Semantic Web concepts used in Web 3.0 applications

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Abstract - *The human mind can only grasp natural language, but a computer can only comprehend digital data in the form of 1s and 0s. There are only two ways to develop a single, shared vernacular for both machines and people: Either educate mankind how to think in binary, or create a machine to understand natural language. The former of these two choices is impractical since the typical human brain is not sufficiently developed to carry out such a task. As a result, there is intense study being done on the drive to teach a computer to understand natural language. This idea is first being applied on a big scale on the Internet due of the huge volume of data that is available. This necessitates the conversion of the present Web 2.0 to the future Internet, often known as Web 3.0 or Semantic Web. The Semantic Web's potential applications are a hot topic of study, despite the fact that it is still in the early phases of development. This essay addresses strategies for integrating the benefits of the Semantic Web into the Internet's current system of several domains.*

***Key Words*: Semantic Web, Web 3.0, Medical care, E Learning, Search Engine.**

1. INTRODUCTION

A technology that "provides a common foundation that permits data to be shared and reused across application, corporate, and community boundaries" is what the World Wide Consortium refers to as semantic web. Semantic Web is the next development in machine learning given the current passion for artificial intelligence. The purpose of the Semantic Web is to build a web of related data from which a computer can skillfully extract and analyse the relevant data. Today's Internet is designed for usage by people rather than computers. Accordingly, even if a computer can view a movie, play a song, and read a web page, only a person will be able to understand the information inside. In addition to providing an answer, Semantic Web promises to link with the doctor's availability calendar to schedule a dental appointment. The document-centric internet of today would change to a data-centric Web of Data type of internet thanks to the Semantic Web. Since research is still in its early stages, as mentioned in Paper 11, there are a number of issues with putting the Semantic Web into practise. Additionally, the same is applied in an equal number of other instances. Therefore, we must reduce the downsides until the range of applications outweighs the Semantic Web's limitations.

The objective is to combine all of this into a single framework so that consumers are given information that is both accurate and only essential.

Resources Description Framework (RDF), SPARQL Protocol and RDF Query Language (SPARQL), Web Ontology Language (OWL), and Simple Knowledge Organization System are among the technologies used by the Semantic Web (SKOS). These have all been utilised independently, with a focus on how each will be used to develop Semantic Web services.

2. MEDICAL SCIENCES

The usage of Semantic Web in Medical Science will be its most significant application. The fact that biomedical data must be merged from multiple unrelated sources presents the largest barrier.

For instance, it would be advantageous to have access to and the ability to combine all knowledge on the links between genes, proteins, vitamins, tissues, activities of organs, cells, and chemical processes when medical discoveries need to be produced [1]. This is feasible because to semantic web. Another useful source of information is offered by [2], which introduces the Dartgrid, a framework for application development that combines a set of semantic tools with semantic web technologies to make it easier to integrate heterogeneous relational databases. This interface uses Dynamic Semantic Query.

[3] demonstrates how Ann, a neurology researcher, will be able to do several things related to her study at simultaneously. She will have to go through a sizable quantity of data when writing a research paper, manually summarise them, gather all the relevant data for her study, re-enter data elsewhere, and perhaps even correlate topics that don't appear to make any sense at all. The next section of the article discusses a "Paper Writing Workspace" that was conceptually created to help the author handle this massive amount of data as well as other personal tasks and email alerts simultaneously. The document also demonstrates the numerous changes made from the original workspace to the final one, the latter of which features a variety of layout requirements, menus, choices, and other buttons and keys to tailor the window to her particular requirements. The Semantic Web's brilliance lies in this.

A structured database can hold all of a patient's records. Based on the patient's medical history, this might aid in disease detection. Patients may also be given medication depending on their prior medical histories. Diagnosis is a crucial stage that the semantic web may help with.

Users may record their illnesses, and semantic web can help identify the underlying causes using patient histories, histories of individuals with comparable illnesses, and a redesigned database of symptoms and disorders. One intelligent system that employs a comparable mechanism is Clinithink.

Websites with a single interface that map various medical data together are available[4]. This objective of combining data from many sources will be accomplished with the aid of RDF, OWL, and each of the Semantic Web's component pieces. By fusing metadata and ontology, it develops a vocabulary to connect various types of medical data and brings them together on a single platform.

The translation and use of imaging to non-imaging biological data is a challenge. According to [5], a method for medical image annotation involves observing the many properties of a picture (like size, density, length, breadth, etc.). The imaging system's database is then used to compare this. For instance, the densities of various bodily tissues vary. The picture of these tissues will also. This comparison enables us to successfully employ photos during medical research in terms of their semantic content.

On the Web, the current increase in knowledge, particularly in the field of biology, is increasing quickly. Due to the notion of e-Science being established as a result, the Internet has been semantically rebuilt to meet the expanding demands of biomedical researchers.

3. SEARCH ENGINE

The goal of modern search engines is to quickly index the pages with the most "hits" possible. We are unsure of the relevance of these "hit" sites to the search query. Depending on the request provided by each user, we may leverage the Semantic Web technology to generate coherent results.

Swoogle is one such search engine that was created [10][11][12]. One of the earliest metadata and search engines for the semantic web is swoogle. It has a data-centric design and is extendable, allowing the various parts to operate independently and communicate with one another via the database. In a semantic document, RDF triplets are used to tag every sentence. These three twins Swoogle employs the concept of "rank" to determine each Semantic document's significance. to be utilised later in the search engine. On the output screen, pages based on "rank" may be shown in this fashion. The proposed "Swoogle" search engine is semantically designed and has three tasks: • Choosing the right ontology

Finding instance data; defining the semantic web; and identifying it. These tasks are carried out by four independent components: interface, metadata development, data analysis, and Semantic Web Document (SWD) discovery. [10] Four functions—discovering, digesting, analysing, and serving—can also be used to describe this. In the first phase, the system continuously updates itself with information on the many SWDs that are accessible online. The next step is to construct metadata at the semantic and syntactic levels by storing snapshots of the SWDs' objective information. Swoogle recently found 346,126 RDF pages containing 65,747,150 triples. While this figure is still insignificant in contrast to Google's index of 8,058,044,651 web pages, it is a significant quantity for semantic web researchers [11].

Utilizing the "context" of the web pages is the next step to evaluate the quality of the findings. In order to do this, the Web of Belief (WOB) is built and then modelled in the agent world, the RDF graph world, and the web. Through custom web interfaces, the service component supports both software and human agents.

4. E LEARNING

One area that is seeing daily rapid development is e-learning. An open, intelligent learning environment must be established as one of the primary conditions for an ELearning system to succeed.

A framework for the Semantic Web architecture is summarised in order to realise sophisticated eLearning techniques. Additionally, a variety of problems with adopting semantic Web technologies for e-learning have been explored. The study concludes by discussing the model and outlining all the potential future developments [6]. and flavours. Even better, these preferences should be based on prior experiences. Every observation made about a student's learning process should be recorded, and the system should be able to simulate the learner's present profile [7]. In this manner, it may even recommend potential courses to each student.

When it comes to learning, there are three distinct phases: pre-learning, learning, and post-learning. A semantically built E-learning system uses each of these steps so that the computer may discover what each student is interested in. Using tools like Learning Object Metadata (LOM), Sharable Content Object Reference Model (SCORM), Learning Design, and other pedagogical studies in semantic e-learning, [8] explains this approach.

It is also possible to incorporate a web-based learning system like the one recommended by [9]. Learning services and assessment services make up the first division of a learning system's content. A teacher is able to upload files in a variety of formats. Utilizing assessment services, instructors continually monitor student behaviour and look for pertinent information tailored to each student's requirements. The database belonging to the student contains the query results, which may be utilised in the future. For each student's many topics and areas of interest, a structured metadata is built. All of the aforementioned techniques could help the state of education as it is now. By doing so, education would be brought to the doorsteps of pupils living in the most isolated regions of a nation.

5. STASTICS

The statistical information presented in the form of graphs, tables, and charts that businesses publish on a regular basis is challenging for machines to understand. This is due to the fact that organising and analysing huge datasets has proven to be quite challenging. Semantic Web, a novel approach, offers encouraging outcomes in this regard.

Linking data together to integrate it is shown to be far more efficient than using a traditional relational database. This connected data may be used by scientists for additional analysis and study. A few evaluation tests have been established in [13] to aid researchers in collecting data from several sources. Additionally, several statistical data may be compared simultaneously. The Friend Of A Friend (FOAF) policy is one way to combine disparate data. Components may be quickly connected together using this technique, and new components can be instantly found and added to the network [14]. A framework called Linked Open Data (LOD) is where a number of datasets are being published more often. This method has demonstrated the ability to not only function on sparse datasets but also scale up to bigger domains. [15]

NESSTAR [16] is another illustration of a programme that deals with semantic data. The purpose of NESSTAR is to "simplify the search for, access to, and analysis of statistical information."

NESSTAR intends to liberate statistical data from being solely human intelligible and make it accessible to machines. Each data publisher in NESSTAR uploads statistical data to his or her own server. This information is uploaded in the form of NESSTAR-identified objects that are saved semantically in a machine-readable format.

6. CONCLUSIONS

Before Semantic Web is completely functioning, there are a number of challenges that must be resolved. All flaws must be fixed since the goal of the Semantic Web is to give computers the intelligence to react to requests from people. Determining which material on the Internet is accurate and which is not will be our first challenge. A means for upholding the online sites' legitimacy or trust should exist. Paper 4 advises that we carry out this action by first deciding on a user group that we can trust. Each of these individuals is tasked with choosing a different group of reliable users or pages. By assigning a trust rating to each page, the trustworthiness of the page may be assessed.

Second, the Semantic Web would oppose this objective in a world where everyone is actively taking steps to demonstrate greater degrees of anonymity. Through the actions of individuals who have accounts on various social networking sites, such as Facebook, MySpace, Twitter, etc., information from these sites will be contributed to the Semantic Web database. Openness and honesty could end up being required.

Third, the greatest natural language processing techniques are going to be needed to extract just the crucial information from the web. The ones that are now accessible can extract relevant information to some extent, but if Semantic Web is adopted, they might not continue to do so.

Fourth, various users/websites may use different words to refer to the same items, even while doing so. A tool must fit the terminology; otherwise, it would be considered incompatible and handled differently.

These are only a few of the negatives that using semantic technology will unquestionably bring to light. Numerous technologies under development that will change the way Web 2.0 is structured can address all of these shortcomings. As seen below, however, the benefits of Semantic Web still outweigh these downsides.

The authors can acknowledge any person/authorities in this section. This is not mandatory.

REFERENCES

[1] Susie Stephens, David LaVigna, Mike DiLascio, Joanne Luciano, Web Semantics: Science, Services and Agents on the World Wide Web, Volume 4 Issue 3, September, 2006, Pages 216-221.

[2] Huajun Chen1, Yimin Wang2, Heng Wang1, Yuxin Mao1, Jinmin Tang1, Cunyin Zhou1, Ainin Yin3, and Zhaohui Wu, Towards a Semantic Web of Relational Databases: a Practical Semantic Toolkit and an In-Use Case from Traditional Chinese Medicine, The Semantic Web - ISWC 2006, Lecture Notes in Computer Science Volume 4273, 2006, pp 750-763.

[3] Karun Bakshi and David R. Karger, Semantic Web Applications.K. Elissa, "An Overview of Decision Theory," A. A. Name, Towards a Semantic Medical Web: HealthCyberMap's Dublin Core Ontology in Protégé-2000, Kamel Boulos MN, Roudsari AV and Carson ER, Centre for Measurement and Information, School of Informatics, City University, London, UK.

[4] Daniel L. Rubin,1 Pattanasak Mongkolwat,2 Vladimir Kleper,2 Kaustubh Supekar,1 and David S. Channin2, Medical Imaging on the Semantic Web: Annotation and Image Markup, Issue No.01 - January/February (2009 vol.24, pp: 57-65.

[5] Khurram Naim Shamsi, Zafar Iqbal Khan, DEVELOPMENT OF AN E-LEARNING SYSTEM INCORPORATING

[6] SEMANTIC WEB, International Journal of Research in Computer Science, 2 (5): pp. 11-14, 2012

[7] Nicola Henze, Peter Dolog and Wolfgang Nejdl, Reasoning and Ontologies for Personalized E-Learning in the Semantic Web, Educational Technology & Society, 7 (4), 82-97.

[8] Weihong Huang, David Webster, Dawn Wood and Tanko Ishaya, An intelligent semantic e-learning framework using context-aware Semantic Web technologies, British Journal of Educational Technology, Vol 37 No 3 2006, pp 351–373.

[9] Fayed Ghaleb, Sameh Daoud, Ahmad Hasna, Jihad M. ALJa'am, Samir A. El-Seoud, and Hosam El-Sofany, E-Learning Model Based On Semantic Web Technology, International Journal of Computing & Information Sciences, Vol. 4, No. 2, August 2006, Pages 63 – 71.

[10] Li Ding, Tim Finin, Anupam Joshi, Yun Peng, R. Scott Cost, Joel Sachs, Rong Pan, Pavan Reddivari, Vishal Doshi, Swoogle: A Semantic Web Search and Metadata Engine, Proceedings of the thirteenth ACM international conference and knowledge management, Pages 652-659, ACM, New York, USA – 2004.

[11] Li Ding and Tim Finin, Boosting Semantic Web Data Access Using Swoogle, AAAI'05 Proceedings of the 20th national conference on Artificial intelligence, Volume 4, Pages 1604-1605.

[12] Tim Finin, Li Ding, Rong Pan, Anupam Joshi, Pranam Kolari, Akshay Java and Yun Peng, Swoogle: Searching for Knowledge on the Semantic Web, AAAI'05 Proceedings of the 20th national conference on Artificial intelligence.

[13] Benjamin Zapilko and Brigitte Mathiak, Defining and Executing Assessment Tests on Linked Data for Statistical Analysis, COLD – 2011.

[14] How the Semantic Web is Being Used: An Analysis of FOAF Documents, Li Ding, Lina Zhou, Tim Finin, Anupam Joshi, HICSS '05 Proceedings of the Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS'05) - Track 4 - Volume 04, Page 113.3, Washington, DC, USA -2005.

[15] Yi Huang, Volker Tresp, Maximilian Nickel, Achim Rettinger and Hans-Peter Kriegel, A Scalable Approach for Statistical Learning in Semantic Graphs, Semantic Web 5(1): 5-22 (2014).

[16] Pasqualino 'Titto' ASSINI (titto@nesstar.com) Nesstar Ltd - U.K., NESSTAR: A Semantic Web Application for Statistical Data and Metadata, International Workshop Real World RDF and Semantic Web Applications, 11th International World Wide Web Conference, (2002).