Performance Evaluation of Search Tools: CORE & BASE

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Abstract—*The paper aims to evaluate the performance of two academic search tools CORE and BASE in terms of the precision, recall and novelty. The study was initiated with the identification of search tools and selection of subject. Two prominent search tools CORE and BASE were selected for the study and Economics was selected as a subject. The sub-fields of the Political Science were derived from the Dewey Decimal Classification Scheme and their search terms were selected from the Sears List of Subject Headings (SLSH). Each search term was searched in both the search tools using the simple search mode. Then the first fifty search results were evaluated to identify the precision, recall and novelty. The results show that CORE performed well as compared to the BASE. The research was conducted on two search engines i.e. CORE and BASE and has only selected terms from Political Science. The study is useful for LIS professionals, politicians, academicians, researchers, industrialists, and others in searching for online information. The present study is the primary effort to find the precision, recall and novelty of academic search tools- CORE and BASE. The study will serve as a baseline for future research in this direction.*

Key Terms: *Search Engines, Precision and Recall, Novelty Ratio, Academic search tools, CORE, BASE*

"1. Introduction"

The extent of World Wide Web is increasing tremendously every second and makes searching on web tough to find accurate information. We usually visit the website for getting information in the form of book, journals or any other source of information. We visit or browse one page to another page and from one website toanother website in order to get relevant information we need **[11].** The World Wide Web can be used as a tool for learning, research and other purposes. Web users can have access to information available around the world with one touch which clearly exhibits that the web is an important tool for retrieving information**[12]**. Users search electronic information via web search tools such as Google and Yahoo on routine basis for surfing web,however, the result output maybe relevant or irrelevant for the user **[9].**Meanwhile evaluation of search tools has the same common purpose as that of any other retrieval system, to provide a measure of how good the system is at providing the user with the information he/she needs.**[10]** A number of search tools were available on the web and these search tools provide different features and efficiencies. Evidently, we cannot use all of them at the same time, so we can get confused, which one is the best? Which one should we use?**[13].** The efficiency of different search tools can be evaluated on various parameters like relevant, irrelevant results; time taken for retrieving results, precision and recall**[5].**Thestudy attemptsto answer these questions by comparing the efficiency of two academic search tools CORE and BASE.

"2. Literature review"

Following were the literature used to accomplish the study.The literature is related about various aspects of web and its evaluation.

[6]proposed an evaluation method for search engines by developing a conceptual model based on the literature and the key factors that influence user evaluation of search engines, effective and efficient criteria for evaluation by considering user satisfaction and usage as the search engine success variables and concluded that the relevance of the results plays a crucial role in revisiting the search engine by the users. The study conducted by**[4]** compared the Hoot retrieval with the Lucene retrieval and found that Hoot is efficient than Lucene and retrieved 91.25% relevant documents as compared to Hoot.**[3]**estimated the precision and relative recall values of the most frequently used Meta search engines. The results provided evidence that the Google is able to give better search results with more relative recall as compared to other search engines. Dog pile also gave better search results with more precision value because it extracts and filters the documents from most effective multiple search engines like Google and Yahoo.**[2]**evaluated on Web Search Engines based on features and end-user experience among the select

five search engines Google, Yahoo, AltaVista, Ask, and Bing. Authors revealed that 92% respondents said that Google is easy to use. The authors concluded that Google is the best till date; people like to search information on Google as it provides better interface, features and ease of use to the users than the other search engines[14]evaluated that Google achieved the best retrieval performance with all five search features among the three search engines (Google, Google China and Baidu). Moreover, Google achieved the best webpage ranking performance [1]. Evaluated that indexing structure and search method were the core criteria for evaluating the search engines. Google achieved the best performance among the six typical Chinese search engines. Few studies have been conducted on search strategies and search skills of internet users.[8] revealed that 63.4 percent of respondents use online databases, followed by search engines (24.3 per cent), and print materials (11.3 per cent). Participants ranked Google as the most favorable search engine. In a comparison to using databases versus search engines, 58.4 percent of respondents stated that they use online databases for seeking scientific information, while 33.6 per cent use search engines.

"3. Research Design"

Purpose

The main intention of the study is to estimate precision, relative recall and novelty ratio of the academic search engine CORE and BASE in the field of Political science. In the present era vast amount of information were available on the web. Every day billion of searches were conducted using different search tools, thus, it's difficult to find relevant information.

Methodology

The study was initiated with the identification of search tools and selection of subject. Two prominent search tools CORE and BASE were selected for the study and Political science was selected as a subject. The sub-fields of the Political science were derived from the Dewey Decimal Classification Scheme and their search terms were selected from the Sears List of Subject Headings (SLSH). Each search term was searched in both the search tools using the simple search mode. Then the first fifty search results were evaluated to estimate the precision, recall and novelty.

1. Estimation of precision and Relative recall

The Precision and relative recall was estimated as given in the below formula.

If the link of the webpage is as per search query then its most relevant results (MR) and score is given to link 2

Ifthe link of the webpage is somehow as per search query then its relevant results(R) and score is given to link 1

If the link displayed other than search query then result is considered as link(L) and score is given to link 0.5

If the link of the webpage isn't at all as per search term then it's irrelevant results (IR) and then score is given 0.

Precision

Capacity of the system to withhold irrelevant documents. Mathematically represented as:

Precision= Sum of the scores of sites retrieved by a search engine/Total number of sites selected for evaluation

Relative recall

Recallis capacity retrieve relevant document of system. However, applying recall value difficult as we don't know actual number of relevant documents for a particular query in a database. So, we calculate relative recall value. Mathematically represented as:

Relative recall= Sum of the scores scholarly documents retrieved by a search engine/Sum of the scores scholarly documents retrieved by all search engine

"4. Data Analysis &Results"

The results of the study are discussed below:

Precision of CORE and BASE

While comparing the precision of CORE and BASE from table 1 and table 2 it was found that the overall precision of CORE (4.96) is more than that of the precision of the BASE (2.74). The mean precision obtained from search queries of Political Science on CORE is highest as compared to BASE. With highest precision (1.28) for the term Democracy and lowest (0.38) for Political Equality. While as in BASE highest precision (0.72) for the term Minority Rights and with lowest (0.7) for Political Equality.

Table 1. Precision of CORE

Search Term	Total Results	Sites Evaluated	More Relevant	Relevant	Irrelevant	Link	Precision	Mean Precision
Political Equality	249300	50	2	15	33		0.38	
Liberal democracy	818436	50	10	17	23		0.74	
Democracy	414310	50	18	32	0		1.36	
Legislation	680231	50	15	34	1		1.28	
Minority Rights	266068	50	14	32	4		1.2	
Total							4.96	0.992

Table 2. Precision of BASE

Search term	Total Results	Sites Evaluated	More Relevant	Relevant	Irrelevant	Link	Precision	Mean Precision
Political Equality	73432	50		35	15		0.7	
Liberal Democracy	21107	50	1	29	20		0.62	
Democracy	220204	50	1	20	29		0.44	
Legislation	13005	50	0	13	37		0.26	
Minority Rights	77815	50	8	20	22		0.72	
Total							2.74	0.548

Relative Recall of CORE and BASE

While comparing the mean relative recall values form table 3. CORE (4.15) with highest value as compared to BASE (0.84) search engine. CORE has highest success rate in retrieving relevant pages as compared to BASE search engine. Moreover, CORE shows consistency in retrieving relevant result hits.

Table 3 Relative Recall of CORE & BASE

Search term	Core	Base	Total	Relative Recall of core		Relative Recall of Base	Mean Relative Recall Core	Mean Relative Recall Base
Political equality	249300	73432	322732	0.772467558		0.227532442		
Liberal democracy	818436	21107	839543	0.974858941		0.025141059		
Democracy	414310	220204	634514	0.652956436		0.347043564	0.831047946	0.168951885
Legislation	680231	13005	693236	0.981240155		0.018759		
Minority Rights	266068	77815	343883	0.773716642		0.226283358		
			Total	4.155239732	Total	0.844759423		

Novelty Ratio of CORE and BASE

From table 4 & 5 different novelty value of CORE and BASE has been retrieved. CORE retrieve (58) recent documents out of 250 documents, while as BASE retrieve (54) recent documents out of 250 documents. Thus, it clearly depicts that the CORE shows (23) % novelty in its results while as BASE shows (21.6) % novelty in its results which is slightly lower than CORE.

Table 4Novelty ratio of CORE

Search term	Sites evaluated	No of recent documents retrieved (2014-	Novelty Ratio
Political equality	50	21	42
Liberal democracy	50	21	42
Democracy	50	8	16
Legislation	50	3	6
Minority Rights	50	5	10
	250	58	
		Mean	23.2

Table 5 Novelty ratio of BASE

Search term	Sites evaluated	No of recent documents retrieved (2014-	Novelty Ratio
Political equality	50	11	22
Liberal democracy	50	10	20
Democracy	50	15	30
Legislation	50	10	20
Minority Rights	50	8	16
	250	54	
		Mean	21.6

"5. Discussion & Conclusion"

The present study estimated the precision and the relative recall of CORE and BASE search tools. The results of the study showed that the precision and relative recall of CORE is higher than BASE. Moreover, the novelty ratio and coverage of CORE is also higher than BASE. The BASE doesn't perform satisfactory as compared with CORE. The performance of CORE in retrieving more scholarly documents is better than BASE. Hence, CORE is the best alternative choice for users to get scholarly information.

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