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A Survey on Ontology Tools in Semantic Web

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Abstract— The linguistics internet will be thought of as a mesh of connected data (resources) or a globally connected distributed information [4, 5, 7]. the most goal is that information ought to simply be processed by machines. Ontology tools will be applicable for all stages of the metaphysics lifecycle (creation, population, validation, deployment, maintenance and evolution). metaphysics will be accustomed support varied data management together with data retrieval, store and sharing. There ar many metaphysics languages like XML, RDF(S), DAML+OIL and bird of prey. several metaphysics tools are developed for implementing information of metaphysics victimisation these languages. However, current metaphysics tools have some issues in interoperation and cooperative work. the first goal of this survey is to grasp and measure every tool by analyzing and victimisation them. Therefore, we will develop the new generation tool not solely supporting a lot of capabilities, however additionally determination current tools' issues.

Keywords— Ontology, RDF, Semantic web

I. INTRODUCTION

Since the information incorporates a heap of representations, purposeful in some contexts, however not in others, there square measure difficulties to use it on an oversized scale, as a result of there's no international system for commercial enterprise information in such the way because it will be simply processed by anyone. This is where the Semantic Web interferes. To give an abstract view of Semantic Web, let us imagine it as a huge engineering solution which addresses data publishing in a purpose-oriented form, thus enabling semantic associations between information.

To improve, extend and standardize the system, many languages, publications, tools and so on have already been developed or proposed by the World-Wide Web Consortium, the international organism that coordinates the Web.One important aspect of the actual Semantic Web directions of research is the use of ontologies as a suitable representation of knowledge available on the Web. A noticed difficulty is the use of a proper tool for modeling, editing and exploiting various ontologies in the context of Web space.

The goal‟s paper is to offer a comprehensive and comparative view regarding the actual tools focused on Web ontology editing. For this, in section II, a short presentation of Semantic Web technologies is provided, including several important aspects concerning ontologies.

Section III is dedicated to our survey on Web ontology editing software tools. We will overview and describe several of the existing ontology-oriented applications, such as OilEd, OntoEdit, pOWL, Protégé, and SWOOP. The results of the comparative case study are also provided by this section. The paper is ended with conclusions.

II. SHORT PRESENTATION OF SEMANTIC WEB

In order to represent data, Semantic Web is using Uniform Resource Identifiers (URI) that address Web resources. In addition, for processing metadata (data about data), Resource Description Framework (RDF) [9] model can be used, in a standardized way. The used metadata format should permit to reason about data. The RDF is intended to be used to capture and state the conceptual structure of information offered in the Web. The RDF assertions – triples of URIs – can be viewed as a data model for describing machine processable semantics of data to build the infrastructure for that Sir Tim Berners-Lee, the creator of WWW space, called Semantic Web [2].

RDF could be a commonplace supported protractile terminology (XML) [3] meta-language, with the assuming to map the data directly and unambiguously to a model, a model that is redistributed, and that there area unit several generic parsers already offered. this implies that after we develop associate RDF application, we all know that bits of information denotes linguistics of the appliance (e.g., business logic), and that bits represent simply syntactical

conventions. to realize advantage of the complete potential of linguistics internet, the most plan is to begin publication information as RDF, a standard information annotation and illustration, with several existing applications in numerous areas [7-9].

The first "layer" of the linguistics internet on top of the syntax mentioned on top of is that the straightforward data-typing model. A schema is solely a document or piece of code that controls a collection of terms in another document or piece of code. that specialize in the aspects mentioned on top of, so as to limit the syntax of XML applications there has been projected a language referred to as XML Schema . XML Schema in conjunction with RDF is also helpful for making data-types so as to hold on completely different styles of data Ontologies provides full properties and categories like inverses, unambiguous properties, distinctive properties, lists, restrictions, cardinalities, combine wise disjoint lists, data types, and so on. Ontologies ar usually able to offer Associate in Nursing objective specification of domain data by representing a accordant agreement on the ideas and relations that characterize the way data in this domain is expressed. This specification may be the primary step in building semantically-aware data systems to support various enterprise, government, and private activities.

Ontologies might vary not solely in their content, however conjointly in their structure and implementation. Among the options and needs that bound metaphysics may compel, we will enumerate:

Level of description – building associate metaphysics, we'd reveal totally different|completely different} aspects to different practitioners. Describing kowledge starts from easy lexicons or controlled ocabularies, to unconditionally organized thesauri or taxonomies where terms square measure connected hierarchically and might incline characteristic properties that may outline new ideas and wherever ideas have named relationships with alternative concepts;

Conceptual scope – ontologies can be used in different domains describing specific information (e.g., medicine, aeronautics, etc.); also, there are upper level ontologies, such as Suggested Upper Merged Ontology (SUMO) , describing the basic concepts and relationships invoked when information about any domain is expressed in natural language; – Instantiation – this side considerations populating the ontology with instances or people that manifest that word definition. This extension will be separated in implementation from the metaphysics and maintained as a content (ABox element in terms of description logic [1]); – Specification language – a number of attainable languages are often used, as well as general logic programming languages like logic programming. additional common, however, square measure languages that have evolved specifically to support metaphysics construction, as an example OKBC (Open cognitive content Connectivity) model and KIF (Knowledge illation Format). These proposals became the bases of different metaphysics languages. There also are many languages supported a variety of logic thought to be particularly calculable called description logics [1]. an even language is net metaphysics Language (OWL). once scrutiny metaphysics languages, what's given up for computability and ease is typically language quality. A language desires solely be as wealthy and communicatory as is critical to represent the fine distinction of data that the ontology‟s purpose and its developers demand.

III. SURVEY ON ONTOLOGY EDITORS

A. Requirements

When starting out on an ontology project, the first and reasonable reaction is to find a suitable ontology software editor. Our main concern must include the provided capabilities like ontology versioning (the project development often involves various ontologies – external as well as newlyin-house developed), mapping and linking, comparing, merging, reconciling and validating, converting them into other forms (such as XML Schemas, database schemas, and others). For this paper, we considered the following categories covering important functions and features of the software,such as:

1)Application: The 2 main developing directions embody the business merchandise designed solely for building ontologies in any domain, and tutorial or government funded comes so as to research the technical application of ontologies. Some editors ar supposed for building ontologies during a specific domain, however ar still capable for all-purpose metaphysics building notwithstanding content focus;

2)Methodology: The process of building ontologies is a high-cost process. Methodologies (supported by certain tools) are essential to: – Help the developer to mark and annotate a concept; – Modularize (and align) the ontologies; Ensure relevance and avoid over-elaboration (this degrades the level of abstraction); – Verify the ontology fits its purpose and if it is reusable in other contexts. Details about the actual proposed methodologies know how to be consult in [4], [8].

3)Interoperability: Ontologies are for knowledge sharing. They are intended to serve as consensual rallying points to exchange and interpret information. The wider the range of applications and other ontologies that can (re)use certain ontology, the greater is the utility. Also, a tool must provide support for diverse ontology representations

(importing and exporting ontologies in various language serializations);

4) Usability: Additionally to the options already mentioned, metaphysics editors vary significantly in their overall feel to the user. We have a tendency to should not concentrate on plan to compare editors beneath use, except for the options, plug-ins that a tool could give – management, manipulation of ontology‟s interlocking ideas and relations square measure essential. as a result of several metaphysics models support multiple inheritances within the conception hierarchies and relation hierarchies, keeping the associations straight may be a challenge. the quality approach is that the use of multiple tree views with increasing and getting levels. A graph presentation is a smaller amount common, though it may be quite helpful for actual metaphysics written material functions that modification ideas and relations.

5) Inference: While ontologies themselves is treated as standalone specifications, they're ultimately accustomed facilitate answer queries concerning some info. bound metaphysics piece of writing applications supply reasoning services to be employed in order to get a (new) inferred information model.

B. Ontology tools

Protégé 2000: Protégé may be a tool that permits a user to construct domain metaphysics, customise knowledge entry forms and enter knowledge. The tool are often simply extended to access alternative data based mostly embedded applications. as an example, Graphical widgets are often added for tables and diagrams. Protégé may be employed by alternative applications to access the information. Protégé permits a user to at the same time work on categories and instances. this is often provided for by an even graphical user interface whose prime level consists of overlapping tabs for compact illustration.

“Classes‟ tab is employed to outline categories and also the category hierarchy, slot and slot-value restrictions, relationships between categories and properties of those relationships. The „Instances‟ tab is accustomed acquire instances of categories outlined within the metaphysics. The forms ar used for effort instances supported the kind of slots that you simply have such that. The default kind will then be changes by rearranging the fields on the screen, dynamic the scale, label and properties for a slot.

The main assumption of Protégé-2000 is that knowledge-based systems square measure sometimes terribly pricy to create and maintain. for instance, the expectation is that knowledge-based system development may be a team effort, together with each developers and domain consultants World Health Organization might have less familiarity with pc software package. Protégé-2000 is intended to guide developers and domain consultants through the method of system development. Protégé-2000 is intended to permit developers to use domain ontologies and problem-solving ways, thereby shortening the time required for development and program maintenance. many applications will use a similar domain metaphysics to unravel completely different issues, and also the same problem-solving technique will be used with completely different ontologies.

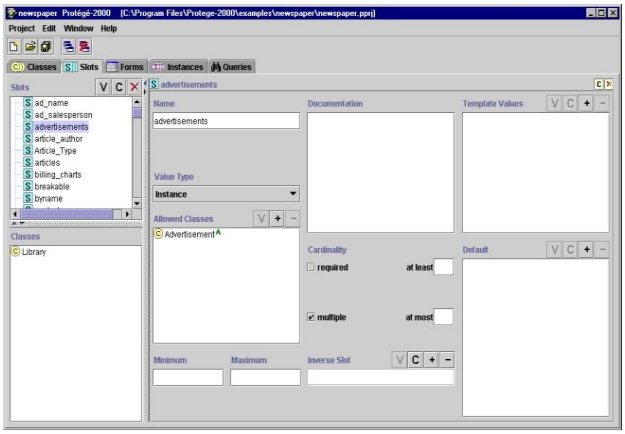

Figure 1. Snapshot of Protégé 2000

- Basic features :
  - Import format

    XML, RDF(S) and XML Schema
  - Export format

    XML, RDF(S), XML Schema, FLogic, CLIPS and Java HTML
- Graph view

Via GraphViz plug-in (browsing of classes and global properties)

Via Jambalaya plug-in (nested graph view)

- Consistency

check Via plug-ins (PAL and FaCT)

- Limited multi-user support

Protégé 2.0 has new multi-user capabilities additional thereto. it's supposed for knowledgeable Protégé users. Multiple users will scan identical info and create progressive changes or changes that do not conflict with each other. However, there isn't any support for multiple users making an attempt to switch identical parts of a knowledge domain or notification of changes created by different users. synchronic changes to identical section can cause severe issues.

- Web support

Via Protégé-OWL plug-in Protégé does not offer mission for accessing knowledge domain from the net, however it will simply be done. variety of our users have communicated with Protégé information bases from the net

via servlets. Protégé are often run as AN application. The new unharness of the Protégé net Browser is currently on the market. It are often downloaded from the Protégé plug-ins page. The Protégé application permits users to browse Protégé ontologies and information bases in their application, while not having to put in the Protégé application domestically.

- Additional features :
  - Merging

Via Anchor-PROMPT plug-in

- Not support to add a new basic type
- Extensible plug-in architecture
- Ontology

storage File and DBMS
(JDBC)

2) OilEd: OilEd may be a straightforward editor that permits the user to form and edit OIL ontologies. the most intention behind oiled is to produce an easy, package editor that demonstrates the employment of, and stimulates interest in, DAML+OIL. oiled isn't supposed as a full metaphysics development atmosphere - it'll not actively support the event of large-scale ontologies, the migration and integration of ontologies, versioning, argumentation and lots of different activities that square measure concerned in metaphysics construction. It should, however, give enough to permit the essential construction of OIL ontologies and demonstrate the facility of the association to the actual fact ratiocinator. OilEd has been engineered by the knowledge Management cluster, Department of technology, University of Manchester, and is patent University of Manchester. The first development of oiled was supported by Interprice GmbH and also the Free University of Amsterdam.

3)

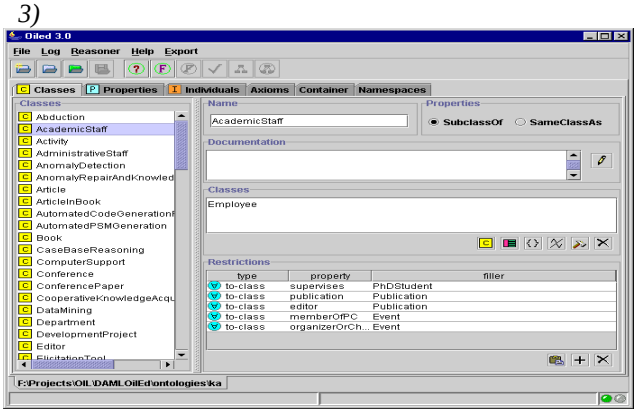

Figure 2. Snapshot of OilEd

- Basic features:Import format RDF(S), OIL and DAML+OIL
  Export format
  RDF(S), OIL, DAML+OIL, SHIQ, dotty and HTML
  Not support graph view
  Consistency check Via built-in FaCT
  Limited web support
  RDF URIs, limited namespaces, very limited XML Schemas
  Additional features :
  Arbitrary class expressions can be used as slot fillers.
  Primitive & defined classes
  Concrete type expressions
  Concrete Types aren"t verywell supported XML Schema types now in DAML+OIL
  Ontology storage
  File
  No extensibility

RDFedt: The RDFedt brings you quick and simple ways in which to make complicated and structured RDF (and RSS) documents. With the element-tree you furthermore mght get the summary at complicated datastructures. in addition functions can assist you to check the info and - if necessary - they'll provide you with comments and errormessages. This publisher supports: language RDF properly said; language RDF Schema; Dublin components Core (standard of metadados); the RDF web site outline one.0 with the subsequent modules: aggregation, notation, amendment of page, content, cut, organization, threading e RSS zero.91; declaration and levels of designs in XML; set of foreign elements; to open and to avoid wasting documents in archives of the sort xml; to come up with code from tree RDF; to print the generated codes; to check entered in tree RDF; to come up with list mechanically of links based mostly in RDF of a document markup language .

An important point is that it is not a Java program, so it is not platform independent. RDFedt works only on Windows platforms

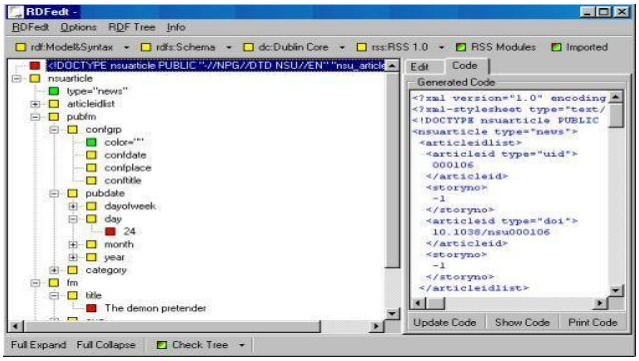

Figure 3. Snapshot of RDFedt

- Basic features :
  - Import/export

format RDF(S), OIL,
DAML and SHOE

- Not support graph view
- Very limited

consistency check Only checks
writing mistakes

- Not support multi-user
- Web support

Via RSS (RDF Site Summary)

- Additional features :
  - Support for Dublin Core Element Set
  - Support RSS

modules Aggregation,
Annotation, etc

- Automatic generation of a rdf-based linked list from a html-document
- Load and save XML files

OntoEdit: OntoEdit is Associate in Nursing metaphysics Engineering setting supporting the event and maintenance of ontologies by mistreatment graphical means that. OntoEdit is constructed on prime of a robust internal metaphysics model. This paradigm supports representation- language neutral modeling the maximum amount as attainable for ideas, relations and axioms. many graphical views onto the structures contained within the metaphysics support modeling the various sections of the metaphysics engineering cycle - the metaphysics kickoff phase, refinement section, and analysis section. It depends on W3C standards and offers a large number of export interfaces to all or any major metaphysics illustration languages. The tool is predicated on a versatile plug-in framework. first off this simply permits extending practicality in an exceedingly modularized means. The plug-in interface is hospitable third parties, that allows users to increase OntoEdit simply by to boot required functionalities. Secondly, having a collection of plug-ins on the market like e.g. a site lexicon, Associate in Nursing inferencing plug-in and several other export and import plug-ins, this permits for easy customization to adapt the tool to totally different usage situations.

The necessities Specification section for metaphysics development results in Associate in Nursing metaphysics requirements specification document describing what Associate in Nursing metaphysics ought to support.. This task is performed by a team of specialists for the domain in the middle of specialists for modeling. It additionally guides Associate in Nursing metaphysics engineer to make your mind up regarding relevant ideas and their data structure within the metaphysics. This section is supported by OntoEdit by the 2 plug-ins OntoKick and Mind2Onto5 for meta metaphysics description with mechanically calculated data point info.

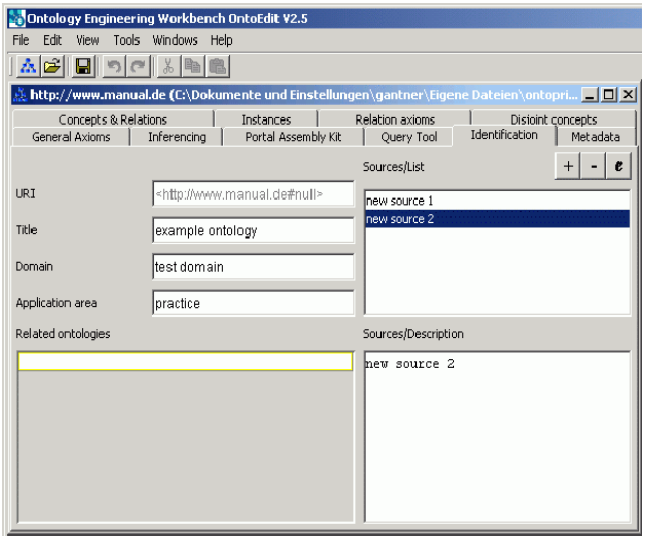

Figure 4. Snapshot of OntoEdit

The goal of the Refinement part is to provide a mature and application-oriented target metaphysics in step with the specification given by the kickoff part. The metaphysics engineer could develop the construct hierarchy, relations and axioms in the maximum amount as potential independence of a representation language. The metaphysics engineering setting OntoEdit uses a strong metaphysics model to store the abstract model of metaphysics. With one click, the metaphysics Engineer is supported to remodel the abstract illustration to any or all major metaphysics illustration languages like RDF(S), XML, DAML+OIL or F-Logic.

OntoEdit tool permits the user to edit a hierarchy of ideas or categories. These ideas could also be abstract or concrete, that indicates whether or not or not it's allowed to ake direct instances of the construct. The Ontologies ar shapely in an exceedingly 'is-a' hierarchy which implies that sub ideas have all properties of their super ideas. an idea could have many names, that primarily may be a thanks to outline synonyms for that idea. Ideas could participate in binary written relations. Attributes of ideas also are thought of to be relations. For this purpose, intrinsic varieties like STRING whole number and mathematician ar introduced. Relations may be composed supported alternative relations. Relations may be ordered in an exceedingly hierarchy, that permits for inheritance/refinement of characteristics of relations. Every construct and relation may be documented expressly among the metaphysics. This can be particularly necessary once exchanging ontologies. Data of the metaphysics, like the creator and also the date of last modification, may be keep among the metaphysics. Transformation modules may be joined into the system, which permit translating the metaphysics from its own general XML-based storage format to a a lot of specific format. Presently AN F-Logic transformation module is accessible, ANd work on an RDF

module is being done. the entire system is multilingual , that means that every construct name, relation name or documentation string may be entered in many languages. The tool permits for multiple ontologies to be opened at a similar moment. The OntoEdit plug-in design is hot-pluggable. Meaning that you just will load and unload plugins throughout runtime.

- Basic features :
  - Import/export format

XML, RDF(S), FLogic and DAML+OIL for free version XML, RDF(S), FLogic, DAML+OIL and SQL-3 (export only) for professional version

  - Graph view
  - Consistency check
  - Web support

	Collaborative working	Ontology library	Inference engine	Exception handling	Ontology storage	Extensibility	Availability
Protégé 2000	**No**	**Yes**	**With PAL**	**No**	**File & DBMS (JDBC)**	**Via plug-ins**	**Free**
OilEd	**No**	**Yes**	**With FaCT**	**No**	**File**	**No**	**Free**
RDFedt	**No**	**No**	**No**	**Yes**	**Files**	**No**	**Free**
OntoEdit	**No**	**No**	**No**	**No**	**File**	**Via plug-ins**	**Free**
WebODE	**Yes**	**No**	**Prolog**	**No**	**DBMS (JDBC)**	**Via plug-ins**	**Free**
WebOnto	**Yes**	**Yes**	**Yes**	**No**	**File**	**No**	**Free web access**

IV. CONCLUSION

So far, we've represented higher than metaphysics tools; protégé 2000, OilEd, Apollo, RDFedt, OntoLingua, OntoEdit, WebODE, KAON, ICOM, DOE and WebOnto. To snow boot, we have surveyed some business tools like Medius Visual metaphysics modeler, LinKFactory bench and K-Infinity. All of those tools square measure metaphysics development tools. to match every tool‟s options, we've chosen the tools of the similar purpose. Of course, there square measure several different tools that have completely different purpose. as an example, Chimaera, FCA-merge and PROMPT square measure metaphysics merge and integration tools. AeroDAML, COHSE, MnM and OntoAnnotate square measure metaphysics annotation tools. Sesame, Inkling, rdfDB, Redland, jena, cerebra square measure metaphysics storing and querying tools.

Several vital aspects once we analyze tools ar exist. we've enclosed info regarding the import/export format, graph view, consistency check, multi-user support, merging, internet support, extensibility, metaphysics storage, metaphysics library support and etc.

Plain RDFS from oiled might be utilized in oiled and Protégé 2000, however it absolutely was not operating well in OntoEdit. Plain RDFS from Protégé 2000 might be utilized in Protégé 2000 and OidEd version 19990303, whereas oiled used associate unmarked version, however it couldn‟t be utilized in OntoEdit. Also, normal Oil RDFS from Protégé 2000 and bird of Minerva from oiled couldn‟t be utilized in all tools (OilEd, Protégé 2000 and OntoEdit). DAML+OIL from OidEd might be utilized in OidEd and OntoEdit with minor issues, however it couldn‟t be utilized in Protégé 2000. ability with alternative metaphysics development tools, merging tools, databases, in addition as translations to and from some metaphysics languages, is vital consider order to integrate ontologies in applications. However, there ar few comparative studies regarding the standard of all translators, the likelihood of exchanging ontologies between completely different tools and therefore the loose of data within the translation processes.

Just in case of storage, solely a couple of of surveyed tools use databases for storing ontologies: LinkFactory, OntoEdit skilled version, Protégé 2000 and WebODE. Also, solely a couple of have backup management practicality.

Though plenty of comparable metaphysics tools exist for metaphysics creation, they don‟t interoperate well nor cowl all the activities of the metaphysics lifecycle. the dearth of ability between of these tools induces vital issues, as an example, once we integrate metaphysics into the metaphysics library of a distinct tool, or once 2 ontologies designed exploitation completely different tools or languages ar integrated exploitation merging tools.

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