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An Analysis Study of Web Page Ranking Algorithms

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Abstract:-World wide web is a collection of large amount of information source. It is interlinked with each other document .Information is viewed by different browser. Information may be text ,image ,videos ,figures Search Engines are used to find or search useful or appropriate information on the www .It is easy way to find relevant information about any subject at very low cost .When we search any information on the internet the n numbers of irrelevant and redundant information is opened and it is waste in user time and accessing time of search engine. So most of the search engines are ranking their search results in different criteria .In this paper we discuss page ranking algorithms ,HITS algorithm and weighted page rank algorithms.

Keywords*: WWW,Page Ranking Algorithm ,HITS ,Web Mining ,Weighted Page Rank Algorithms.*

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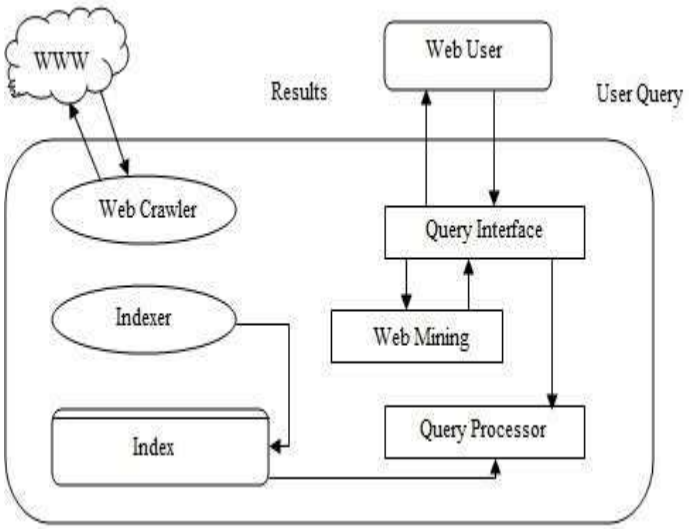
INTRODUCTION

WWW is a huge source of information which continue expand in size and complexity .Web provides an access this information at any place and at any time. User always want relevant information when he /she searching on the web. There are the bulk amount of information so user is feeling very difficult to search ,filter and extract relevant information on the web. The following are the challenges in the web mining[1][6][7]

1.Information is huge on the web
2.Most of web information is semi structured.
3.Most of Web information is linked.
4.The web information is dynamic.



Simple architecture of a search engine

Web Mining

Web mining is one application of data mining means to discover patterns from the web.Two different approaches are related to defines the web mining 1)"Process –Centric view" which define web mining sequences of task.2)Data-Centric View " Which defines web mining in terms of types of web data that is being used in the mining process [8].

There are some following tasks[3][6]

1.Resource Finding:-It is the process which involve extracting data from either online or offline text resource available on the web.

2. Information Selection and processing: The automatic selection and preprocessing of particular information from retrieved web resource

3.Generalization: automatically discovers general patterns at individual web sites as well as across multiple sites.

4 Analysis : Validation and /or interpretation of the mined patterns

Web mining Categories

Web mining is the extraction interesting and useful patterns and implicit information from WWW Web Mining Categories are classified into three-

1.Web Content Mining .
2.Web Structure Mining.
3.Web Usage Mining.

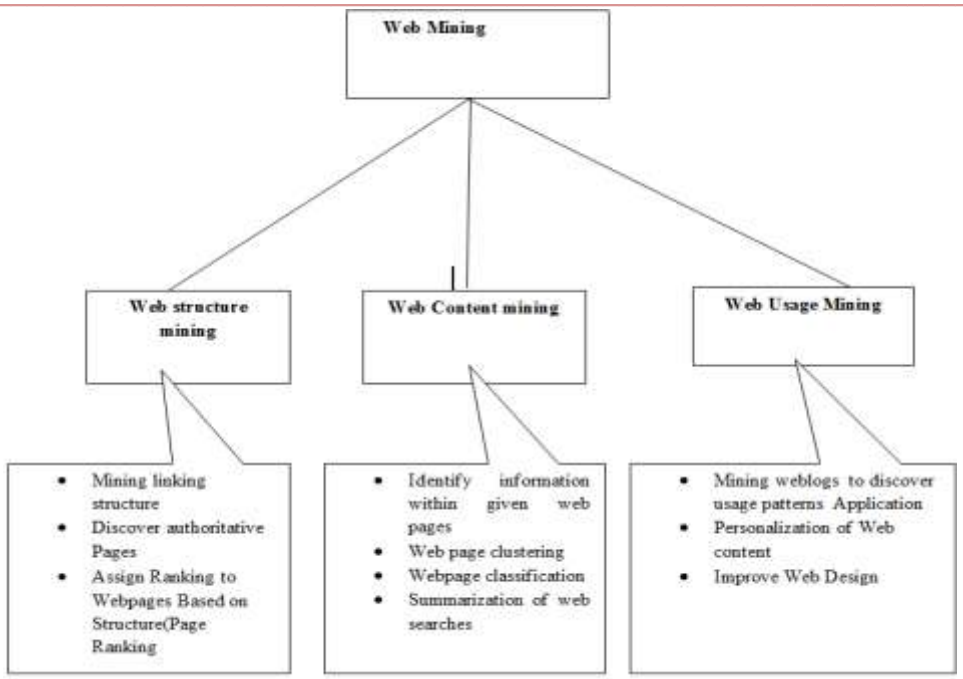


Fig2: Web mining types and tasks[14]

Ranking Algorithms [15]

The web page ranking algorithms rank the search results depending upon their relevance to the search query. For this algorithms rank the search results in descending order of relevance to the query string being searched. A web page's ranking for a specific query depends on factors like- its relevance to the words and concepts in the query, its overall link popularity etc. There are two categories of these algorithms viz. text based and link based [6].

3.1 Text-Based Ranking

The ranking scheme used in the conventional search engines is purely Text-Based i.e. the pages are ranked based on their textual content, which seems to be logical. In such schemes, the factors that influence the rank of a page are [6]:

- Number of matched terms with the query string.
- Location Factors influence the rank of a page depending upon where the search string is located on that page. The search query string could be found in the title of a page or in the leading paragraphs of a page or even near the head of a page [6].
- Frequency Factors deal with the number of times the search string appears in the page. The more time the string appears, the better is the page ranking [6].

Most of the times, the affect of these factors is considered collectively. For example, if a search string repeatedly appears near the beginning of a page then that page should have a high rank [6].

3.2 Link-Based Ranking Algorithms

Another popular class of ranking algorithms is the link-based algorithms. They view the web as a directed graph where the web pages form the nodes and the hyperlinks between the web pages form the directed edges between these nodes [6]. Link-based ranking algorithms propagate page importance through links. During 1997-1998, two most influential hyperlink based search algorithms were reported. These algorithms are:

- PageRanking algorithm
- Weighted Page ranking algorithm
- HITS (Hyperlink Induced Topic Search)

1.Page Rank Algorithm

Google use Page Rank algorithm which is a research project of Larry Page and Sergey Brin for their PhD at Stanford university .Page ranking algorithm Eq. as follows----

$PR\ A = 1 - d + d\ (PR(T1)/Q(T1) + \ldots\ \ldots\ \ldots PR(Tn)/Q(Tn)$

Page Rank algorithm Eq. describe as following [5]:

Where,

PR (A) = Page Rank of page A,

PR (T1) = Page Rank of pages T1 which links to Page A

C (T1) = Number of outbound links on page T1

d = Damping factor whose value between 0 to 1 but usually value is 0.85.

Page Rank of page A is determined by the Page Rank of those pages which links to page (A) using above Eq.

Advantages of Page Rank [9]

The strengths of Page Rank algorithm are as follows:

- Less Query time: Page Ranking give at crawling time.
- Less susceptibility to localized links: Page Rank is generated use for entire Web graph .
- More Efficient: Compared with HITS, page rank give much greater efficiency.

- Feasibility :Compared to Hits algorithm the Page Rank algorithm is more feasible. It calculate page rank at crawl time rather than query time.

The following are the problems or Disadvantages of Page Rank [9]:

- Less Relevant to user Query: Page Rank of a page ignores whether the page is not relevant to
- the query of user.
- Rank Sinks:Page rank is a static algorithm so popular pages tend to stay popular generally. Popularity of a page does not guarantee the desired information to the searcher.
- In Internet, available data isvery huge and page ranking algorithm is not fast.
- Spider Traps: A group of pages which has no links within the group to outside the group.
- Dangling Links: This occurs when a page contains a link that the hypertext points to a page with no outgoing links.

2 .Weighted Page Rank algorithm

Wenpu Xing and Ali Ghorbani was proposed Weighted Page Rank Algorithm [5][9] .It is the extension version of Page Rank algorithm. This algorithm calculate value of the important pages. Each out link page gets a value proportional to its popularity .Popularity of web pages can be determine by the help of incoming links and outgoing links to the web pages, so this algorithm determine this value by the help of following Eq.

Win(v,u) = weight of the link (v , u) calculated based upon number of incoming links of page u and the number of incoming links of all references pages of page v.

Win (v, u) = Iu / $Ip \in R(v)$ p

Where

Iu = Number of incoming links of page u.

Ip = Number of incoming links of page p.

Page Wout (v,u) = weight of the link (v,u) calculated based upon number of outgoing links of page u and the number of outgoing links of all references pages of page v.

W out(v, u) = Ou/ $Op \in R(v)$ p

Where

Ou = Number of outgoing links of page u.

Op = Number of outgoing links of page p.

So the modified Page Rank algorithm is as given below

$wpr(u) = 1-d + d\ wpr(v) W v \in B(u)$in (v, u) W out(v , u)

Where;

wpr (u) = page rank of page u to find out

wpr (v) = Page rank value of page v that pointed to page u

3. HITS algorithm[10]

In 1988HITS algorithm is proposed by Kleinberg. HITS algorithm identifies two different types of Web page called Hubs Pages and Authorities pages. Authorities are pages having important contents. Hubs are pages that act as resource lists, guiding users to authorities. Good hub page for a particular points to many authoritative pages on that subject and good authority page is pointed by many good hub pages on the same subject. Hubs and Authorities are shown in following figure . This page can be a good hub and a good authority at the same time. This circular relationship leads to the definition of an iterative algorithm called HITS (Hyperlink Induced Topic Selection). HITS algorithm is ranking the web page by using in links and out links of the web pages. In this a web page is named as authority if the web page is pointed by many hyper likes and a web page is named as hub if the page point to various hyperlinks. An Illustration of hub and authority are shown in following fig. HITS is, technically, a link based algorithm. In HITS algorithm, ranking of the web page is decided by analyzing their textual contents against a given query. After collection of the web pages, the HITS algorithm concentrates on the structure of the web only, avoiding their textual contents.

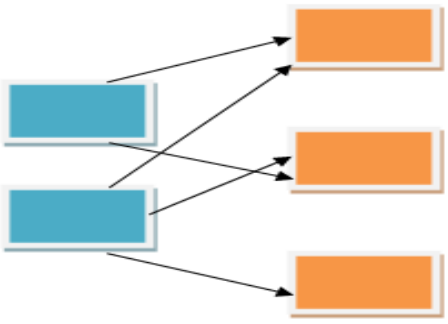
Original HITS algorithm has some problems which are given below.

(i) High rank value is given to some popular web page that is not highly relevant to the given query.

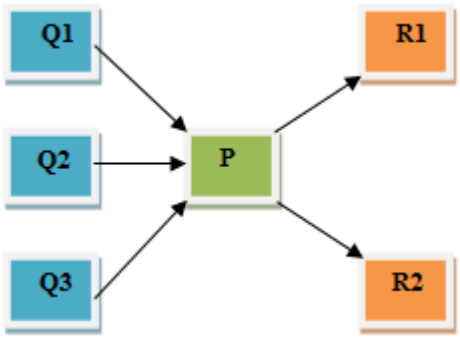
(ii) Topic Drift occurs when the hub has multiple weights are given to all the out links of a hub page.

(iii) In efficiency: graph construction should be performed on line.

(iv) Irrelevant links: Automatically generated links.



Hub Authorities



Calculation of hubs and authorities

Literature Review

Author Hema Dubey discussed about page rank algorithm and HITS algorithm.She proposed new PR algorithm which depends upon normalization technique. They present novel approach which reduce number of iterations.

According to Taruna Kumari PR algorithm rank score of any webpage is divided pages for this pages which it links and weighted page rank algorithm give large rank to the more popular pages.She compare weigthed page rank and PR algorithm .She also tells that wpr is better than PR algorithm by changing value of damping factor(0.15,0.50,0.85) .

Priyanka Buddha describe new algorithm ,time spent on links to improve the relevancy of web pages.the proposed algorithm uses ,the popularity from the time spent by the user for outlinks.She have calculated the page rank value at different damping factor based on WPR,WPRVOL and WPR(time)vol.

Neelam Tyagi[15] have analyzed that the internet consists millions of web pages and large amount of information available within web pages. She describe in this paper that suggested algorithm is used to obtain more relevant information according to a user's inquiry ,this concept is useful to display most valuable pages on the top of the result list on the basis of user browsing behaviour, , which reduce the search space to a large scale

Parveen Rani [16] describes the new algorithm for calculating web page rank according to different parameters. The proposed algorithm called M-HITS (Modified HITS) is a new version of HITS algorithm. It is developed by extending the properties of HITS algorithm. Author present new algorithm in which six parameters are used to evaluate rank for web page. Future work can be done by using some AI techniques in addition to these proposed techniques to improve the rank of web pages.

Comparison of Page Rank algorithms [11]

COMPARISON OF DIFFERENT ALGORITHM	**Page rank**	**HITS**	**Weighted Page rank**
Main Technique	Web Structure Mining	Web Structure Mining	Web Structure Mining
I/O Parameters	Back link	Content, Back link, forward link	Content, Back link, forward link
Complex	O(login)	<O(Login)	<O(login)
Working	This algorithm computes the score for pages at the time of indexing of the pages	It computes hubs and authority of the relevant pages. It relevant as well as important pages as the result	Weight of web page is calculated on the basis of input and outgoing links and on the basis of weight the importance of the page is decided
Efficiency	Very less	Moderate	Average
Importance	High, black links are considered	Moderate, Hub authorities scores are utilized	High. The pages are sorted according to the importance
Limitations	Results come at the time of indexing and not at the query time.	Topic drift and efficiency problem	Relevancy is ignored
Quality of result	Medium	Less than page rank	Higher than page rank
Relevancy	Less	More	Less

Conclusion

The web page ranking algorithms, which are importance of web mining, play a very important role in making the user search navigation easier in the results of a search engine. The paper presented a detailed comparison study of page ranking algorithms, Weighted Page Rank algorithm, HITS algorithm.

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