B. Partitional clustering [9]

Partitional clustering aims at partitioning a group of data points into disjoint clusters optimizing a specific criterion. When the number of data points is large, a brute force enumeration of all possible combinations would be computationally expensive. Instead, heuristic methods are applied to find the optimal partitioning. The most popular criterion function used for partitional clustering is the sum of squared error function given by ;

$$E = \sum_{i=1}^{k} \sum_{x \in C_i} (x - m_i)^2 \qquad (1)$$

where k is the number of clusters, Ci is the ith cluster, x is a data point and mi is the centroid of the ith cluster.

C. Hierarchical Clustering (Connectivity-based Clustering) [9]

Hierarchical clustering groups data over a variety of scales by creating a cluster tree or dendrogram. The tree is not a single set of clusters, but rather a multilevel hierarchy, where clusters at one level are joined as clusters at the next level. This allows you to decide the level or scale of clustering that is most appropriate for your application. The Statistics and Machine Learning Toolbox function cluster data supports clustering and performs all of the necessary steps. It incorporates the *pdist* , *linkage* and cluster functions, which you can use separately for more detailed analysis. The *dendrograms* function plots the cluster tree.To perform hierarchical cluster analysis on a data set using Statistics and Machine Learning Toolbox functions, follow this procedure:

- Find the similarity or dissimilarity between every pair of objects in the data set. In this step, we calculate the distance between objects using the pdist function. The pdist function supports many different ways to compute this measurement.
- Group the objects into a binary, hierarchical cluster tree. In this step, we link pairs of objects that are in close proximity using the linkage function.The linkage function uses the distance information generated in step 1 to determine the proximity of objects to each other. As objects are paired into binary clusters, the newly formed clusters are grouped into larger clusters until a hierarchical tree is formed.
- Determine where to cut the hierarchical tree into clusters. In this step, we use the cluster function to prune branches off the bottom of the hierarchical tree, and assign all the objects below each cut to a single cluster. This creates a partition of the sdata. The cluster function can create these clusters by detecting natural groupings in the hierarchical tree or by cutting off the hierarchical tree at an arbitrary point.

D. Density clustering [9]

It is based on connecting points within certain distance thresholds. However, it only connects points that satisfy a density criterion, in the original variant defined as a minimum number of other objects within this radius. A cluster consists of all density-connected objects plus all objects that are within these objects' range. Another interesting property of DBSCAN is that its complexity is fairly low - it requires a linear number of range queries on the database - and that it will discover essentially the same results.

OPTICS is a generalization of DBSCAN that removes the need to choose an appropriate value for the range and produces a hierarchical result related to that of linkage clustering.

E. Grid-based Clustering using AMR approach [10]

The grid-based methods have the fastest processing time that typically depends on the size of the grid instead of the data objects. These methods use a single uniform grid mesh to partition the entire problem domain into cells and the data objects located within a cell are represented by the cell using a set of statistical attributes from the objects. Clustering is, then, performed on the grid cells, instead of the database itself. Since the size of the grid is usually much less than the number of the data objects, the processing speed can be significantly improved.

Adaptive Mesh Refinement (AMR) is a type of multiscale algorithm that achieves high resolution in localized regions of dynamic, multidimensional numerical simulations Instead of using a single resolution mesh grid, the AMR clustering algorithm first adaptively creates different resolution grids based on the regional density and these grids comprise a hierarchy tree that represents the problem domain as nested structured grids of increasing resolution. Secondly, the algorithm considers each leaf as the center of an individual cluster and recursively assigns the membership for the data objects located in the parent nodes until the root node is reached.

F. Clustering by 'means ' approach [9]

It comes under partitional clustering. Two common method are involved in it. This include k-means method and k-medoids method. In k-means method, each cluster has centriod which represents the cluster. Centroid is nothing but the mean of all the data points in the cluster. In k-medoids method, each cluster is represented by the data point closeset to centroid of the cluster.The process starts by GARG method of contribution of data points given by

$$dispersion(C_i) = 1/n \sum_{x \in C_i} (x-m_i)^2 \quad (2)$$

$$contribution(x.C_i)=dispersion(C_i-[x]) - dispersion(C_i). \quad (3)$$

It clearly states that , if data point is negative,it adversely effect on cluster. And positive points are grouped together.This tells us that the negative points are treated separately than positive points.

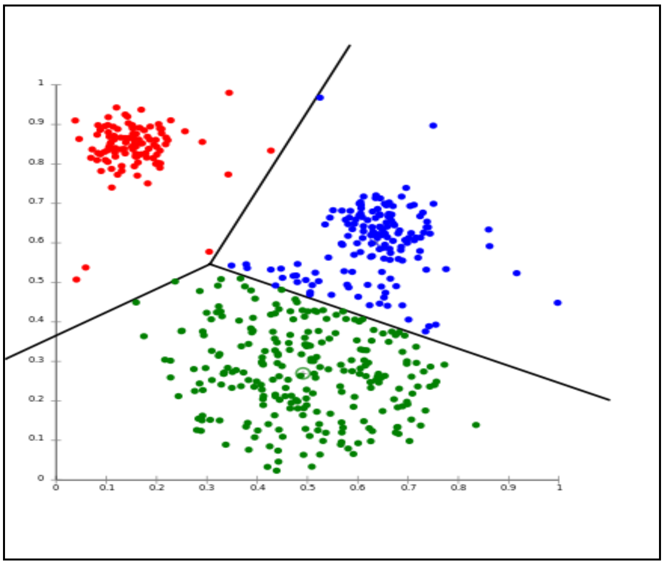

Figure 2. K-means separates data which assumes equal-sized

G. Mining Click logs approach [4]

Search engines generates millions of image result for a query. This provides a datset that bridges the semantic and intent gaps. But the large-scale clicked data does not provide means to build linkage among visual content,semantics and search intents. In these approach, a dataset named Clickture is introduced. This dataset contains a triad

$$Clickture=\{(K,Q,C)\} \quad (4)$$

This triad means that the image K was clicked C times in the search result query Q in one year. This approach also removes duplications by attaching an unique key to each image K in the dataset. This key is hash code generated from the URL of the image. Hence, the similarity between the images can be removed. Through users' click action during ,when doing image search, a user often clicks one or more images that are relevant to the query, thus mostly the query Q in the triad is relevant linked to the image K.

In general, the bigger the click count C is, the higher probability that the corresponding query is relevant to the image. For convenience, we call Q a "clicked query" of Image K, and K a "clicked image" of query Q, and call (K,Q) a "clicked image-query pair", and the triad (K, Q,C) as "click data". We also call "clicked queries" of an image as "labels" of the image.

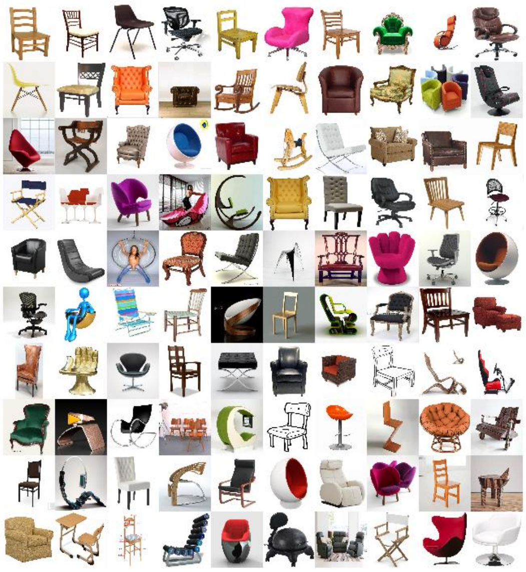

Figure 3. Example of Clickage for the query 'chair'. Top ranked images are obtained[4].

H. Ranking based Tensor Factorization model [2]

Conventional image search caused more problems as textual based description need more specification. This thing is not possible every time, because an image cannot be described fully in words. Hence, conventional image search shows more unambiguous results. Hence, Personalized image search came into existence. Personalization fall under two categorizes. The first is collaborative filtering which takes opinion of many users to uses new items of similar class. Users are asked to rate the items based on some criteria. The system counts the rating of each items and bring the high rating items to top. The second is profile-based filtering which users the users profile to target the interest of the users about the items of some criteria. The ranking based model mainly work on second category of personalize search. This model performs the basic search as per the user's interest related to query and annote the images.Then it maps the user preferences and query into a specific space. Finally,the images are re-ranked according to user's preferences.

The working model is as follows;

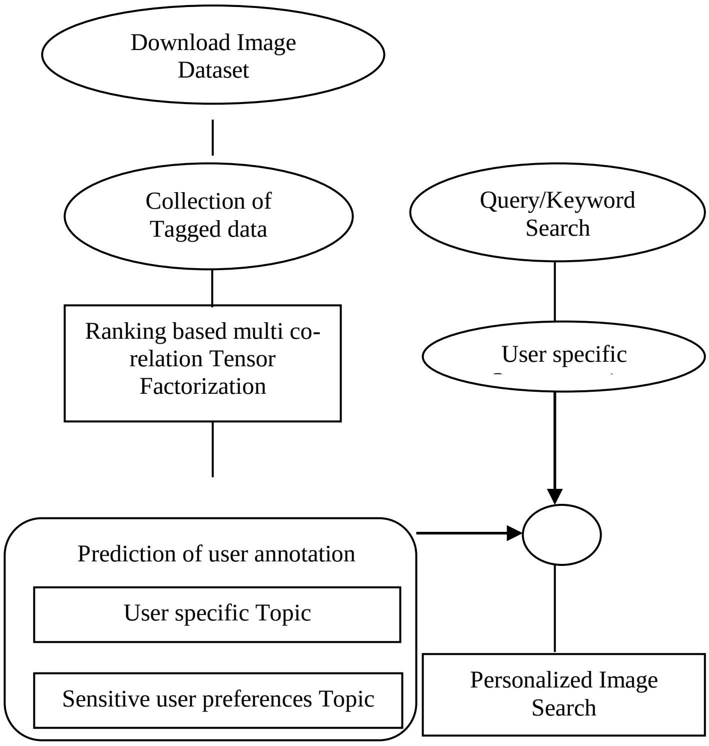

Figure 4. Working model for RMTF approach[2].

I. iLike approach [3]

This approaches combines both the textual as well as visual features of CBIR technique. Directly moving toward the process of working, this approach firstly collects all the relevant images from the Web server. Internet spider program is used for collecting images. This images are collected depending upon the textual features. Then analysis of all the extracted images are done and feature extraction of each image is performed. The feature of colour and texture is used Features of each retrieved images are collected and are stored in database. Then compared with the feature of query image. Distance between the query image and all the retrieved images are calculated. After calculating, the images with minimum distance are indexed first followed by remaining images and are outputted to users.

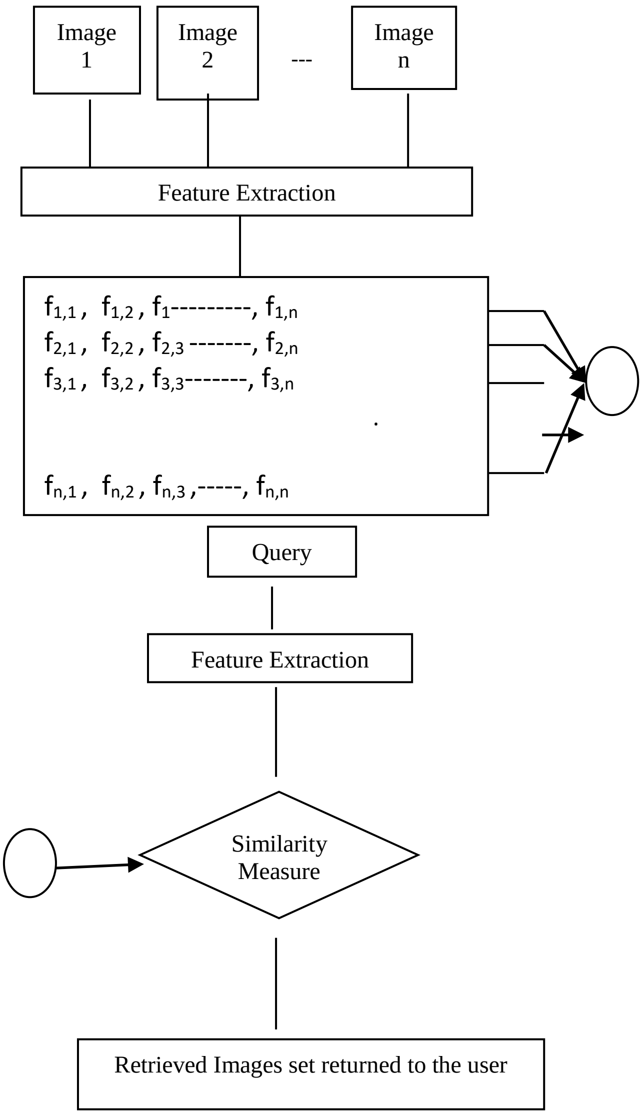

Figure 5. Relevance Retrieve System[3].

J. Bag-based Image re-ranking approach [5]

Clustering means grouping similar images together and compare or matching among the clusters instead of individual images. This will reduce the concerned time complexity to a great extent. So, cluster of similar images containing most of the relevant images is called positive bags and the bag containing least relevant images related to query is labelled as negative bags. This way of clustering is called as bag-based reranking.

The task of the following bag formation is removal of irrelevant images and re-ranking the remainder. Iterative application of bag formation algorithm using weak bag annotation technique yields bag more precise to the entered query.

K. Re-ranking sets of Picture by Exploiting Consistency (ReSPEC) approach [7]

The purpose of content based image retrieval is that whenever a user gives a query image, it retrieves the images that are mostly related to the content. ReSPEC is composed of two main methods. Firstly, based on the user query image (keyword) the image search engine (Google, Yahoo,…etc) retrieves the images then, clusters the results based on extracted image features, and returns the cluster that is inferred to be the most relevant to the search query. Secondly, ranks the results that are most relevant to the user query images.

- Segmentation of Image
  In image segmentation each images collected from the image search engine has been broken into regions of resemblance, with the intuition that each of these regions is a separate object in the image by using a graph based approach.
- Selection of Feature
  In order to obtain a measure of how similar image blobs are to one another, good features are needed to represent the blobs. Color histograms in HSV color space used to represent the image features. To form a feature vector for each blob, histograms are built for the H, S and V channels, with 15 bins each, and then concatenated together to form a 45 dimensional feature vector.
- Mean Shift Clustering in Feature Space
  The next step in the system is to cluster the blobs, according to their extracted features with the hope that the object of interest will form the largest cluster. Since some of the blobs will represent garbage, it is difficult to predict the number of clusters that are present.
- Re - ranking of Images
  After obtaining the “significant” cluster in feature space, the mean is computed. The rest of the images are then resorted based on the distance of their blobs to this mean. Since each image could potentially contain more than one blob, the closest blob in each image is used.

L. Active Re-ranking [5]

It is the reranking with user-intention. Figure below depicts the flow of active reranking technique. It involves active sample selection in which user labels the images as relevant or irrelevant. The images obtained in third module are the user labelled relevant images. This step is followed by dimension reduction which localizes visual features.

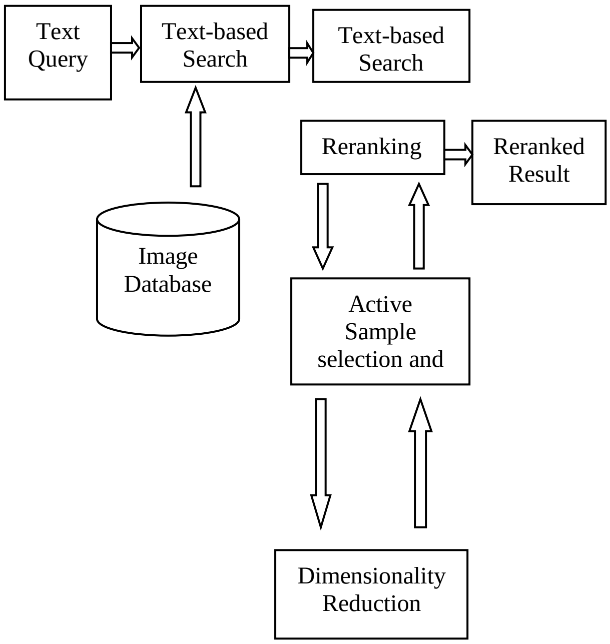

Figure 6. Working model of Active reranking[5].

M. Circular Re-ranking [5]

In this technique of reranking, images are made to reranked again and again. Images obtained by text query search is made to reranked. The result of first reranking is stored and given as input to next reranking step. This process is made to continue until the final re ranking. This mutual exchange of imformation across multi[le modalities for improving search performance.

III. CONCLUSION

On the basis of reviewed from this survey of available image retrieval and re-ranking techniques is that the text-based image retrieval is not sufficient for obtaining precise image for a given query. Most of the techniques used only visual features and tries to capture user's intention. These methods do not compete but can complement each other.

The domain of image harvesting, retrieval and re-ranking offers a vast scope for exploration as well as innovation. This survey will prove to be beneficial to gain overview of the work done in this field.

IV. REFERENCES

[1]. "IntentSearch: Capturing User Intention for One-Click Internet Image Search" Xiaoou Tang, Fellow, IEEE, Ke Liu, Jingyu Cui, Student Member, IEEE, Fang Wen, Member, IEEE, and Xiaogang Wang, Member, IEEE, VOL. 34, NO. 7, JULY 2012.

[2]. "Personalized Image Search from Photo Sharing Websites Using Ranking Based Tensor Factorization Model (RMTF)", Poonam Bhusari* Rashmi Gupta Amit Sinahal, Volume 3, Issue 8, August 2013

[3]. "A New Trend Content-Based Image Retrieval Technique used in Real Time Application" , Ms.Sayali.S.Pawar Prof.R.S.Chaure, Volume 4, Issue 6, June 2014

[4]. "Clickage: Towards Bridging Semantic and Intent Gaps via Mining Click Logs of Search Engines" , Xian-Sheng Hua, Linjun Yang, Jingdong Wang, Jing Wang Ming Ye, Kuansan Wang, Yong Rui, Jin Li, Vol 3, Copyright 2013, Oct 2013

[5]. "Image Retrieval and Re-Ranking technique" , Mayuri Joshi,Revati Deshmukh,Kalashree Hemke,Ashwini Bhadke,Rakhi Wajhi,Vol.5,No.2,April 2014

[6]. " Extended Image Features for User Intention Refined Image Search", S.Sunitha* A.RamaSatish, Volume 4, Issue 2, February 2014

[7]. Internet Image Search Based On User Intention, Raviraj Kasture,Dr. A.M.Dixit, Volume 2, Issue 6, June 2014

[8]. "Survey On Novel Techniques for Effective Image Search Based On Users Intention", S. Aarif Ahamed1, B. A. Vishnupriya1, V. Venkateshwaradev, Vol. 2 Issue 4, April - 2013

[9]. "Contribution-Based Clustering Algorithm for Content-Based Image Retrieval", Harikrishna Narasimhan, Purushothaman Ramraj, Volume 4, Issue 6, August 2014

[10]. A Grid-based Clustering Algorithm using Adaptive Mesh Refinement Wei-keng Liao Ying Liu Alok Choudhary ,July 2014.