Mining User Queries for Image Search using Click-through Approach

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ABSTRACT

The analysis of user serach for a query can be useful in improving search engine performance. Although the text search has received much importance but a little attention has been proposed for image search. In this paper, we propose influencing advantage of click session information, Click-through logs maintain clicked images information. The visual information of clicked images is used to infer user-image search goals. The Click session information can be used as past users' implicit guidance for clustering the images, more precise user search goals can be obtained. "Classification" based approach is proposed for autoclassification of user image search. Experimental results demonstrate the effectiveness of the proposed method.

Keywords

Image-Search Goals, Click-through logs, Classification, Search Engine, Image retrieval.

1. INTRODUCTION

Search Engines are means of information searching which provide a way of searching information for textual resources as well as multimedia [1][2][3]. Most search engines have similar interfaces: submit query, receive set of results [4][5][6]. In web search application, when users submit queries to search engines, they will not get expected result. Even for the same query, users may have different search goals. This is due to following reasons:

i) A keyword may represent different things.eg. "apple" may be fruit or OS.
ii) The same thing may have different forms.
iii) The same thing can be represented from different angles of view such as "leaf".

Inferring user search goals is very important in improving performance of search engine. We can categorize search results for image search goals to help users to reformulate their queries during image search & make it easier for users to browse. Further we can classify & re-rank the results retrieved for query.

The Click-through information from past users can provide good guidance about images. By mining the user Click-through logs, we can obtain two kinds of information: the Click content Information & Click session information commonly, a session in user Click-through logs is a sequence of queries & series of clicks by user. In this paper, we define a session in image search as a single query & series of clicked images.

2. RELATED WORK

Queries for image search without ranking have some limitations. User feedback is taken into account to improve the search engine relevance. Different clicked URLs of a query are analyzed through log of click-through images.

J. Cui, F. Wen, and X. Tang [1] proposed IntentSearch that works directly on Microsoft Live Image Search, and re-ranks its results according to user specified queries and the automatically inferred user intention. Other than searching in the interface of Microsoft Live Image Search, they have also design a more flexible interface for users to browse and play with all the images, which makes web image search more efficient and interesting.

Y. Luo, W. Liu, J. Liu, and X. Tang. Mqsearch [2] proposed A novel search idea using query images from multiple classes. Instead of conducting query search for one image class at a time, they conduct multi-class query search jointly. By using several query classes that are similar for multi-class query, they have utilized information across similar classes to fine tune the similarity measure to remove outliers. This strategy can be used for any information search application. In this work, they have used content based image search to illustrate the concept.

G. P. Nguyen and M. Worring [3] introduced A system that combines advanced similarity based visualization with active learning. They did extensive experimentation on interactive category search with different image collections. The results using the proposed simulation scheme show that indeed the use of advanced visualization and active learning pays off in all of these datasets.

Z.-J. Zha, L. Yang, T. Mei, M. Wang, and Z. Wang [5] proposed a new query suggestion method named Visual Query Suggestion (VQS) which works for image search. It provides a more effective query interface to formulate an intent-specific query by joint text and image suggestions. They have presemted that VQS is able to more precisely and more quickly help users specify and deliver their search intents. When a user submits a text query, VQS first provides a list of suggestions, each containing a keyword and a collection of representative images in a dropdown menu. If the user selects one of the suggestions, the corresponding keyword will be added to complement initial text query as the new text query, while the image collection will be formulated as the visual query. VQS then performs image search based on the new text query using text search techniques, as well as content-based visual retrieval to refine the search results by using the corresponding images as query examples.

U. Lee, Z. Liu and J. Cho [7] studied whether and how we can automate this goal identification method. First needs to present results from a human subject study that strongly indicate the feasibility of automatic query-goal identification. Then introduced two types of features for the goal identification task: user-click behavior and anchor-link distribution. Experimental evaluation shows that by combining these features we can correctly identify the goals for 90% of the queries studied.

X. Li, Y-Y. Wang and A. Acero [8] found a completely orthogonal approach — instead of enriching feature representation, targeted at drastically increasing the amounts of training data by semi-supervised learning with click graphs. Specifically, inferred class memberships of unlabeled queries from those of labeled ones according to their proximities in a click graph. Moreover, we regularize the learning with click graphs by content-based classification to avoid propagating erroneous labels. Demonstrated the effectiveness of algorithms in two different applications, product intent and job intent classification.

The above mentioned Image search engines provide an effortless route, but currently are limited by poor precision of the returned images and also restrictions on the total number of Images provided. While several studies reveal general characteristics of image searching based on transaction log data, little has been investigated concerning whether or not image searching behavior, especially querying behavior – query iterations and query length – differs based on a user‗s contextual aspects and different sources of collections on Web search engines. The existing methods for image searching and ranking suffer from the unreliability of the assumptions under which the initial text-based image search results. However, producing such results containing a large number of images gives more number of irrelevant images.

3. EXISTING SYSTEM

The existing methods for image searching have some limitations. The results are not relevant images.

3.1 TBIR – Text Based Image Retrieval

This is very popular method of image retrieval. But there are two major limitations when the size of collection of images is very large. First is large amount of efforts are required for manual image analysis and second is user expected results. This method does not give the exact result. Unwanted images are also displayed in result.

3.2 CBIR – Content Based Image Retrieval

This method was proposed to overcome the limitations of TBIR. Instead of manual annotation by text-based keywords, images are indexed by visual information. Human efforts are reduced. But the results are not much accurate. To overcome from these drawbacks, we propose a new image retrieval system to increase accuracy.

4. PROPOSED SYSTEM

Recently the machine learning algorithms have received wide popularity. We introduced a new machine learning approach for classification of similar user queries for image search. Our approach finds most relevant images which are required by users based on given query. Focus is to customize search results according to each individual interests by applying ranking. This approach take user image search queries, explore images and extract images by using Click-through logs to reach user search goals.

Fig.1 describes the proposed system architecture for Image Classification and Grouping based on User Query and Click-through Data process. The system architecture consists of four major components as Query Handler, Query Formulation, Event Handler and Result Handler, which implement the algorithm for Image Classification and Grouping based on User Query and Click-through Data. A Semantic similarity-based Matching algorithm will be implemented for classification and Grouping the search image results.

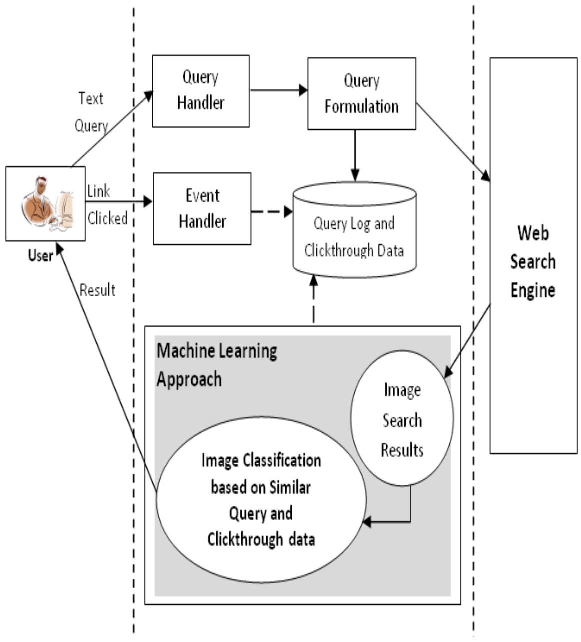

Fig.1. Framework for Image Classification and Grouping based on User Query and Click-through Data

1. Algorithm for Semantic similarity-based Matching To perform the semantic similarity matching we need input text query by the user and clickthrough data.

Input:

User input Query *(Q)*, and
Clickthrough data *(C)* from the database

Output: Semantically Associated and Cluster Results *(*S_R*)*in relevance to the user queries

Begin

Create an empty cluster vector as E_C

Create keywords, *K* from Q.

For each keyword of (*K*) ***do***

Select *K(i)* -> k_w

For each clickthrough data in (*C) **do***

Select *C(i)* ->C_w

If Compute Association (k_w Є C_w*) == true*

If Cluster E_C does not contain k_w *== true*

Add $C_w$to Cluster E_C

End if

End if

End for

End for

Create an empty object vector as S_R

For each objet in Cluster E_C ***do***

Object Count *(*O_C*)* ->0

Select $E_C(i) \rightarrow O_w$

For each clickthrough data in (C)***do***

Select $C(i) \rightarrow C_w$

If Compute ($O_w \in C_w$) == *true*

$O_C = O_C + 1$

End if

End for

Update $S_R(i) \rightarrow O_C$

End for

End

2. **Algorithm for Re-Ranking**

Input: Cluster Results (S_R)

Output: Re-Ranked Results (R_{Rank})

Begin

Create an empty Object_Rank vector as, R_{Rank}

For each record in S_R ***do***

Select $S_R(i) \rightarrow FR_{(i)}$

Intial_Top_Rank(T_{Rank})->$FR_{(i)}$

For each record in S_R ***do***

$k = i+1$

Select $S_R(k) \rightarrow NR_{(k)}$

If$NR_{(k)} > FR_{(i)}$

$T_{Rank} = NR_{(k)}$

End if

End for

Update $R_{Rank} \rightarrow T_{Rank}$

Remove T_{Rank}object from S_R

End for

End

5. PROCESS FLOW

When a query is fired by an user, it is received by request handler. The submitted query might not be in proper format for submitting to search engine. Query Handler prepare the keywords and update the query log database. Once the image search result retrieved from the search engine, Result Handler organize images as per the ranking. Re-ranking process is applied on Query log and click-through data.

Classification and reorganization of result is done as per the user interest and relevant result is displayed to the user. To make the result as more precise, images can be clicked and stored into click-through database. This improves the relevancy of the result.

6. UML DIAGRAMS

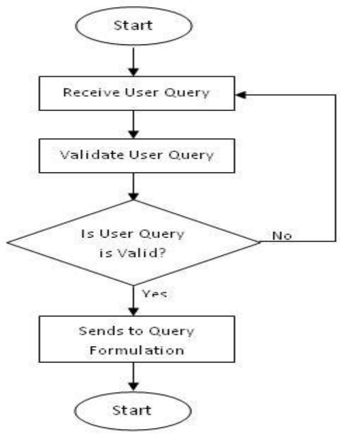

Fig.2 User Query Image Search

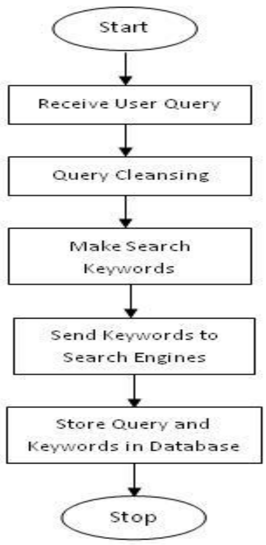

Fig.3 Query Handler

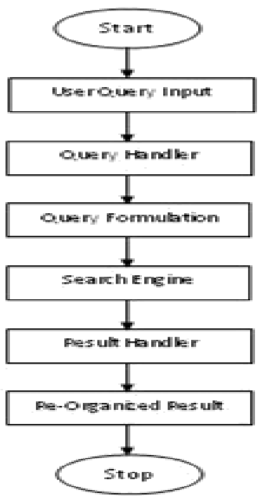

Fig.4 Query Formulator

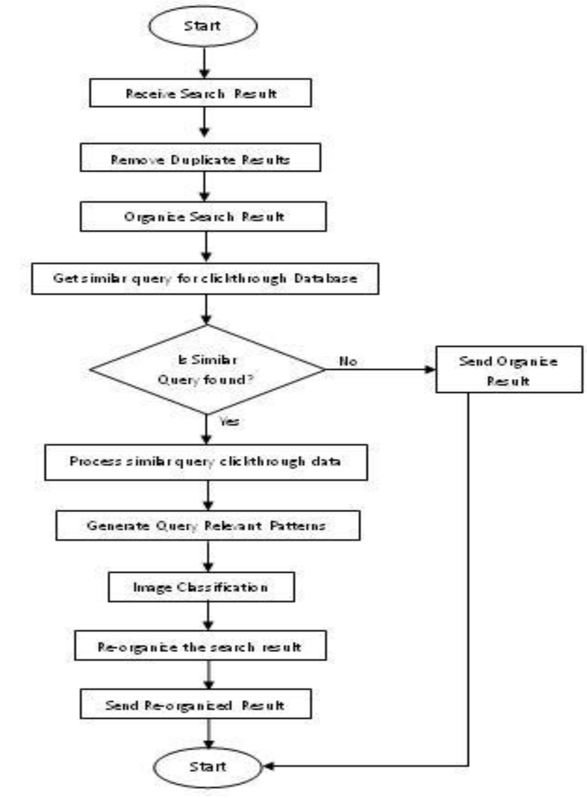

Fig.5 Result Handler

7. RESULT

The following output screen shows the input and output of the execution. User need to enter a search query to and click search button for start image search as shown in figure 6. Here we enter a query as "apple Fruit" for searching.

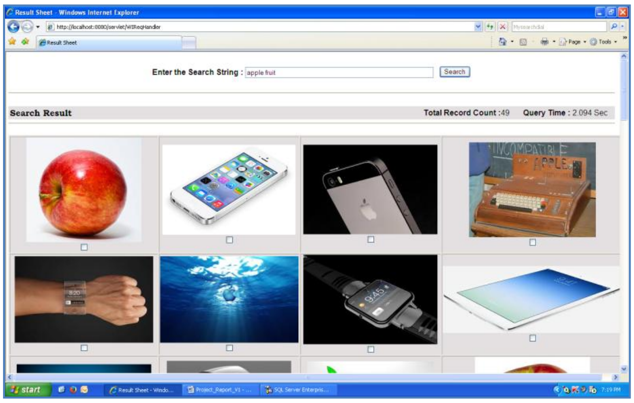

Fig.6 Search Result Obtained for the query as "apple fruit"

We need a supporting parameter to classify these objects separately, for which we have collecting click-through data of a user session for automatic image classification. To do so we provided a checkbox for each image for user selection. We assume that the selected images are which user wants to click in relevance to the search. We save these selected images information in click-through log for classification in relate to the grouping similar queries in future.

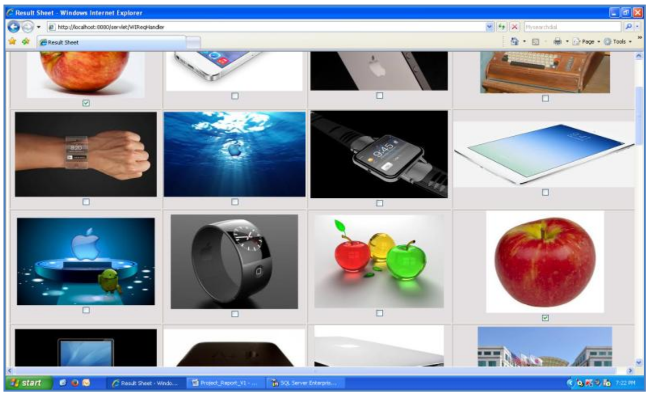

Fig.7 User selected images for the query as "apple fruit"

Fig.7 shows the user selected images in related to the query. The selected images are shown in red circles, and finally we store these selections in clickthrough log in database.

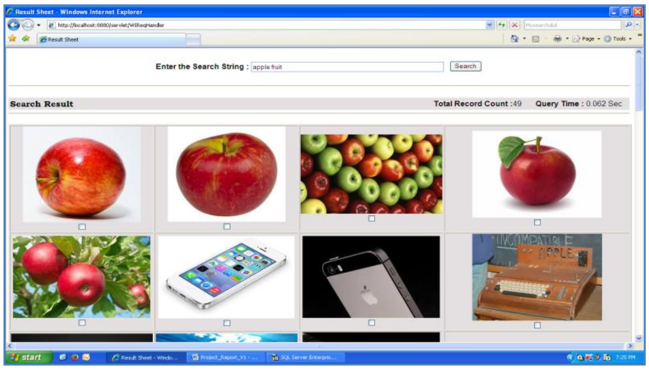

Fig.8 – Search result for second time query as "apple fruit"

Fig.8 shows the classified result based on image classification based on similar query and click through data. We obtain all the user selected images in first session to the query.

8. CONCLUSION

In this paper we focused on designing a new approach for classification of user queries for image search. Our approach retrieves expected result of images as per users' interest. We focused to associate user queries with click-through data to obtain search results as per users' preferences using ranking procedure.

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