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# Design and Implementation of SOA Enhanced Semantic Information Retrieval web service using Domain Ontology, WCF and .NET Technologies for a Distributed Environment

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***Abstract:*** *Information retrieval services serve a critical role in numerous business knowledge systems. There are different mature IR algorithms that have been implemented and it is by all seems to be a waste of resources and time to re-implement them. The implemented IR algorithms can be distributed and or their functions can be made accessible and open through the framework of SOA enhanced semantic web services. SOA enhanced Web services in the IR domain have not been widely attempted. Concept relevancy ranking of link and page content retrieval is an imperative area in traditional IR. Demonstrated that it can be easily adopted as IR web services and can be accessed in numerous ways. For the IR web services, we exploit the semantic web which is presently an evolution of the current web that represents information in a machine-readable format, while keeping the human-friendly mark up language representation and whereby avoiding key word searching. A new system is proposed here for a semantic web information retrieval service utilizing Domain Ontology [28], which consolidates semantic web, WCF services and .NET technologies to improve System skeleton for building the semantic web support for intelligent business knowledge search using RDF, ontology and SPARQL queries.*

***Index Terms:*** *Semantic Web Search, SERP-Search Engine Result Page, WCF-Windows Communication Framework, Domain Concept Ontology, Semantic Annotation, Concept keyword.*

## I. Introduction

The area of IR is more or less fifty years old and many techniques and operations which have been developed in IR don't oblige intense changes and/or re-implementation. The key idea behind SOA enhanced web services is that frequently used functions can be implemented once and offered to other application through user programmatic interfaces. Very few of web services exist for IR even though several common IR functions can be potentially offered through web services. In this paper, we concentrated on Concept relevancy ranking of link and page content retrieval[11] as key IR functions and demonstrate how these capabilities can be offered as web services. The paper will briefly outline the architecture of our system. It will describe how the key concepts are determined and extracted. The paper will conclude with a discussion of future work.

## II. Methodology

In the Semantic Web, Ontologies give resources shared, machine process capable significance by modelling the entities and processes used to depict both the content of a Web resource and, more imperatively, the logical relations between the resources. Ontological models permits the *annotation* of Web documents (modelling the representation of information contained in them) and thus the formulation of more precise queries to retrieve documents. Annotation normally involves creating metadata items (as instances of concepts from the ontology) to represent specific entities recognized in the resources, and then linking this metadata to the resource as its description. Numerous research efforts have thus focused on providing automatic or semiautomatic ways to annotate web documents in different formats—mainly text, but also structured formats such as databases.

As existing System depends on Key Word Searching – getting just 70% accurate result staying 30% are pointless results. Current catchphrase based web crawlers [5] can't totally get the inherent abundance of synonymy and polysemy.

Proposed System depends on Semantic Searching methodology - ontology annotation knowledge representation methodology– building up a Semantic web look structure which will get 90% precise results and utilizing level documents and SPARQL queries for get ready Flat records; Processing is Very quick there by Semantic web Search in view of Annotation Engine, Search Engine using Ontology and RDF.

## III. Architecture

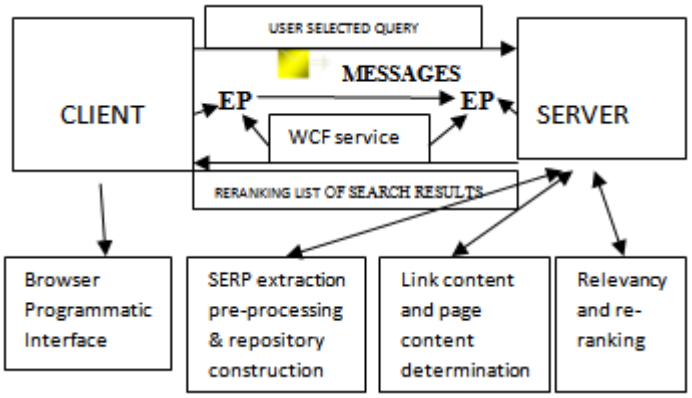



**Figure 1. System Architecture**

### 3.1 System Architecture

The system (see Figure 1) mainly comprise of three components: the SOA [8][21] enhanced web services[5], which are deployed on Visual Studio 2008, .NET, WCF and IIS Server; the client, which passes the user selected query to the web services[8] and recovers the outcomes back based on the SOAP protocol; and data access modules to get domain terms and document archive gatherings.

#### 3.1.1 Framework architecture

WCF is designed in accordance with service oriented architecture standards to help distributed computing where services are devoured by consumers.

Clients can consume multiple services and services can be devoured by multiple clients.

Services are inexactly to one another. Services typically have a WSDL interface (Web Services Description Language) which any WCF client can use toexpend the service, irrespective of which platform the service is facilitated or hosted on. WCF implements numerous propelled web services [16] (WS) standards such as WS-Addressing, WS-Reliable Messaging and WS-Security.

#### 3.1.2 Endpoints (EP)

A WCF client connects with a WCF service through an Endpoint. Each service exposes its contract by means of one or more endpoints. An endpoint has an address, which is a URL indicating where the endpoint can be accessed and binding properties, that tag how the data will be transferred.

Address / Binding / Contract. specifies what communication protocols are utilized to get the service, whether security mechanisms are to be utilized, and so forth. WCF incorporates predefined bindings for most regular communication protocols such as SOAP over HTTP, SOAP over TCP, and SOAP over Message Queues, and so on. Interaction between WCF endpoint and client is done using a SOAP envelope. SOAP envelopes are in basic XML form that makes WCF platform independent.

When a client needs to access the service by means of an endpoint, it not only needs to know the contract, but also to adhere to the binding indicated by the endpoint. Therefore, both client and server must have compatible endpoints.

#### 3.1.3 Interoperability

WCF supports interoperability with WCF applications running on the same Windows machine or WCF running on a other Windows machines or standard web services based on platforms such as Java running on Windows or other operating systems. WCF does not simply support SOAP messages, it can likewise be configured to support standard XML data that is not wrapped in SOAP, or can even be utilized to support formats such RSS, or JSON which makes WCF adaptable for current necessities and further changes.

## IV. Semantic Web Services

In the Semantic Web Service[1], Ontological models allows the *annotation* of Web documents and in this manner the formulation of more exact queries to retrieve documents.

Annotation typically involves instances of concepts[23] from the ontology[26] to represent specific entities perceived in the resources, and then linking[9] this metadata to the resource as its portrayed, a new methodology namely – ontology annotation knowledge representation is introduced to rank the relevant pages based on the domain concepts and keywords as opposed to keyword.

In this approach[25] at first SERP's are extracted based on the user query. Pre-process both user query and SERP for domain ontology[27] and semantic annotation. Root words are separated from the user query to form a repository. Here the link content and page content of the SERP's are checked with repository so that the more relevant pages are retrieved.

In this SOA enhanced web service[21], we developed and deployed three web service methods (operations). Each of them is detailed as below.

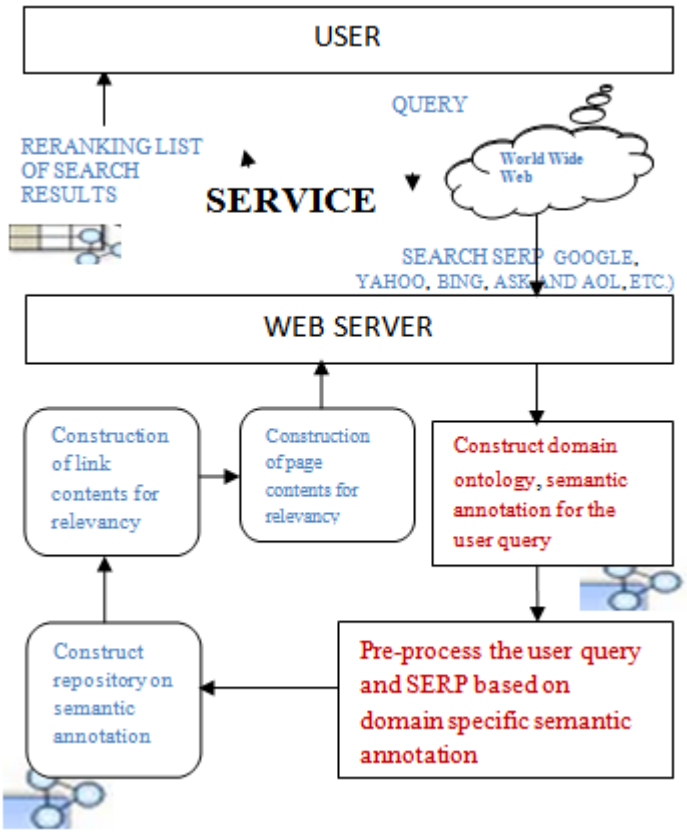



**Figure 2. Web Service Design Architecture**

**4.1 SERP extraction**

Based on the user query, Search Engine Results Page (SERP) are retrieved. Pre-process both User Query and Search Engine Results Pages exclusively based on domain ontology and semantic annotation.

**4.2 Pre-processing**

Pre-process user query and extract root words, which are considered for constructing Repository and it is built along with its domain ontology and semantic annotation.

**4.3 Link content and page content determination**

Pre-process and extract the link content[9] and page content keywords for the search engine result pages and compared against the Repository. If match found then corresponding strength is granted each word.

**4.4 Relevancy calculation**

The relevancy is calculated based on how well the results matches the query in addition to how related the retrieved index items of the results to the query.

After finding the web pages on the proposed approach[2] relevancy for the particular Search Engine Results Pages against user query is computed by summarizing all the strength of the link contents and page contents by use of damp factor d. The search result page's total relevancy are ranked in increasing order.

**4.5 Re-ranking**

Finally re-rank the search results[15][20] on Total relevancy in increasing order. The Top Search Result is the most relevant and bottom is the least relevant for the User query.

## V. Concept Relevancy Ranking of Link and Page Content

Input : Extracted Search Engine Results Page
Methodology : Ontology annotation knowledge representation
Output : Re-ranked Search Engine Results Page

Step 1:/* In our example, the user query is "company cts chennai taramani "*/
For the user query extract SERP's of Top-K results.
Step 2: /* pre-process based on domain and semantic annotation.*/
pre-process the user query and SERP's based on domain ontology[7] and semantic annotation .
Step 3:/*construction of Root Words RW and repository*/
Pre-process the user query, Extract root words RW and construct a domain repository without duplications of root words RW.
Step 4: /*link content computation*/
Extract and pre-process the link contents[22] words for the SERP's and compute Link Content Kyword Strength.
S(LCKWi) =1/ Σ*LCKWi*
Compare each link keywords against Repository. if match found grant the keyword strength to the specific link content keyword Else grant 0. Calculate Total Strength for link content Keyword by summarizing strength of all link content keywords. TLCKS(SRi) = ΣS(LC*KWi*)
Step 5: */page content computation/*
Pre-process and extract the page contents words for the SERP's and calculate Page Content Keyword Strength.
S(PCKWi) =1/ ΣP*CKWi*
Compare each page content keyword against Repository. if match found grant the keyword strength to the specific page content keyword Else grant 0. Calculate Total Strength for page content Keyword by summarizing the strength of all page content keywords TPCKS(SRi) = ΣS(PC*KWi*)
Step 6: Compute total relevancy for the particular SERP using damping factor d..
$TR_i$ = total strength of link content keywords * d + total strength of page content keywords * (1- d)
TRi = TLCKS(SRi)*(d) + TPCKS(SRi)*(1- d) where $0 < d < 1$
Step 7 Repeat the Step 4 through 6 for all SERP's
Step 8 Re-rank the result based on TR in increasing order.
The Topmost Search Result SRi is the most relevant and bottom most search result is the least relevant for the User query whereby display the retrieved documents according to the re-rank.

## VI. Experimental Implementation and Modules

This experimental implementation consists of three main modules viz.
1. Admin Module
1.1 Domain Ontology
1.2 Semantic annotation
1.3 View Domain
1.4 View RDF
1.5 View SPARQL
2. Search Interface Module
3. Testing Module

### 6.1 Admin Module

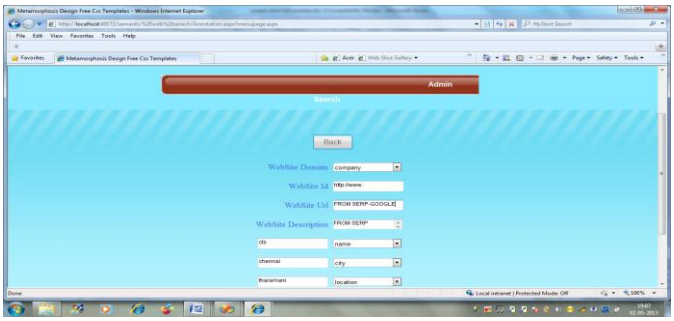
Admin module comprises of five sub modules viz. domain ontology, semantic annotation engine, and view domain, view RDF and view SPARQL.

The primary sub module domain ontology specifies formal explicit specification of shared concepts and it accepts the Domain namely company and its concepts includes name, city, and location. Ontology must represent dynamic operations such as sequences, selections and iterations that are important and necessary to represent tasks

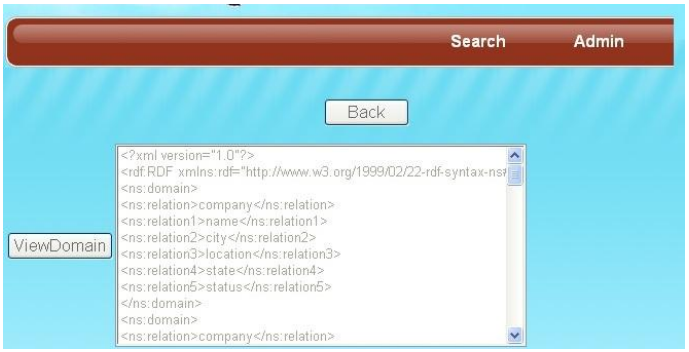
The second sub module semantic annotation element uses domain knowledge to create the actual Meta data. The framework component queries the information generated by the annotation component. It accepts queries posted in SPARQL and returns a set of links to matching resources. It uses ontology's to specify meaning of annotation. This sub module accepts the domain and its concepts from the domain ontology and accepts entry for the keywords namely cts, chennai, taramani subsequently building domain concepts-keywords relationship.

Subsequent sub modules viz. view domain, view RDF and view SPARQL displays the related domain RDF and SPARQL for the user concepts and keywords for the Domain Company as follows:

domain : company (business knowledge)
name : cts
city : chennai
location : taramani

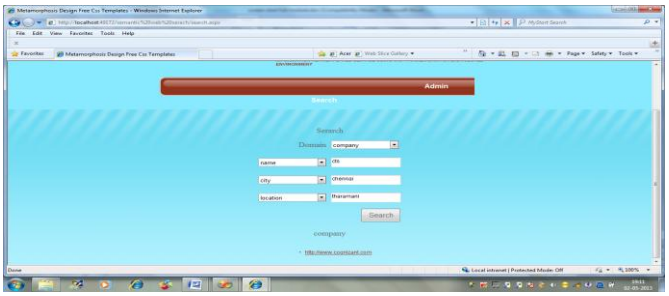







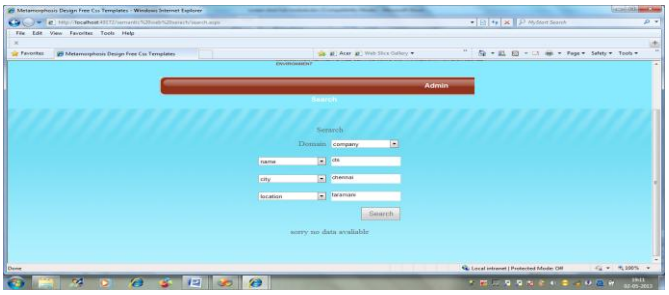

### 6.2 Search Interface Module

The search interface lets end users to access the resources filtered and annotated by the semantic annotator component. User can interact with the knowledge base to fine-tune the query, making subsequent searches more precise. The key aim for the search interface is to give the user an intuitive and clear unique abstract query model that hides, as much as could reasonably be expected, the underlying complexity of representation and interpretation.



### 6.3 Testing Module

Once the implementation exists, must test it to check whether it is free of errors or bugs to ensure high quality thereby must meet user's needs and expectations, furthermore the experimental implementation should attain this with insignificant or no imperfections, the focus being on improving by enhancing prior to delivery rather than correcting them after delivery.



## VII. Experimental Results and Performance Evaluation

Since there is no standards metrics to measure the quality of ranking ontologies or instances in the semantic at present; evaluate the accuracy of our proposed ranking; in comparison with search engine ranking and procedure based manual ranking.

Now we compare the rankings of the various search engines Google, Yahoo, Bing, Ask, AOL on the domain specific user query ("company cts Chennai taramani") on the same day – Table 4. As examining all the results in Table 4, out of which proposed ranking approach on Google Vs procedure based manual ranking give more closure results.

**Table 4** Comparison Of Multiple Search Engines – Relevancy Ranking

| SERP ID | PROPOSED RANKING APPROACH ON | | | | | PROCEDURE BASED MANUAL RANKING |
|---|---|---|---|---|---|---|
| | YAHOO | BING | ASK | AOL | GOOGLE | |
| SERP1 | 9 | 6 | 9 | 3 | 10 | 10 |
| SERP2 | 6 | 4 | 5 | 10 | 5 | 4 |
| SERP3 | 5 | 3 | 6 | 6 | 4 | 5 |
| SERP4 | 4 | 10 | 4 | 9 | 2 | 2 |
| SERP5 | 1 | 9 | 2 | 7 | 1 | 1 |
| SERP6 | 2 | 1 | 1 | 8 | 9 | 9 |
| SERP7 | 8 | 8 | 8 | 5 | 8 | 7 |
| SERP8 | 10 | 7 | 7 | 4 | 3 | 3 |
| SERP9 | 3 | 2 | 3 | 1 | 6 | 6 |
| SERP10 | 7 | 5 | 10 | 2 | 7 | 8 |
| Contd ●●● | | | | | | |

**TABLE 1 – INPUT DATA SET**

Did you mean: company cts chennai ***taramani***

| SERP ID | Search Engine Results Pages |
|---|---|

SERP1 **Cognizant Technology Solutions** India Private Limited, **Taramani ...**
*www.asklaila.com › **Chennai › IT Companies***
IT **Companies**, Airtel Payment Dropbox: **Cognizant Technology Solutions** India Private Limited, **Taramani**, **Chennai**, Tamil Nadu – Get contact address, mobile **...**

SERP2 **Cognizant** in Jobs, recruitment in **Taramani**, Tamil Nadu | Indeed.**co**.in
*www.indeed.**co**.in/ **Cognizant** -in-jobs-in-**Taramani**,-Tamil-Nadu*
Jobs 1 - 10 of 38 – 38 **Cognizant** in Jobs available in **Taramani**, Tamil Nadu on Indeed.com. one search. all **... Cognizant** IN 340 reviews - **Chennai**, Tamil Nadu **...**

SERP3 **Cognizant Technology Solutions** Jobs, recruitment in **Taramani ...**
*www.indeed.**co**.in/**Cognizant**-Technology-Solutions-jobs-in-**Taraman**...*
Jobs 1 - 10 of 31 – 31 **Cognizant Technology Solutions** Jobs available in **Taramani**, **... Cognizant** IN 340 reviews - **Chennai**, Tamil Nadu **...**

SERP4 **Cognizant Technology Solutions**
www.**cognizant**.com/contactus/office-**locations**
Score: **24** / 30 · 22 Google reviews

SERP5 **Cognizant Technology Solutions**
*www.**cognizant.**com/*

SERP6 Cognizant Technology Solutions Ltd. in Tharamani ...
*yellowpages.sulekha.com › ... › Software Companies in Tharamani*
**Cognizant Technology Solutions** Ltd. in **Tharamani**, **Chennai** - 600113 – Get **Cognizant Technology** ... Fill this Form and Software **Companies** will call you now.

SERP7 Cognizant in Jobs, recruitment in Taramani, Tamil Nadu ...
*www.indeed.**co**.in/**Cognizant**-in-jobs-in-**Taramani**,-Tamil-Nadu*
Jobs 1 - 10 of 50 - 50 **Cognizant** in Jobs available in **Taramani**, Tamil Nadu on Indeed.com. one search. all jobs. ... Advanced Job Search. job title, keywords or **company**, city or state ... **Cognizant** IN 2,095 reviews - **Chennai**, Tamil Nadu ...

SERP8 Cts Jobs, recruitment in Taramani, Tamil Nadu | Indeed.co.in
*www.indeed.**co**.in/**Cts**-jobs-in-**Taramani**,-Tamil-Nadu*
Jobs 1 - 10 of 53 - 53 **Cts** Jobs available in **Taramani**, Tamil Nadu on Indeed.com. one search. all jobs. ... **CTS**, SITEL, SUTHERLAND – **Chennai**, Tamil Nadu ...

SERP9 Cognizant Technology Solutions India Pvt Ltd in Tharamani ...
*www.justdial.com/**Chennai**/**Cognizant**...**Tharamani**/044P7011372_Q2hlb...*

Rating: 4.3 - 172 votes
**Cognizant Technology Solutions** India Pvt Ltd in **Tharamani**, **Chennai** listed ... your friends rating SEBA BUISNESS SOLUTIONS ENCHANTER **CORPORATION** ...
SERP10Cognizant Technology Solutions India Pvt Ltd in Perungudi ...
*www.justdial.com/**Chennai**/**Cognizant**..**Tharamani**.../044PF005719_Q2h...*
No 1, Veeranam Road, Perungudi,**Chennai** - 600096 Opp To **Tharamani** Railway Station | Map ... We found the **company** to be good in payment and service.
Contd. ●●●

Proposed algorithm – Concept relevancy ranking is applied to above SERP and the results are listed in Table 2.

**TABLE 2 – RELEVANCY RANKING**

| Sl. No. | SERP ID | TOTAL RELEVANCY | RANK |
|---|---|---|---|
| 1 | SERP5 | 0.1 | 1 |
| 2 | SERP4 | 0.1 | 2 |
| 3 | SERP8 | 2.35 | 3 |
| 4 | SERP3 | 2.45 | 4 |
| 5 | SERP2 | 2.45 | 5 |
| 6 | SERP9 | 3.0 | 6 |
| 7 | SERP10 | 3.0 | 7 |
| 8 | SERP7 | 2.45 | 8 |
| 9 | SERP6 | 2.45 | 9 |
| 10 | SERP1 | 3.8 | 10 |

Contd. ●●●

From the TABLE 2 results, it is understood that if the total relevancy value is less, it is ranked as first and vice-verse.
Now the same relevant dataset is evaluated against retrieved dataset. Comparison results of the proposed approach against search engine ranking and procedure based manual ranking are given in the TABLE 3.

**TABLE 3 COMPARISON OF – RELEVANCY RANKING**

| SERP ID | SEARCH ENGINE RANKING | PROCEDURE MANUAL RANKING | PROPOSEID RANKING APPROACH |
|---|---|---|---|
| SERP1 | 1 | 10 | 10 |
| SERP2 | 2 | 4 | 5 |
| SERP3 | 3 | 5 | 4 |
| SERP4 | 4 | 2 | 2 |
| SERP5 | 5 | 1 | 1 |
| SERP6 | 6 | 9 | 9 |
| SERP7 | 7 | 7 | 8 |
| SERP8 | 8 | 3 | 3 |
| SERP9 | 9 | 6 | 6 |
| SERP10 | 10 | 8 | 7 |

Contd. ●●●

TABLE 3 represents the matching of procedure based manual ranking against proposed approach ranking. Document SERP2, SERP3 represents the mismatching of procedure based manual ranking against proposed approach. As can observe from the experimental results; proposed methodology outperforms existing ranking results.

The results after entering the query in the search page, it gives the precise output which the user actually anticipate. This in-fact is almost the best Search while searching the substantial amount of data, the fields are to be filled with accurate data, and for a novel user it may be troublesome however if searching for a particular output or search this gives the best result. The data stored in SPARQL with the help of RDF fetch the relevant data. Completed a comparison taking search time and search accuracy as comparison parameters of proposed ranking approach applied with some of the search engines viz. Google, Yahoo, Bing on the domain

specific user query ("company cts Chennai taramani"). The Comparison table regarding time to search and accuracy of result is shown in the below table. The accompanying table shows the search time and accuracy of proposed ranking approach on selected search engines chosen in our implementation with a normal trial search of 100 searches on domain specific user query ("company cts Chennai taramani").

**TABLE 5 - COMPARISON OF PROPOSED RANKING APPROACH ON MULTIPLE SEARCH ENGINES – FOR EFFICIENCY (IN SEC.) AND ACCURACY (IN %)**

| SERP ID | PROPOSED RANKING APPROACH ON | | | | | | | | | PROCEDURE BASED MANUAL RANKING |
|---|---|---|---|---|---|---|---|---|---|---|
| | YAHOO | | | BING | | | GOOGLE | | | |
| | Ranking | Search Time (in Sec.) | Accuracy (in %) | Ranking | Search Time (in Sec.) | Accuracy (in %) | Ranking | Search Time (in Sec.) | Accuracy (in %) | |
| SERP1 | 9 | 2.0 | 90 | 6 | 2.5 | 90 | 10 | 3.35 | 90 | 10 |
| SERP2 | 6 | 1.0 | 95 | 4 | 1.4 | 95 | 5 | 2.0 | 95 | 4 |
| SERP3 | 5 | 1.5 | 95 | 3 | 1.3 | 95 | 4 | 1.04 | 90 | 5 |
| SERP4 | 4 | 3.0 | 90 | 10 | 3.0 | 90 | 2 | 1.3 | 95 | 2 |
| SERP5 | 1 | 2.5 | 90 | 9 | 2.5 | 90 | 1 | 1.2 | 95 | 1 |
| SERP6 | 2 | 1.5 | 95 | 1 | 1.2 | 95 | 9 | 3.30 | 90 | 9 |
| SERP7 | 8 | 2.0 | 90 | 8 | 2.2 | 90 | 8 | 3.20 | 90 | 7 |
| SERP8 | 10 | 2.4 | 90 | 7 | 2.4 | 90 | 3 | 1.03 | 95 | 3 |
| SERP9 | 3 | 1.5 | 95 | 2 | 1.2 | 95 | 6 | 2.02 | 90 | 6 |
| SERP10 | 7 | 2.5 | 90 | 5 | 1.5 | 90 | 7 | 3.0 | 90 | 8 |

## VIII. Conclusion and Future Enhancements

Our system showed that mature IR algorithms can be effectively transformed into web services. The Proposed approach[9] gives obviously better results contrasted with search-engine ranking. In evaluating the performance of the search system it is observed that by ontology-based annotations users could perform more accurate results while being returned up to more percent of fewer results than with a keyword-based search engine in the best cases eliminating more percent of the irrelevant documents. The accomplishment of the proposed ranking approach can be credited to two reasons: one is the way in which the query gets advanced by way of development thus by assisting users to identify their range of search and the improvements made in the view ability of search results which diminishes the gap in identifying results by users from a immense data collection.

Semantic Web has considered as Web of Information. It is not the more up to date variant of Web but rather it advocates for the change of existing contents of the web into machine readable form. The machines require semantics data to set up relationship among the contents. The significant confinement of the current search engine is the lack of these missing semantics in current web contents. This outcomes in an immense number of retrievals of results. The vast majority of them are neither reliable nor relevant . We in this work utilize the Semantic Web tools for example, RDF and Ontology for searching the semantic information. This empowers our framework to take a shot at any stage. There are numerous extensions conceivable in this framework. Information from different domains can be incorporated by proposing ontologies. As of now metadata feed is a manual prepared so we are presently working towards automation. There are two conceivable answers for this issue. To start with is by bringing Semantic Crawlers, second is the utilization of RSS feeds.

Further research is going ahead as semantic web search still not in its mature stage to refine theses deployments and we are planning more industrial deployments in terms of mobile apps in the near future.

## Acknowledgment

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## References

[1]. Edgar Meij, Krisztian Balog, Daan Odijk, *"E*ntity linking and retrieval for semantic search", WSDM '14, Proceedings of the 7th ACM international conference on Web search and data mining, *2004*
[2]. Christoph Mangold , "A survey and classification of semantic search approaches", *Int. J. Metadata, Semantics and Ontology, Vol. 2, No. 1, 2007*
[3]. Xiaomin Ning, Hai Jin, Hao Wu, "RSS: A framework enabling ranked search on the semantic web", Elsevier 2007
[4]. Ruiqiang Zhang, Yi Chang and Zhaohui Zheng, Donald Metzler† and Jian-yun Nie, "Search Result Re-ranking by Feedback Control Adjustment for Time-sensitive Query", 2007
[5]. Weimao Ke, Yueyu Fu and Javed Mostafa, " Advanced Information Retrieval Web Services for Digital Libraries", 2008
[6]. Miriam Fernandez, Vanessa Lopez, Marta Sabou, Victoria Uren, David Vallet, Enrico Motta, "Semantic Search meets the Web", 2008
[7]. Jihyun Lee, Jun-Ki Min, Chin-Wan Chung," An Effective Semantic Search Technique using Ontology" ACM 2009
[8]. Thippeswamy K. and Manjaiah D.H. , "Design and development of SOA for information retrieval using web Services" , Advances in Information Mining, ISSN: 0975–3265, Volume 1, Issue 2, 2009, pp-05-10
[9]. Debashis Hati, Amritesh Kumar, "An Approach for Identifying URLs Based on Division Score and Link Score in Focused Crawler" , *International Journal of Computer Applications (0975 – 8887) Volume 2 – No.3, May 2010*
[10]. Anlei Dong, Yi Chang, Zhaohui Zheng, Gilad Mishne Jing Bai Ruiqiang, Zhang Karolina, Buchner Ciya, Liao Fernando Diaz, "Towards Recency Ranking in Web Search", Yahoo! Inc. *WSDM'10,* February 4–6, 2010, New York City, New York, USA.
[11]. J.Uma Maheswari, Dr. G.R.Karpagam, "A Conceptual Framework For Ontology Based Information Retrieval", J. Uma Maheswari et. al. / International Journal of Engineering Science and Technology Vol. 2(10), 2010, 5679-5688
[12]. Florian Bäurle, Master Thesis, "A User Interface for Semantic Full Text Search" , July 2011
[13]. B.Hemanth kumar , Prof. M.Surendra Prasad Babu, " An Implementation of Semantic Web System for Information retrieval using J2EE Technologies" , B.Hemanth kumar et al. / International Journal on Computer Science and Engineering (IJCSE)
[14]. Anusree.ramachandran, R.Sujatha, " Semantic search engine: A survey", Int. J. Comp. Tech. Appl., Vol 2 (6), 1806-1811, IJCTA | NOV-DEC 2011
[15]. G.Poonkuzhali, R.Kishore Kumar, R.Kripa Keshav, K.Thiagarajan K, Sarukesi, "Statistical Approach for Improving the Quality of Search Results" , Recent Researches in Applied Computer and Applied Computational Science 2011
[16]. K.Srinivas, P.V.S. Srinivas, Govardhan, "Web Service Architecture for a Meta Search Engine" , *(IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 2, No. 10, 2011*
[17]. Surabhi Lingwal, Bhumika Gupta, "A Comparative Study Of Different Approaches For Improving Search Engine Performance" , International Journal of Emerging trends of Technology in Computer Science Vol 1 Issue 3 september-october 2012
[18]. Abrar Ahmad H, Muhammad Ruknuddin Ghalib , "A Novel Framework of Semantic Web Based Search Engine", International Journal of Engineering and Innovative Technology (IJEIT) Volume 1, Issue 5, May 2012
[19]. Poonam Yadav,R.P. Singh, "An Ontology-Based Intelligent Information Retrieval Method For Document Retrieval" , Poonam Yadav et al. / International Journal of Engineering Science and Technology (IJEST) , 2012
[20]. G. Poonkuzhali, R. Kishore Kumar, P. Sudhakar, G.V.Uma, K.Sarukesi, "Relevance Ranking and Evaluation of Search Results through Web Content Mining" , Proceedings of the International Multi Conference of Engineering and Computer Scientists 2012.
[21]. Thippeswamy.K, Manjaiah.D.H, "Performance of SOA for Information Retrieval System Using Web Services", Volume 2 No. 2, February 2012 ISSN 2223-4985 International Journal of Information and Communication Technology Research ©2012 ICT Journal.
[22]. G. Poonkzalim, K. Sarukesi, "Effective Algorithms for Improving the Performance of Search Engine Results", International Journal of Applied Mathematics and Informatics 5 (3), 216-223, 2012
[23]. Patsakorn Singto, Anirach Mingkhwan, "Semantic Searching IT Careers Concepts Based on Ontology", *Journal of Advanced Management Science, Vol. 1, No. 1, March 2013*
[24]. Dahua Lin, Sanja Fidler,Chen Kong, Raquel Visual, "Semantic Search: Retrieving Videos via Complex Textual Queries" Urtasun 2014
[25]. Ashish Kumar Ray, Mr. Ajay Kushwaha, "Quality based Web information extraction approach using NLP and Text Mining", *International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 6, June 2014*
[26]. G.Sudha Sadasivam, C.Kavitha, M.SaravanaPriya, "Ontology Based Information Retrieval for E-Tourism", (IJCSIS) , International Journal of Computer Science and Information Security, Vol. 8, No. 2, May 2010
[27]. Thomas Lukasiewicz, "Ontology-Based Semantic Search on the Web" 2011
[28]. Swathi Rajasurya, Tamizhamudhu Muralidharan, Sandhiya Devi, Prof. Dr. S.Swamynathan,"Semantic Information Retrieval Using Ontology In University Domain", International Journal of Web & Semantic Technology (IJWesT) Vol.3, No.4, October 2012
[29]. S. Raja Ranganathan, Prof. M. Sadish Sendil, Dr. S. arthik, "Relation Based Semantic Web Search Engine", International Journal *Of* Academic Research Vol. 2. No. 3. May 2010 [30]Aditya Khamparia , " What is the current, ongoing research about the semantic web? ", Semantic web , 2014