Efficient Ranking Model for image retrieval using user clicks and visual features

Mrs.S.S.Sugantha Mallika[1], Nivetha venugopal[2], R.M.Priyanka[3]

[1] *Assistant professor,Dept of Information Technology,Tamilnadu,India*
[2] *Dept of Information Technology,Tamilnadu,India*
[3] *Dept of Information Technology,Tamilnadu,India*

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Abstract : *The volatile expansion and extensive accessibility of community contributed media content on the Internet have led to a surge of research activity in image search. Search-by-example, i.e. finding images that are similar to a query image, is an indispensable function for modern image search engines. The existing system focused on the issues of handling the inconsistency between textual features and visual contents. Click features which are more reliable rather than textual information in justifying the relevance among a query and clicked images, are implemented in image ranking model. To achieve the ranking model, visual and click features are used. concurrently used in this system. However the existing scenario has issues with re-ranking methods and hence the important information is not considered. This leads the system performance to degrade. In the proposed system,* ***Improved Latent Semantic Indexing*** *(ILSI) is introduced which is used to perform the re-ranking on the retrieved images. By learning the query-specific semantic spaces it helps to significantly expand both the efficiency and effectiveness of image re-ranking. It learns different visual semantic spaces automatically for different entered query and it improves the ranking methods. From the experimental result, the conclusion derived is that the proposed system is higher than the existing system.*

1.INTRODUCTION

Image mining deals with the extraction of knowledge, image data relationship, or other patterns not explicitly stored in the images. The access of multimedia information system necessitates the capability to search and organize the information in a sequential manner. Since the availability of technology to search text in web has been increased, the result of retrieving relevant information has becoming a challenging issue. Several researchers have examined methods to retrieve images with respect to their content however many of these frameworks needs the user to query based on image models like color or texture in which users are not familiar with it. Usually, user would like to create semantic queries by employing textual descriptions and discover relevant images to those of semantic queries.

In this project, a set of images from search engine are collected and the visual features and the click features for the images are extracted. A ranking model[2] is built by using both visual features and click features. Click features represent the counting of clicks from a search results page of a search engine. User click has recently been used to measure the relationship between queries and retrieved objects, because a number of research works have found that click is more reliable than textual information in justifying the relevance between a query and clicked objects. Visual features are used to improve the better re-rank for providing the relevant query image results. A set of visual features are used to describe different aspects of images. And also it is used to integrate various visual features to compute the similarities between the query image and other images. The model then trains a classification model with the labeled data and adopts it for ranking. If given a query, the learning to rank system retrieves data from the collection and returns the top-ranked data.

2.RESEARCH METHOD

Learning to rank is a method used for the construction of ranking models for image retrieval systems by training the model in a ranking task.

1. Requirement Definition

Analyzes based on similar application and determines the necessary features in the application to be included. Features that are needed as are follows.

a. Visual features extraction

Visual features[2] are extracted from the images in the dataset. The visual features are considered by constructing hypergraphs such as the HSV color histogram(HSV), wavelet texture(WT) and edge direction histogram(EDH). The visual features are used to refine the images in the re-ranking process. The basic assumption is that relevant images for a query should obtain the characteristic of visual consistency, and visually similar images should obtain a similar ranking output.

b. Click features integration

Click features[27] are extracted for the images in the training data set. Click features indicate the count or the number of clicks for a particular image. It is extracted according to specific query. The images with click count greater than or equal to two are considered in the model. The remaining images do not hold. Click features are extracted to form a feature vector including total click count, hover count.

c. Fast Alternating Linearization

The Fast Alternating Linearization Method(FALM)[1] is applied by keeping the visual features unchanged and linearizing the click features. This algorithm is used to improve the computation speed and minimize the number of iterations.

d. Cutting plane algorithm

The cutting plane method iteratively finds a small set of constraints and solves the small scale problem until the stop condition is met. Initially, this algorithm starts with an empty constraint set, and iteratively searches the most violated prediction for each query.

e. Re-ranking using ILSI

Re-ranking process using ILSI to increase the accuracy performance is performed. Improved Latent Semantic Indexing method is used to perform re-ranking of retrieved images. LSI method applies synonymy concept to given query keyword and then compares it with title and description of images to produce resultant similarity value in fraction (percentage). By using this similarity co-efficient image is re-ranked.

2. System and Software design

System design is the process of planning a new system to complement or altogether replace the old system. The purpose of the design phase is the first step in moving from the problem domain to the solution domain. The design of the system is the critical aspect that affects the quality of the software. System design is also called top-level design. The design phase translates the logical aspects of the system into physical aspects of the system.

The image dataset is collected. Ranked lists are initialized for images in the training set. Visual features are extracted for the images in the training dataset. Click features are generated for the images based on click count and the features are integrated with the visual features[25]. The user inputs the query. The images are re-ranked using Improved Latent Semantic Imaging. Re-ranking result for the given query is generated. ILSI algorithm is more efficient in refining images.

Algorithm

1. Consider the input
2. Start the searching answer for query Q
3. Q ←q1, q2….qn
4. Obtain synonyms of all query
5. Q ←S
6. Result ←Syn_Query
7. Re-rank the query
8. Get all synonyms of title plus description of retrieved images from dictionary
9. Store it in array -→ A
10. Syn_Images [a, b, c…]
11. Compare Syn_Query with Syn_Images.
12. Count ++

$$ILSI = \frac{wordlengt\ h}{counter} * 1$$

Where, words length = total length of word for comparison

Counter = total match found

a. Global initialization

The cutting plane algorithm[1] starts with an empty constraint set, and iteratively searches the most violated prediction $\mathbf{r}$ for each query $q\ j$. If the related constraint is violated by more than a predefined threshold ε for $\mathbf{r}$, it will be added to the working set S^j for query q^j and the problem can be solved with the added constraints for all the queries. The problem is solved by adopting the cutting plane method which iteratively finds a small set of constraints and solves the small scale problem until the stop condition is met. In FALM, the most violated prediction is obtained and added into the working constraint set.

b. Input design

Input design is one of the most important phases of the system design. Input design is the process where the input received in the system are planned and designed, so as to get necessary information from the user, eliminating the information that is not required. The aim of the input design is to ensure the maximum possible levels of accuracy and also ensures that the input is accessible that understood by the user.

The input design is the part of overall system design, which requires very careful attention. If the data going into the system is incorrect then the processing and output will magnify the errors.

c. Output design

The output design is the most important and direct source of information to the user. The encoding time and file size for both the fractal as well as fast fractal technique are shown in output screen. The comparison of both techniques is done and the PSNR value is calculated. The reconstructed image is also displayed in the output screen.

Output from the computer system is required to communicate the result of processing to the user and to provide permanent copy of these results for later consultation. While designing the output, the type of output format, frequency etc has been taken into consideration. Output designed to simply generate an output of the process whether it was successful or not.

3. Implementation and unit testing

Implementation is the process of converting a new or revised system design into an operational one. The implementation is the final and important phase. It involves system training, system testing and successfully running of developed proposed system. The user tests the developed system and changes are made according to their needs. The testing phase involves the testing of developed system using various kinds of data.

An elaborate testing of data is prepared and the system is tested using that test data. The corrections are also noted for future use. The users are trained to operate the developed system. Both the hardware and software securities are made to run the developed system successfully in future. Education of user should really have taken place much earlier in the project when they were being involved in the investigation and design work. Training has to be given to the user regarding the new system.

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

4. Integration and System testing

System testing is the testing to ensure that by putting the software in different environments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

When the individual components are working correctly and meeting the specified objectives, they are combined into a working system[21]. This integration is planned and co-coordinated so that when a failure occurs, there is some idea of what caused it.

In addition, the order in which components are tested, affects the choice of test cases and tools. This test strategy explains why and how the components are combined to test the working system. It affects not only the integration timing and coding order, but also the cost and thoroughness of the testing.

a.Bottom-up Integration

One popular approach for merging components to the larger system is bottom-up testing. When this method is used, each component at the lowest level of the system hierarchy is tested individually[21]. Then, the next components to be tested are those that call the previously tested ones. This approach is followed repeatedly until all components are included in the testing.

Bottom-up method is useful when many of the low-level components are general-purpose utility routines that are invoked often by others, when the design is object-oriented or when the system is integrated using a large number of stand-alone reused components.

b.Top-down Integration

Many developers prefer to use a top-down approach, which in many ways is the reverse of bottom-up. The top level, usually one controlling component, is tested by itself. Then, all components called by the tested components are combined and tested as a larger unit. This approach is reapplied until all components are incorporated.

A component being tested may call another that is not yet tested, so testers write a **stub,** a special-purpose program to stimulate the activity of the missing component. The stub answers the calling sequence and passes back the output data that lets the testing process continue.

c.Big-bang Integration

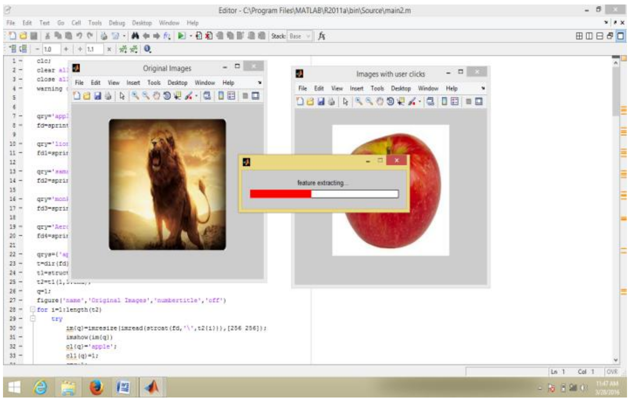
When all components are tested in isolation, it is tempting to mix them together as the final system and see if it works the first time. Many programmers use the big-bang approach for small systems, but it is not practical for large ones.

In fact, since big-bang testing has several disadvantages, it is not recommended for any system. First, it requires both stubs and drives to test the independent components. Second, because all components are merged at once, it is difficult to find the cause of any failure. Finally, interface faults cannot be distinguished easily from other types of faults.

3.EXPECTED RESULTS

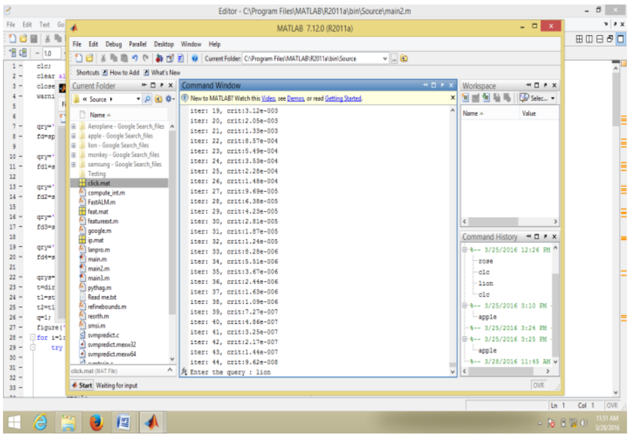
Below are the screenshots for the efficient ranking model for image retrieval using user clicks and visual features obtained in MATLAB.

3.1 Feature Extraction



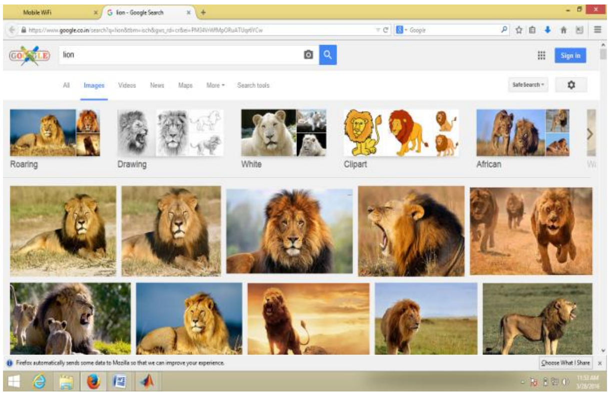
The visual features and click features are extracted for the images in the dataset.

3.2 Entry of query



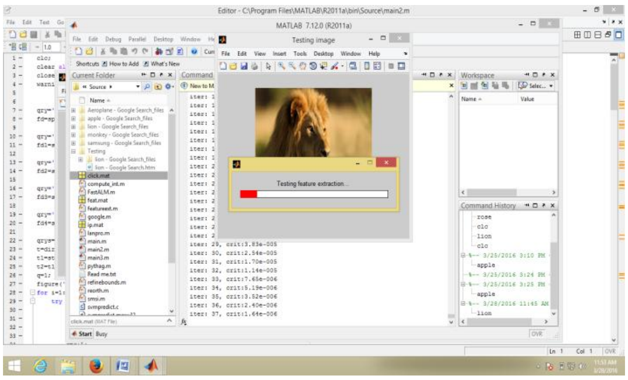
The user enters the query in the command window.

3.3 Image download



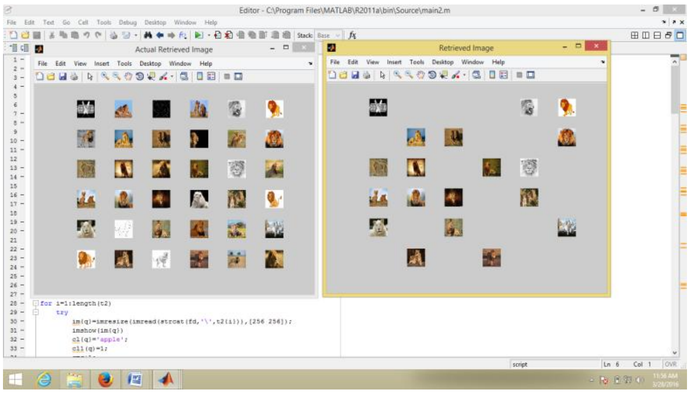
The images corresponding to the given query is downloaded from the google search results page.

3.4 Feature Extraction of downloaded images



The features for the images downloaded from the google search results page are extracted.

3.5 Retrieval of top ranked images using FALM



The images are re-ranked using ILSI and displayed as retrieved image and the actual retrieved images are displayed so that the results can be compared.

4. CONCLUSIONS AND FUTURE WORK

4.1 Conclusions

In this section, the conclusion derived is that the proposed system provides better accurate information rather than the existing system. Existing commercial image search engines usually suffer from imperfect results caused by the noisy textual description in visual search. Although many methods, such as visual re-ranking[27], have been proposed to solve this problem, the improvements in performance have been limited. In this paper, a novel learning to rank model based on visual features and click features (VCLTR), in which both visual and click information are simultaneously utilized in the learning process for ranking is proposed. A more robust and accurate ranking model can be learned from this framework because the noises in click features will be removed by the visual content. But, the existing system has issue with inaccuracy of semantic information. To overcome this problem, improved latent semantic indexing (ILSI) is proposed to increase the accuracy of semantic information. The proposed system is focused on the learning semantic features by re-ranking framework. The visual features of images are projected into their related visual semantic spaces automatically learned. Thus the information accuracy is higher using ILSI method. From the result, it proves the proposed system is higher performance than the existing system.

4.2Future work

In the future work, advanced algorithm to integrate visual appearance consistency so that the information blockage clusters not only protect information about search relevance but also illustrate the part of the visual appearance in every preview session of view can be extended.

5. REFERENCES

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BIOGRAPHIES

S.S.Sugantha Mallika received her M.E degree in Computer science and engineering from Anna University, Coimbatore. She is presently working as Assistant Professor in the Dept of Information Technology at Sri Ramakrishna Engineering College,Coimbatore. Her area of interest is Image Processing and mining.

Ms.Nivetha Venugopal is currently pursuing her final year of B.tech degree in Information Technology at Sri Ramakrishna Engineering College, Coimbatore. Her area of interest is mining and networks.

Ms.R.M.Priyanka is currently pursuing her final year of B.tech degree in Information Technology at Sri Ramakrishna Engineering College, Coimbatore. Her area of interest is mining and networks.