UNIT-I

## Thinking and Intelligent Web Applications:

The term "thinking" is frequently loosly defined and ambiguously applied. For the reason, it is important to provide a brief preview of what we mean by the term in the context of intelligent applications on the world wide web

In general, "thinking" can be a complex process that uses concepts, their interrelationships, & inference or deduction, to produce new knowledge

We can infer some aspects of the concept of "thinking" by recognizing we identify an individual as intelligent if he has accurate memory recall. The ability to apply the correct logic.

Here we can apply "intelligence" to nonhuman entities as we do in the field of Artificial Intelligence (AI). But we frequently mean something somewhat different than in the case of human intelligence of child prodigy. Whereas AI can be seen as the science of machines that behave intelligently.

The world wide web can be described as an interconnected network of networks, but that does not go quite enough. The present day web consists of not only the inter-connected networks, servers, clients but also multimedia hypertext representation of vast quantities of information distributed over an immense global collection of electronic devices. With software services being provided over the web, one can readily see an analogy to the human (or machine) thinking process where information stored, accessed, transferred and their interconnection

Search engines are one web technology designed to automatically process information from large numbers of web sites to deliver useful processed information, but the search methods used today have rudimentary capabilities. The keys to moving forward are (a) the important way of the ability Software applications to communicate directly with one another and (b) the representation of information in ways that are far more usable by software applications.

An important framework for creating such meaningful abilities can be provided by the proposed next generation of web architecture - the semantic web

# The Information Age

We are accustomed to living in a world that which is rapidly changing. This is true in all aspects of our society & culture, but is especially true in the field of Information technology as exemplified in "Moores-law", the observation made in 1965 by Gordon Moore, co-founder of intel, that the number of components on integrated circuits had doubled every 18 months.

Today, the information age is establishing a new set of rules to replace those of Industrial revolution. For example, "Standardization of parts" is being replaced by parts "designed and manufactured to custom specifications." And we concentration of workers" is being replaced by flexible workforces including "telecommuting" And most importantly, "Concentration of stokepiles" is being replaced by "just-in-time". inventory and reductions in planning uncertainty.

As a result, production and consumption are continuing to move further apart. For many years the falling cost information has shifted power from hands of producer in the hands of customer.

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## The World Wide Web (WWW)

The ARPANET was a great success from the start. During its first few years, the small network rapidly developed and expanded from its initial four nodes as many additional sites and features were added.

In starting contrast, America Online (AOL), Campuserve and microsoft were investing fortune in proprietary networks that offered mostly duplicated and limited amounts of information to the public

In 1991, Berners Lee working at European particle physics Laboratory of European organization for neuclear research, Consiel Europeen pour la Recherche Nucleare (CERN) in switzerland, introduced the concept of World Wide Web.

The web combined words, pictures and sounds on Internet pages, The groundwork for the open standards of the web. Thier efforts included the Hypertext transfer Protocol (HTTP) linking web documents. HTML is markup lang. & URL is system to address web documents.

Limitations of Todays Web

Over the past several decades, the web has changed from distributed high reliability, Open system, to a web dominated by portals, such as yahoo, Google, AOL & MSN which control much of traffic. While the W3C developed open web standards, vendors have been customized thier application for efficient business logic processing through thier proprietary servers and applications.

By the year 2000, the introduction of web services led to a dichotomy of microsofts (.NET) and sun's java (J2EE) frameworks within the server community Infrastructure. As a result, the web moved strongly towards becoming a decentralized network with highly critical hubs. The Extensible Markup Language (XML) was developed as markup Language based on principles and rules of Standard Generalized Markup Language (SGML) and uses tags that are not predefined. This gives XML great flexibility and between J2EE & .NET as a result, XML is essential support for both web services' frameworks.

The web is still based on HTML, which describes how information is to be displayed and laid out on a web page for a humans to read. The WWW has its origin in the idea of hypertext, the web today is characterized by textual data augmented by pictorial and audio-visual additions.

Today, the developement of complex networks with meaningful content remains difficult. Web browsers are restricted to accessing existing information in a standard form. In addition todays basic web limitations include search, data base support, Interoperable applications, Intelligent business logic, automation, security and trust.

As result, The Information Rerolution awaits the next breakthrough to fully open ~~file~~ information flow.

The next generation web.

A new Web architecture called the Semantic web offers users the ability to work on shared knowledge by constructed new meaningful representations on the web. Semantic web research has developed from the traditions of AI and Ontology Semantic web agents could utilize meta-data, ontologies, and logic to carry out its tasks. such agents are pieces of software work autonomously and proactively on the web to platform to perform tasks.

## Machine Intelligence:

Machine intelligence is associated with the Machine-Learning, computational Intelligence, Soft-computing, and artificial Intelligence Although these terms are often used interchangeably, they are actually different branch of study.

For example: AI involves symbolic computation (i.e the mathematical transformation of Symbolic expressions, using computer algorithms), while soft-computing (i.e - Techniques in computer science and in artificial Intelligence such as fuzzy logic, Neural Networks, and probablistic reasoning).

Although symbolic AI is currently built and incorporated into Semantic Web data representation, there is no doubt that Software tool developers will eventually incorporate the soft computing paradigm as well. The benefit of such a step will be creation of adaptive software.

While the semantic web is under development, concepts surrounding machine Intelligence. will continue to evolve. The extent of the usefulness of the semantic Web will be tested in various ways, but the controversy evolving the meaning of machine intelligence will undoubtebly not end in the foreseeble future.

## Artificial Intelligence

John McCarthy contributed the term "Artificial-Intelligence" (AI) and by the late 1950s, there were many researchers in AI working on programming computers. Eventually, AI expanded into such fields as philosophy, psychology, & biology. It described in two ways: Strong AI and weak AI. Strong AI asserts that computers can be made to think on a level equal to humans. Weak AI simply holds that some "thinking-like" features can be added to humans to make more useful tools. Examples of weak AI abound: Expert systems, drive-by-wire cars, smart browsers and speech recognition software.

AI includes the study of computers that can perform cognitive tasks including: Understanding natural languages statements, recognizing visual patterns, performing financial analyses, learning new procedures for problem solving and playing complex games.

## Ontology

If a program wants to compare information across two knowledge bases on the web, it has to know when any two given terms are being used to mean the same thing. Ideally, the program must have a way to discover common meanings for whatever knowledge encounters

→ A solution to this problem is provided by the semantic Web in the form of collections of information called ontologies.

Artificial Intelligence and web researchers use the term ontology to refer to a document that defines the relations among terms A typical ontology for the web consists of a taxonomy and a set of inference rules.

The taxonomy rules tells about classes, objects, and relations among them. Classes, Subclasses and relations among entities are important tools. A large number of relations among entities can be expressed by assigning properties to classes allowing subclasses to inherit such properties.

Inference rules in ontologies may express rules for manipulating information.

The full power of semantic web will be realized when programs can be created that collect web content from diverse sources, automatically process the information, and communicate the results in appropriately useful machine readable Web content and automated services become available. Semantic web promotes this vision: Because flexibility built into the semantic web content. even agents that were not explicitly designed to work together can transfer semantic data.

## Inference engines

Inference engines are intended to derive answers from a knowledge base. They are at the core of the expert systems that provide a methadology for reasoning about information in knowledge available in the semantic web. They deduce new knowledge from previously established knowledge

An Inference engine controls the overall execution of a set of rules. It searches through a knowledge base, attempting to pattern-match facts or data that exist in through a knowledge base, attempting to record of antecends of rules. If a rule's antencendent is satisfied, the rule is considered applicable and is placed in agenda. When a rule is qualified it means that since the antecedent is ~~satif~~ satisfied.

## Software Agents:

An intelligent agent is a computer software elements that is capable of autonomous action and learning in order to meet its design objectives. Agents have the following characteristics: They are reactive, proactive and social; they are capable of perceiving their environment and of to responding of these perceptions; they are

They are reactive and they exhibit goal. directed behavior. Real-time intelligent agent technology offers a powerful web tool. Agents are able to control both over twier own internal state and their behavior. Normally, an agent will have a repertoire of actions available

For the semantic web, providing sufficient Power for agents to interact successfully is essential.

Berners-Lee www:

By 1991, three major events converged to accelerate the developement of the information Revolution. These three events are the - introduction to World Wide Web. turned out to be the university of HTML. The concept provided the ability to combine words, pictures and sounds (i.e to provide multimedia content) on Internet pages.

Berners. Lee and his collaborators laid the groundwork for the open Standards of the web. Twier efforts included inventing and refining the Hypertext Transfer Protocol (HTTP) for linking web documents, the Hyper Text Mark-up Language (HTML) for formating web documents, and the universal Resource Locator (URL) System for addressing Web documents.

# The Semantic Web Roadmap

The inventor of world Wide Web, Tim Berners-Lee and his World Wide Consortium (W3C) team are working to develop, extend and Standardize the Web's mark up languages and tools. In addition, they are designing the next-generation Web architecture, the Semantic web.

Currently the objective of semantic web architecture is to provide a knowledge representation of linked data in order to allow machine processing on global scale. This involves moving the web from - the repository data without logic to a level where it is possible to express logic through knowledge representation systems. The vision for semantic web will be more effective.

The difficulty of semantic web will be a more effective search capability. While today's search engines index HTML pages to find many answers. The first use directory, or portal site, which has been manually constructed by searching the web and then categorizing pages & links.

On other hand logic engines can restrict thier output to which is provably correct answer, but they suffer from inability to go through the immense quantity of connected data.

By combining a reasoning engine with search engine, future semantic web approaches may be able to produce dramatically improved results. Such a system would be able to reach out to indexes that contain very complete lists of all occurrences of given term and then use logic to weed out all but those to be of use in solving problem.

The development of the Semantic Web is proceeding in a step-by-step approaching one layer on top of another. Two important technologies for developing the semantic Web are already place; eXtensible Markup Language (XML) and Resource Description Fromework (RDF)

XML increases & empowers each page author to create his own tags. Scripts or programs, can make use of these tags in sophisticated ways.

HTML → allows information exchange & display

XML → Open standard that allows data to be exchange between applications over the web.

J2EE & .NET → We can consider XML as a highly functional subject subset of SAML; however results metadata. Its meta-Language that allows users to design their own markup Language

## Logic on the Semantic web.

The goal of semantic web is different from that most systems of logic. The goal of the semantic web is to create unifying system where every subset of the whole system is constrained to provide the tractability and efficiency necessary for real applications. However, the semantic Web itself does not actually define a reasoning engine, but rather follows a proof of theorem.

This parallels an important developement between conventional hypertext systems and original web design. The original web design was selected in faror of expressive flexibility and scalability while dropping link consistenty.

As result, a semantic web would actually be more like a proof validator than theorem prover.

## 2.1 Ontologies and their role in the semantic web.

The ontology and ontology languages may be viewed as one of important technology in Semantic web. Typically ontology can be described as formal allotment of conceptualization baud on domain. This implies, it provides the description of concepts and their corresponding relationships. In particular, the Ontologies are designed as domain models that broadly specify two special characteristics signifying the semantics. They are.

1. Ontologies are usually defined in formal languages which consists of well-defined semantics.

The first characteristic signifies that the languages which consist of well-defined modelling. the ontology must contain formal semantic such languages includes RDF and OWL these languages are thread as most frequently used languages in semantic web. These languages contains those domain models which are preferred by term ontology.

2. Ontologies existing within the community are created as most frequently used languages. understanding. This understanding may be viewed as an agreement made between the members of the community corresponding to the concepts and relationship with in the domain and its utility.

The second characteristics signifies the non-existing of 'subjective ontology'

Example:

The user created application does not corresponds to an ontology. This is because the schema of database or a UML class diagram is only related to the application. This schema of a database is potentially regarded as conceptual model of a domain which is not shared among the members of a community.

However, this definition doesn't specify the following.

(i) The level at which ontologies are modelled.
(ii) The least expressivity needed from ontology point of view.

The criterion that helps in distinguishing different ontological structure is the complexity. The most commonly preferred ontological structures with respect to complexity given.

Unit-II

## 2.2 Ontologies and languages for semantic web. - Resource Description Framework (RDF) / RDF schema.

The ontologies has greatest importance in the architecture pontentially presents the motivation in designing ontology languages across Semantic web In particular, the languages including RDF and OWL are most prevalent for the distributed and open environment of the web.

Semantic web can be understood clearly by representing the existing web resources with ontology based meta-data. Beside this, it can publisize the content of data by conveying the data and the scheme in the standard ontology languages.

Ontology languages in particular to Semantic web play major role in defining the concepts existing within the ontologies. This is performed by identifiers (RIs) which are deployed by data sources in order to indicate a perticallar concept or relationship from an external, public ontology. The users are free to create and publish the ontology and this creating process is a counterpart of creating HTML pages and connecting them to the existing page.

In order to make meta-data and schema public, the user makes use of RDF or OWL document on-line. Also the user may choose to provide access to a data sources via standard query language and protocol bounded to the Semantic web.

Example:

Ontologies describing the distinct forms of Scientific publications and there related -properties including scientific articles processing titels, set of authors, a journal and publication - date, emphasizes on how classes belonging to one ontology are connected to the Classes other ontology.

4

Determining whether or not newly discovered term is similar to previous term in order map the two concepts.

The RDF - (Resource Description Framework) is a domain independent framework. It is primitive modelling language and was originally developed to describe resources on world wide web such as web pages and other content. Also it is used to model real world objects and information resources. It forms the basis for sophisticated languages such as OWL.

Primitives in RDF can broadly be classified as resources and literals. The resources are appeared uncleanly because in general everything which is identified and described can be modelled as resource.

RDF can practically implemented by considering an RDF document in the form of graph - visualization. The graph visualization includes six statements which are represented as directed labelled graphs. Here the nodes are viewed as subjects and objects of statement

In addition to this, it includes RDF/XML syntax and XML-based notation appeared by world wide consortium. The RDF/XML and XML based syntax and considered as most up-to-date, widely preferred syntax. And it is also processable by XML tools.

Basic elements of RDF are as below.

1. Syntax
2. Header.
3. Namespace
4. Description
5. Data type
6. Vocabularies
7. Reification.

example for Namespace.

- <rdf : RDF xmlns: rdf = "http://www.cnn.com/rdf-syntax-ns#">

Syntax

Resource Description Framework (RDF) and RDFS both use syntax based on XML. RDF offers a mechanism through which the relationship between the resources (values & named properties described.

Header.

A document prepared with RDF looks similar to an XML document particularly in using tags, namespaces and elements. An RDF document contains headers with root element as "rdf:RDF" along with a number of namespaces.

3. Namespace.

External namespaces in RDF are used to define resources to import RDF documents. This import enables reuse of resources and addition of new features to resources that produce huge base of knowledge distribution.

## Data types

RDF uses type to identify the kind of a resource It uses two general types for identification - a literal type and resource. ~~They~~ Type can also be specified along with ar triplet.

<http://www.bbc.com/people/Mary>
rdf:type, <http://xmlnsvt.com/wordnet/2.5/Personal>

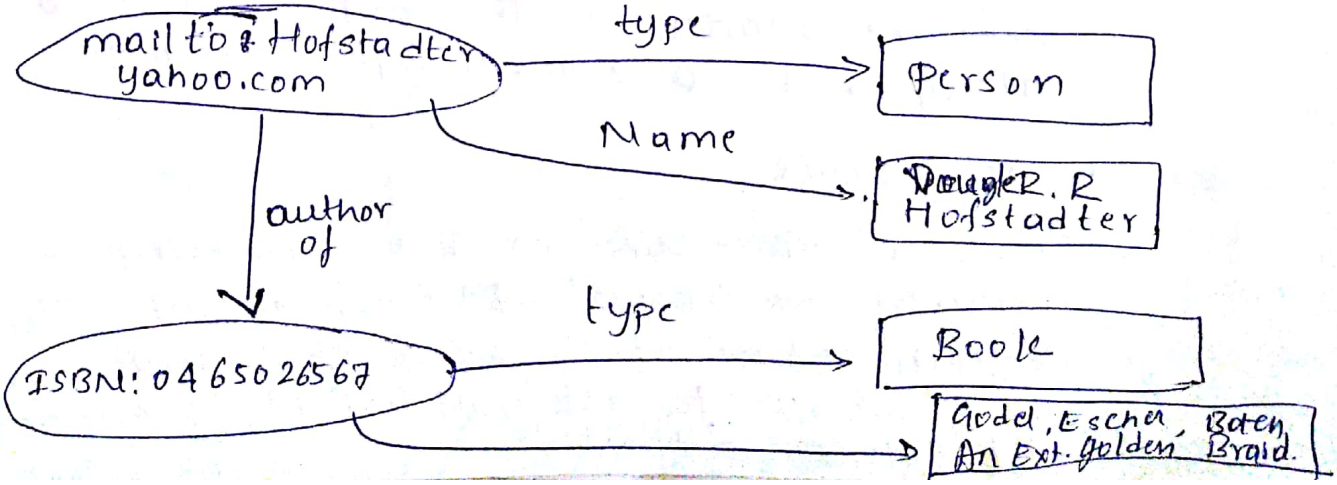
* The resource <http://xmlnsut.com/wordnet/2.5/personal> represents a person.
* Wordnet offers resource URI - Universal Resource Indicator for words.
* rdf:type is a predicate of triple & it is RDF namespace.

Vocabularies.

RDF creates vocabularies that suit various domains to model resources. It offers mechanism through which information about resources can be recorded and also be serialized through XML by using a collection of defined element constraint through RDF schema and syntax.

## RDF Schema:

This provides a simple yet powerful model for describing information including a basic directed graph, but the semantics (meaning of information) is described using RDF schema. The purpose of RDF schema is to provide an XML



2.2.2 Ontology Web Language (OWL), UML, XML/ XML schema.

## Ontology Web Language (OWL)

Ontology Web Language was aimed by adding the constructs of Description Logics (DL) to RDF. This extends the expressiveness of RDF schema while distinguishing classes and properties. Description logics can be defined as collection of knowledge representation languages the formal semantics of which are dependent on thier mapping to First Order Logic (FOL).

In actual, ontology web language is a collection of three languages i.e OWL lite, OWL DL, OWL full. These three languages extend each other syntactically. OWL lite documents. This can be seen in cases where OWL DL is restricted for extending constructs of a language like conclusion would be same.

### RDF/OWL

1. In comparison to UML, it is easy to model RDF because it has less restrictions on itself. Moreover the primitives provided by OWL DL are more when compared with UML.
2. OWL describes defined classes. Defined classes is a class that provide essential and adequate condition for an instance to treat it as a member of the class.
3. RDF/OWL gives high properity to its properties. They treat the properties as global. i.e properties does not relate to any class Aside this, RDF properties can be given as values of properties.

4. Classes can be considered as instances and can be seen in its statements with literal values.
5. Properties can be sub-properties of some other properties
6. Representation in RDF is highly flexible. which can be seen in its statements with literal values.
7. Instances posses multiple types.
8. Identification of non-blank RDF resources can be done using URI.

## Features of UML

1. UML has concept of relationship roles and favours n-ary relations.
2. It has two similar kinds of part whole relations which can be reconstructed in OWL
3. It clearly differentiates between the attributes and associations. Such distinction does not have any relation with datatype and object properties in OWL interestingly, attributes take instances as values whilst datatype takes literal values

The comparison of UML class model with RDF OWL model with RDF/OWL model. This is because, the semantics of UML is written in meta-language and there is no scope of direct mapping among RDF/OWL and MOF. Furthermore, the implementation of enterprise software is done in object oriented methodologies.

RDF/XML schema.

It is one of most popular language because of different complementary tools and technologies like,

1. XML database
2. Standard schema
3. Range of editors
4. Parsers
5. Processors
6. Query and transformation languages such as XQuery and XSLT.

The property of XML even compelled W3C to use it as a notation for both RDF and OWL. RDF/XML is an XML format in which the statements from the graph are written with certain possibilities for abbrevations by considering one statement at a time. This implies that there exists multiple XML serialization for single RDF graph based on the following two criteria.

(i) Usage of abbreviation.

(ii) Arrangement of statements.

Among all complementary tools and technologies, XML editors are only considered useful as they are used in verifying well established Representation.

## 2.3 Ontology Engineering, Constructing Ontology.

The semantic web requires the construction of ontologies for its various representation languages, query languages, and inference technologies. They define common vocabularies for the sharing of information that can be used by both humans and computers. Ontologies can be in the form of lists of words;

Taxonomies, database schema, Frame languages and logics. The main difference between these forms is their expressive power. An ontology together with a corresponding set of concept instances constitute a knowledge base.

Taxonomy is defined as a set of classes of objects and their relationships. These classes, subclasses and their are important tools for manipulating Information. Their relations are described by assigning properties to classes and allowing subclasses to inherit these properties. An ontology then is taxonomy plus inference.

### Ontology applications

The simpliest ontology consists of a simple taxonomy with a single relation categories of ontology applications can be grouped as:

- Neutral Authoring
- Ontology as specification.
- Common access to Information.

## Constructing Ontology :

Ontology permits sharing common understanding of the structure of information among people and software agents. Since there is no unique model for a particular domain, Ontology developement is best achieved through a iterative process.

Objects and their relationships reflect the basic concepts within an ontology. An Iterative approach for building ontologies starts with a rough first pass through the main processes as described by Noy & McGuinness.

- First, set the scope. The development of an ontology should start by defining its domain and scope.
- Second, evaluate reuse. Check to see if existing Ontologies can be defined and extended.
- Third, enumerate terms. It is useful to list all terms, what they address, and what properties they have.
- Fourth, define the taxonomy. There are several possible approaches in developing a Class hierarchy.

## Ontology Developement tools.

Below is list of some of the most common editors used for building ontologies.

1. DAG-Edit

It offers an interface suitable for browsing query and editing vocabularies with DAG data struct

2. Protege 2000

It is one of widely used tool. It is used to design ontologies and knowledge bases.

3. Wonder Tools.

Wonder tools serve as an index that is used to design & select an onto building tool.

4. Web Onto:

It is an applet of Java which is coupled along with web server. With the help of this editor the user perform browsing and editing of knowledge models.

(b) SPOT the common Editors for Building Ontologies.

The "SPOT" ontology consists of three owl: Classes and six rdf: properties. The terms including in classes and properties are used to define 'spot' with the help of an example shape: eclipse.

Classes

The three OWL Classes are

spot: a two-dimensional "spot" defined as a closed region on the plane.

Point: A point is defined as a location on Cartesian plane. It has two attributes its x-position and y-position on an implicit coordinate system of the plane.

Ellipse: Ellipse here is defined as a circle stretched along either x-or y-axis.

Properties : RDF

Shape: A spot assumes a shape of an ellipse. Therefore the domain of shape spot and the range of spot is ellipse.

Center: The center is the center point of ellipse. It has an rdfs: domain of ellipse and an rdfs: range of point.

x-position: An x-position is an owl: Data-type property that has a domain of point. Its value (of type xsd: double) is the distance from the origin on the x-axis of the co-ordinate system.

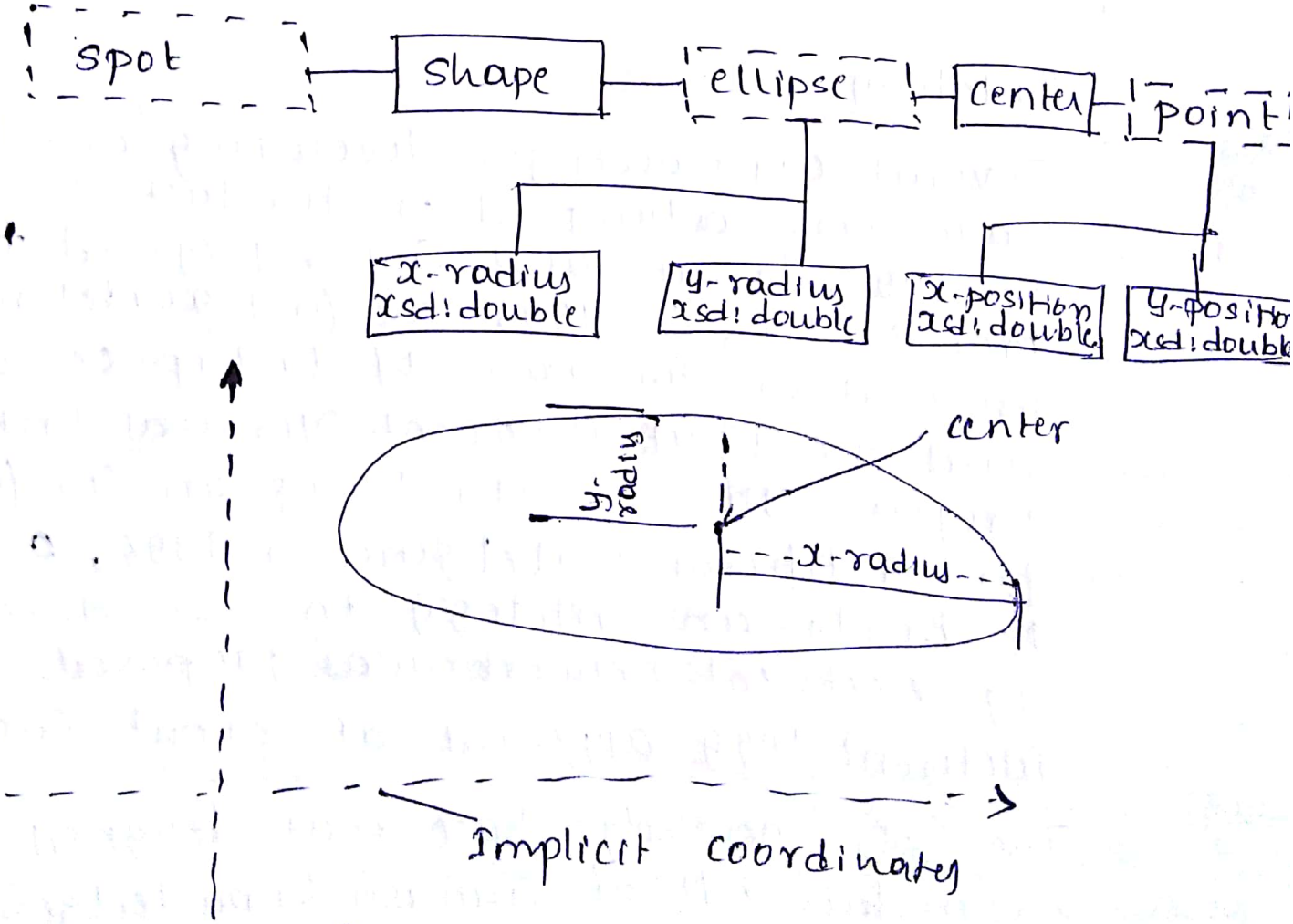



Fig: Ellipse definition

y-position: A y-position is an owl: Datatype property that has a domain of point. Its value (of type xsd: double) is the distance from the origin on the y-axis of the co-ordinate system.

x-radius: An x-radius is an owl: Datatype property that has an rdfs: domain of ellipse. It is the radius parallel to the x-axis of the coordinate system

y-radius: A y-radius is an owl: Datatype property that has an rdfs: domain of ellipse. It is the radius parallel to the y-axis of the coordinate system.

## Ontology Methods:

Several approaches for developing ontologies have been attempted in the last two decades In 1990, Lenat and Guha proposed the general process steps. In 1995 the first guidelines were proposed on the basis of Enterprise Ontology and the TOVE ( Toronto Virtual Enterprise) project. At the 12th European Conference for Artificial Intteligence in 1996, a method to build an ontology in the domain of electrical network was proposed. The Methontology appeared at about same time.

The Cyc Knowledge Base was designed to accomodate all of human knowledge and contains about 100,000 concept types used in the rules and facts. encoded in its knowledge base.

The Electronic Dictionary Research (ERD) project in Japan has developed a dictionary with over 400,000 concepts.

Wordnet is a hierarchy of 166,000 word form and sense pairs. WordNet doesn't have as much detail as CYC or as broad coverage as EDR, but it is the most widely used ontology for natural language.

The main concepts in ontology developement include: the use of a top-down approach in which the most abstract concept are identified first, followed by specialization into more specific concept.

Ontology Sharing & Merging:

Knowledge representation can be considered to be the application of logic and ontology to the task of constructing automated models. Each of following three fields contributes to knowledge representation.

- Logic: Different implementations support different combinations and variations of logic. Sharing information between implementations can usually be done automatically.
- Ontology: Different systems may use different names for the same objects, or they may use the same names for different objects
- Computation: Even when the names and definitions are identical, side effects may produce

## Ontology Libraries:

Researchers throughout the world should be able to access global, distributed knowledge bases of scientific data that are integrated, locally available, and easy to search.

- DAML ontology library
- Ontolingua ontology library
- Protégé Ontology Library.

An ontology that attempts to describe general entities is known as a foundation ontology or upper ontology. Available upper ontologies include:

- IEEE Standard Upper Ontology (suo.ieee.org)
- Cyc (www.cyc.com)

Available general ontologies include

- (www.dmoz.org)
- WordNet (www.cogsci.princeton.edu/~wn/)
- Domain-specific ontologies.
- NCMLS Semantic Net
- GO (Gene Ontology) (www.geneontology.org)
- Chemical Markup Language, CML

## Ontology Mapping Tools:

There are generally Three type of ontology mapping tools, as discussed by Choi et al.

For ontology mapping between local ontologies an example tool is algorithm known as GLUE. GLUE uses machine Learning techniques.

→ In implementing its mapping process, GLUE finds the most similar concept between two ontologies.

- For ontology mappings between the source ontology and an integrated global ontology an example tool is LSD. In LSD (Learning Source Description), schema are used as ontologies with restricted relationship types. Therefore, the mediated schema can be considered to be a global ontology.

For Ontology mapping in ontology mery-ing, allignment, and integration, an examp-le tool is OntoMorph, OntoMorph provides a powerful rule language for specifying mappings, and it faciliates ontology merging while relying on the rapid generation of knowledge base translators.

# UNIT-III

# LOGIC, RULE AND INFERENCE ENGINES.

## LOGIC AND INFERENCE

Logic is the study of principles of reasoning. As such, it can be used as the basis by which formal languages express knowledge, convey semantics, and act as automatic reasoners to infer conclusions. And by the way it forms the foundation of knowledge representation which generally applied to artificial intelligence and particularly applied to the www. It has expressive power highly and also offers high level language to express the knowledge.

RDF and OWL (DL & Lite) incorporate capabilities to to express predicate logic that provide a syntax that fits well with web languages. They offer a trade-off between expressive power and computational complexity.

### Inference Rules:

In logic, a rule is a methadology for constructing correct inferences. Such rules establish the valid relationships between a set of formulas, called premises and an assertion designated as a conclusion. New true assertions can be reached from already known ones.

There are two forms of deductivity valid argument: modus ponens (Latin for "affirming mode")

In first order predicate logic, rules of inference are required to enable logical analysis. Proof systems are constructed from sets of rules that can be combined to form proofs, or derivations.

For the semantic web, logic can be used by software agents to make decisions and select a path of action.

RepeatCustomer(X) → discount(25%)

where repeat customers are identified from the company database.

where repeat customer are identified This involves execution of a rule of the form "IF (Condition), THEN (conclusion). With only a finite number of comparisons, we are required to reach a conclusion. This means that the logic will be tractable and the tools to execute it will be efficient reasoning tools to execute.

Rules can be either conditional or biconditional. Conditional rules, or rules of inference are rules that one can use to infer the first type of statement from the second.

Conditional Transformation Rules.

We use the letters P, q, r, s etc... as propositional variables.

An argument is considered to be modus ponens if it has the following form (P1 refers to first premise, P2 refers to the second premise and C refers to the conclusion)

For example:

(P1) If Socrates is human, then socrat is mortal.

(P2) Socrates is human.

(C) Socrates is mortal.

This modus ponens argument can be represented as follows:

$$[(P \rightarrow q) \wedge q] \rightarrow [q]$$

## Biconditional Transformation Rules:

These rules, or rules of replacement, are rules which one can be use to infer the first type of statement from the second, or vice versa.

Double negative elimination is represented as

$$[\neg \neg P] \Longleftrightarrow [P]$$

Tautology is represented as

$$[P] \Leftrightarrow [P \vee P]$$

## Monotonic and Non-Monotonic Rules

Within Predicate logic, if a conclusion remains valid after new information becomes available then this case follows monotonic rule. If, however, the conclusion becomes invalid with the introduction of new knowledge, then it is said to follow a non-monotonic rule.

The semantic web will express knowledge in machine accessible way using RDF and OWL, and then exchange rules across different applications using XML-based rule languages. A subset of predicate logic, Horn logic, is the basis of monotonic rules.

Monotonic rules are useful where information is unavailable. These rules can be overridden by contrary evidence presented by other rules. Priorities are helpful to resolve some conflicts between nonmonotonic rules. XML-based languages can be used to represent rules.

Inference Engines:

An Expert system can be considered to have three levels of organization: a working memory, an inference engine, and knowledge base. The inference engine controls the execution of reasoning rules, and consequently it can be used to deduce new knowledge from existing information. It is the core of an expert system and it acts as a generic control mechanism to implement the axiomatic knowledge from the knowledge base to analyze the task-specific data and reach some conclusion.

Two techniques for drawing inferences are: general logic-based inference engines and specialized algorithms.

many realistic web applications will operate on an agent-to-agent basis with out human intervention to spot glitches in reasoning.

How the Inference Engine Works.

Forward chaining and backward chaining are the two basic kinds of inference used in rule-bases systems.

## Forward Chaining

In this method, the data is placed in a working memory. The conditions of rules matching with new data are triggered. Now, the actions can be formed by these rules. Even these actions can add new data to memory and trigger more rules. Since, an inference is being triggered when the new data is placed in the working memory this is called as data directed inference.

Use the below set of rules to iterate continuosly until the conclusion is reached.

Rule 1: IF A and C THEN F

Rule 2: IF A and E THEN G

Rule 3: IF B THEN E

Rule 4: IF G THEN D.

Given that, rule A and B are true. Then, consider rule 1 and move down the list until rule which can be applied is found out inorder to prove. 'D' is true, Here only rule 3 fires in the first iteration at the end of which A, B, and E are considered as true. Second one uses information, where rule 2 fires after adding the information that G is true.

## Backward chaining:

In this method the system requires to know the value of specific piece of data. The conclusion of the rules which mention the data are searched. The conditions of the rule need to be tested before they can be used. This helps to know the value of many pieces of data and so on. Since, inferences are not performed until a specific goal is not proved by the system, this is called as goal directed inferences or hypothesis driven. The user must initiate the desired goal and try to find evidence so that the goal can be proved.

Initially we search the rule to prove that D is true. This will be rule 4. And to prove that A is true will be the ~~goal~~ sub-goal which is met by rule 2. Since A is true, the next goal is to prove that E is true.

## Searching algorithm:

A branching Network or tree can be represented as knowledge base There are searching algorithms, among which two basic approaches are.

1. Depth-first search algorithm.
2. Breadth-first search algorithm.

Depth first Search algorithm wher search begins from a particular node (source node) which represents the data or desired goal. It checks whether the left-most node beneath

The CYCORPS. CYC adopts a distinct approach which consists of approximately 1mb of axioms with the use of first order framework. The axioms are organized by CYC in context and consistency is maintained for one context

## Closed World Machine:

A semantic web program is popularly known and written by Tim Berners-Lee and Dan Connolly is called closed world machine inference engine. It serves as general purpose data processor for the semantic web and it also serves as forward changing resoner which can be used for several purpose data processor for semantic web and it also serves as forward changing reasoner which can be used for several purposed like querying, checking, filtering and transforming the information. RDF that is extended for adding rules is its basic language.

## RDF inference engine:

The RDF statements can be directly translated into character strings by using RDF triples notation. For RDF statements (S,P,O), RDF triple is string of any one following forms,

(i) When 'O' has an absolute or relative URIref, then the character string representation is

<S><P><O>

- This process continous until the bottom of the graph is reached. After this, backtracking is performed and then again exploring the next node in the same way. This process continues until a terminal node is reached.

Breadth-first search algorithm where the search begins from particular node (source) and then exploring all the nodes until a solution is reached. Otherwise the tree is explored completely. This process helps in finding the shortest path from initial assertion to a solution.

In addition to this, There are even other methods to make inferences which combines the above two techniques.

Some of these methods might be better than other methods in terms of time, memory and cost of the solution path based on the number of given paths & reasonable-inferences.

Full First-order Logic Inference Engines.

A Full-Fledged automated theorem prover is needed to specify axioms by using full first-order logic. For huge amounts of data and axioms, the first-order logic is partially decidable with the Inferencing which is computationally hard to solve. Such programs on web will not increase to handle large amount of knowledge. Where as, full first theorem proving denotes the consistency maintenance through out the web. But this is purely impossible.

(ii) When 'O' is a literal then the string is represent -ted as,

<S> <P> "O"

For a set of RDF statement, the notation of RDF triple is obtained just by concatenating the RDF triples representing every RDF statement, in any order.

Example

Let us consider some examples of RDF statements as shown in the table below.

| Statement | Element | Value (Absolute URIref. or Literal) | Value of Qualified Name. |
|---|---|---|---|
| Sa | Subject | http://www.catelogue.com/docs#R30402 | |
| | Property | http://purl.org/dc/elements/1.1/creator | dc:Creator |
| | Value | | |
| Sb | Subject | http://www.catelogue.com/auth#R06202 | |
| | Property | http://www.catelogue.com/docs#R30402 | dc:title |
| | Value | http://purl.org/dc/elements/1.1/title | |
| | | Marina Home Page | |
| Sc | Subject | http://www.catelogue.com/docs#R30402 | |
| | Property | http://purl.org/dc/elements/1.1/date | |
| | Value | 2012-12-12 | dc:date |

The above table has three RDF statements Sa, Sb, Sc These statements behave as a fragment of the catelogue. The subject of all the statements have same URIrefs to identify a document. But, the objects of Sa is URIref and the objects of Sb & Sc are literals.

The equivalent RDF triples for the RDF statements mentioned in the above table are as follows,

<http://www.catelogue.com/docs#R30402>
<http://purl.org/dc/elements/1.1/creator>
<http://www.cat.com/auth#R30402>.
<http://purl.org/dc/elements/1.1/title>
"Marina Homepage"
<http://www.catalogue.com/docs#R30402>
<http://purl.org/dc/elements/1.1/date>
"2012-12-12".

For a set of RDF statements, the RDF graph can be explicitly defined as a labeled graph. The generation of the graph involves

(i) Construction of nodes
(ii) Construction of arcs.

Construction of nodes

The set of nodes for the graph can be construc-ted in the following ways,

* There exists a node with label u and graph for every URIref u with occur in R as subject or object of RDF.
* There is a node with label 'L' in the graph for every Literal L which occurs in R as Object of RDF statement.

Construction of arcs:

The set of arcs for the graph can be construct-ed in following ways.

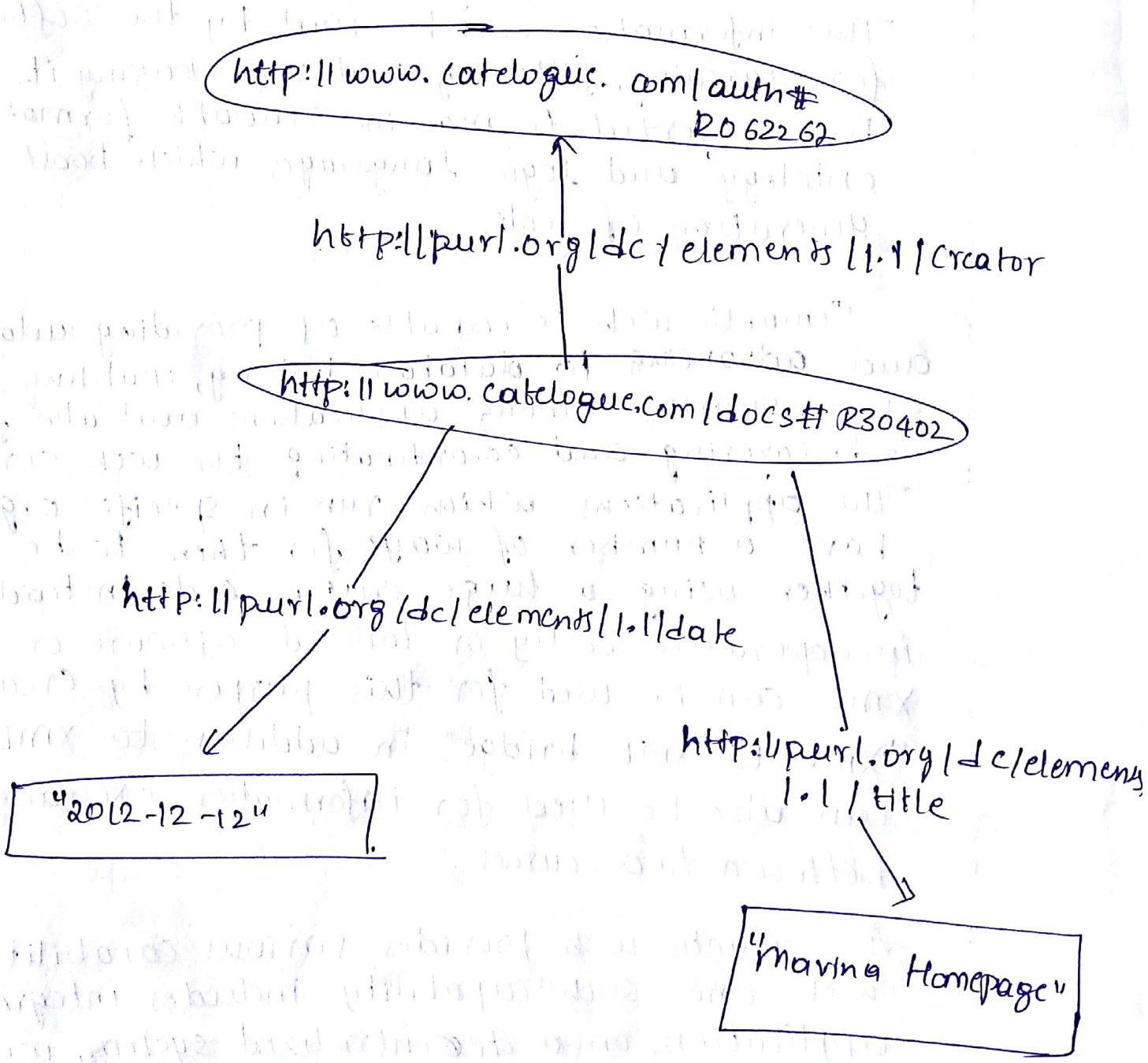
* There exist an arc with label 'P' for every RDF statement (S, P, O) directed from one node

- To another node with labels S and O respectively.

In RDF graph, simply define URIrefs are allowed for labelling of nodes and arcs. Nodes can be labelled either using URIrefs or with literals.

Nodes with URIrefs are denoted using ellipses, whereas nodes with literals are denoted by using boxes, as shown in the

Example



## Semantic Web Applications and Services.

A web based application which include semantic content comprising information as well as metadata are called semantic web application. It can also be used successfully to discover, automate, integrate and also reuse over several applications. It offers infrastructure for web pages. databases, services, programs, sensors and user devices. This information can be used by the software-agent for searching, filtering and repackaging it. It can be converted to machine readable format by the ontology and logic languages which boost a new generation of tools.

Semantic web is capable of providing addressing and advancing to database linking, enabling information sharing among applications and also for discovering and co-ordinating the web services. The applications which run in specific organization have a number of ways for them to be linked together using a huge custom code instead of incooperative costly or tailored software or interfaces. XML can be used for this purpose by creating "XML to XML bridge". In addition to XML, RDF can also be used for information exchange between two sources.

A semantic web provides various capabilities for web. One such capability includes integration of application on a decentralized system, without any need for a human to handcraft all the connections. This type of integration of data and programs enhances the business market.

## Semantic Web Services:

Semantic web services integrates data as well as programs on current web. This Integration can be done using RDF

Web services are said to be self-contained, self-described and component applications which can be invoked over the web for performing critical business process. These applications are capable of discovering and invoking services as soon as it is deployed. However, human interaction is needed for identifying and implementing the web services

It is suggested that web services and semantic web can be combined as the combination of web services business logic and meaningful content of semantic web.

## Semantic Search:

The results of traditional search can be amplified and improved by semantic search methods by making use of the concepts and logical relationships rather than just words.

Two approaches are available to improve the search results via these methods. They are.

1. Using the semantic web metadata directly &
2. Latent Semantic Indexing (LSI).

A much meaningful metadata is provided about the content by the semantic web by making use of resource description framework and web ontology language documents.

## E-Learning.

Semantic web approaches to interoperability among educational systems are major factor which need to be achieved in e-learning. In addition to this, it must be automated, structured and should have unified authoring. The semantic web plays a key role and allows educational systems to interoperate among them by capitalizing on the following.

* Semantic Conceptualization and ontologies
* Syntax of common standardization communication
* Extensive combination of educational content and usage.

RDF on the other hand, determines objects and their relationships. It enables the information to be reused easily for various devices, like mobile phones & PDAs and to be represented to the peoples with various capabilities.

## SEMANTIC BIOINFORMATICS:

The semantic Web can exert an impact on the industry as a tool for Enterprise Application Integration. Just as the web integrates human-oriented information systems, the Semantic Web would integrates human oriented information systems, the Semantic Web could integrate applications for machine processing.

The initial foundation and early growth of the web was based in great part on its adoption by high energy physics community then six high-energy physics web sites collaboration, allowing their participation physicits to interact on this new network of networks. A similar critical mass in life sciences could occur if a half dozen ontologies for drug discovery were to become available on the semantic Web.

Life science is a particularly suitable field for pioneering the Semantic Web.

For Example, In the area of new drug-discovery, many databases and information systems are used by drug researchers on a global scale. In this regard, the Biological Pathways Exchange (http://www.biopax.org/) is developing a standard data exchange format for metabolic, signaling, genetic regulatory, and generic pathways information.

## Enterprise application integration:

The semantic web can exert an impact on the industry as a tool for Enterprise application Integration. Just as the web today integrates human-oriented information system. the semantic web could integrate applications for machine processing.

As an example consider the British Telecom Call center (http://www.bt.com). A call center is a platform for companies to communicate

Current call center technology lacks the support of the operator in solving incoming requests. The investment in call center technology could offer better customer service, lower overheads, and lower operational costs, for British Telcom, a system for supporting interact-based virtual communities is being developed. It allows the automatic sharing information on share its associated ontologies allow-storage of the best practice information in an ontology and automatic dissemination of information to relevent call center agents. The ontology provides sharable structure for the knowledge base and a common language for communication between call center agents.

Knowledge Base:

As semantic web Technology is being introduced, knowledge systems are gaining the capability to support the automated aquisition, organi-zation, processing, sharing, and use of informati-on in multimedia content.

In one particularly interesting application, Cycorp intends to sell products and services using its inference engine, which has been designed to work with the Cyc knowledge Cycorp provides a reference Cyc Server that is executable for Intel-based Linux and for Windows 2000.40

According to promotional material from Cyc, Open Cyc, the open source version of the cyc techno-logy, is the world's largest and most complete general knowledge base and common-sense reasoning engine. It is used as the basis for many applications.

# UNIT-4

# XML BASED WEB SERVICES AND SOCIAL NETWORK ANALYSIS

## XML-based Web Services

Web services aims in providing a standard to all the distinct software applications that are being implemented on different platforms. The essential features that supports interoperability of web services are extensibility & language neutrality. Some of the popular standards are

1) Universal Description Discovery & Integration (UDDI)

It provides a standard for web service discovery & composition. It is well accepted technology developed by IBM & Microsoft

2) Web Services Description Language (WSDL)

It is a world wide accepted standard which helps in binding of web services.

3) Simple Object Access Protocol (SOAP)

It is a world wide known standard which helps in messaging & dynamically invoking web services.

In XML-based web service, all the s/w agents have different functionalities & depending on their functionalities they are assigned distinct roles.

## Creating an OWL-S Ontology for web Services:

→ It explains about all the programs involved in the service as well as declarative description of all the program's properties

→ It explains about the grounding of all the atomic processes involved as well as relate them with other processes.

→ It explains about the compositions of each atomic proces

→ It explains about the simple proces through which web services can be serviced.

→ It explains about the profile as well as enable declarative advertisements of the service

## Semantic Search Technology:

Semantic Search seeks to improve search accuracy by understanding the searcher's intent & the contextual meaning of terms as they appear in the searchable dataspace to generate more relevant results.

All the web search makes the use of keywords for searching any query there are 2 subjects on which the search is dependant on. 1. Polysemy 2. Synonymy

1) Polysemy define a single word with different meaning
2) Synonymy define a different words insignificant searches

Semantic search faces some of the issues like incompleteness logic because the search tree is too huge. Hence some of the mechanisms or technique to defeat this problems. They are

1) DFS 2) BFS.

1) Depth first Search

The search is initiated from the top of the tree & go down the path till the generation of the result or the desc end.

2) Breadth first Search.

The search is initiated from layer to layer. first one tries to reach the goal trying all the zero step proofs after this uses one step proofs.

## Web Search Agents And Semantic Methods.

### Web Search Agents:

Web Search engines & web search agents perform the same task of searching a user's query. But the difference is each search engine searches the sites whereas, search agents searches the user's query in the database of the knowledge base. It tries to search its specific query at all the distinct locations possibly including the sites till it reaches its target. Search agent is consider as a intelligent agent, it determines the task within the allotted time & takes wise decisions in timely manner

There different phases in search agents.

1) Initialization phase

In this it setup arrays, variables & structures.

2) Perception phase:

All the details of the site from which the information is to be retrieved is gathered.

3) Action phase:

The agents finds out whether the information that has been gathered by the system meets the required goals or not

Semantic Methods:

In Semantic methods are of 2 semantic methods.

1. Latent Semantic index search. (LSI)

It records the keyword in a document & adds in important step in indexing process. It examines the collection of documents which contain some keywords.

a) Semantic Search Engine (TAP)

TAP is a distributed project. It applies many automated & semi-automated ~~to~~ rel schemes in order to retrive the information from structured & unstructured bodies of text. It specially design to route the existing information & to extract

b) Swoogle: It is a indexing & retrieval system for semantic web documents created using RDF & OWL. to extract the metadata & evaluate the information.

## Ontologies Languages for the Semantic Web:

Resource Description Framework (RDF) is a domain independant framework. It is a primitive modelling language and was originally developed to describe resource on world wide web such as web-pages and other content. Also it is used to model real world objects and information resources. It forms the basis for sophisticated Languages such as OWL

## Resource Description Frame (RDF / RDF Schema):

Primitives in RDF can broadly be classified as resources and literals. The resources are appeared mainly because in general everything which is identified and described can be modelled as a resource. Clearly there are two potential methods in identifying resources.

→ It is either URI or left blank. The former one is identified with a special syntax whereas the later one is often referred to as block node or blank resources.

→ These are the existential quantifiers of the Language. In particular the blank resources are considered as resources with an anonymous identifier. And further the RDF model does not have any process to assign identifier to a blick node. On the other hand, literals are strings (character literals)

consisting of optional language and datatype identifiers and these are used at the end of the statement.

clearly, the expressions are rendered out of statements (triples). they may take in the form of subject, predicate and object.

Subject :-

The subject of the statement is a resource which is usually stated as with a URI

Predicate :-

The predicate of the statement is a URI

Object

The object of the statement can be resource or literal

RDF can practically be implemented by considering an RDF document in the form of a graph visualization. The graph visualization includes the statements which are represented as directed labelled graphs. Here the nodes are viewed as subjects and objects of statements. Similarly here these statements are labelled with the URI of the property Another important aspect is that the statements of the RDF model creates a graph. This is due to the object of

→ This is due to the object of one statement becoming the subject to another statement.

→ In addition to this. It includes RDF/xml syntax and xml-based notation appeared by world wide consortium. The RDF/xml is an xml based syntax and is considered as most up-to-date, widely preferred syntax. And it is also processable by xml tools. Besides this, the fragments of preferred

→ Aside this, the RDF Languages not just facilitates basic terms that helps in assigning a type to a resource (rdf: type) but also declare a resource as a property. It also allow distinct features to describe collection of instances and to create statements about statement.

## Basic Elements of RDF

The basic elements of Resource Description Framework langu

(1) Syntax
(2) Header
(3) Namespace
(4) Describing
(5) Data type
(6) Vocabularies
(7) Reification

(1) Syntax:

Resource Description Framework (RDF) and RDF scheme (RDFS) both use syntax based on XML. RDF offers a mechanism through which the relationship between the resources (value and named) properties are described. It compliments the XML and encoding its triple in XML makes an object interoperable between many applications and portable on various platform. It can be parse into the web as a document using software based on XML

(2) Header

A document prepared with RDF looks similar to an xml document particularly in using tags. namespaces and elements. An RDF document contains header with the root element as "rdf:RDF" along with a number of namespace

(3) Namespace

External namespaces in RDF are used to define resources to import RDF documents. This import enables reuse of resource and addition of new features to the resources that produce huge base of knowledge distribution. A namespace can be added anywhere in the RDF document however, it is incorporated in the RDF tag.

Example

<rdf:RDF xmlns:rdf="http://www.cnn.com/rdf-Syntax-ns#">.

Semantic Web Documents (SWDs):

A document in Resource Description Framework (RDF) or web Ontology language (WOL) accessed by s/w agents is called SWDs.

a) Semantic Web Ontologies (SWO):

A document whose stmts defines new class or adds new properties

b) Semantic Web Database (SWD)

A document that does not define or extend terms is called Semantic Web DB.

Social Network Analysis:

The study of social relations b/w a group of actors is called Social Network Analysis (SNA). It do not concentrates on attribute of the single actor.

Network analysis make use of social structures & view them globally considering that the types & patterns of relationships rise from individual connectivity. Also, the availability & unavailability of these types & patterns effects the N/w and its constituents.

The new structure facilitate with some opportunities & also enforce constraints on individual actors with the help of identifying the flow or transfer of resources in the N/w.

SNA collects data & perform analysis.

## Development of the Social Network Analysis:

The development of different concepts of social N/w analysis is done independently by performing empirical studies of many social settings. However there are certain concepts that have generated naturally from social studies.

In this N/w graph, the nodes represent individuals & edges represent personal relationships. It also depicts the relationships b/w social units such as groups, organization, nations.

The two following development resulted in the explosion in N/w literature

1) Advances in N/w Technology.
2) Advances in Application of Methods of SNA.

## Electronic Sources for N/w Analysis - Electronic Discussion N/ws.

Electronic discussion N/w within an Organization can be developed by determining the relationship that exist b/w any pair of individual while developing these discussion N/w's one-way relationships are not taken into consideration. These N/w are used for

1) identifying leadership roles within the Organization
2) Finding formal Communities
3) finding informal Communities.

# UNIT-V

## BLOGS AND ONLINE COMMUNITIES

### * Blogs and Online Communities:-

→ A blog is a site which provides the information. It published on the world wide web. It consist of posts in such a manner that post which is the most recent one is appeared first.

→ Until 2009, the blogs were managed by a single group particularly on a single subject such types of blogs are known as SABs (Single Author Blogs)

→ But most of the new coming blogs known as MABs (Multi-Author Blogs) are being managed by more no. of people regrading different subjects.

→ The different types of Blogs are:

a) Personal blogs
b) Microblogging
c) Corporate and Organizational blogs
d) Political blogs e) Health Blogs f) Media blogs etc.

### * Online Communities:-

→ It is a Virtual Society. It is an Online information system which allows people to know each other as well as allow anyone to post the content such as in the bulletin board system or allow any specific

registered people to post the content such the In the blogs.

→ There are two types of participations of an Community

a) Public Participation :-

The Participants involved are Posters, who publish their their options and belief's

b) Non-Public Participations :-

The Participants involved are called lucker, who participate the virtual community without posting options or belief's.

* Web Based Networks :-

1) Links :-

→ The Links act as the agent to represent the real world These links created by author of the page are connected to the relevant authoritative information.

→ The social studies related to the linking structure is to provide

2) Co-Occurences :-

Co-occurences of names in a webpage is frequently occuring phenomenon. In which a name can occur more than once and its ocurrence are related to each other.

The text mining methods of web such as statistical methods are applied to obtain the relationship among co-ouurences of name.

What is Jacard coeffient of coocurence:?

Jacard coefficient measures the similarity of symmetric information on binary and non binary data

$$J_{AB} = \frac{|n(P \cap Q)|}{|n(P \cup Q)|}$$

* Semantic web Applications with social network

Generic Architecture of Semantic web Application:-

The generic architecture of Semantic web application was developed in order to reuse heterogeous data occurs and Services, before reusing heterogenous data and Service, data must be normalize syntatically and Semantically.

→ The normalisation can be done by initially transforming the data into RDF Syntax like RDF or xml and latter the Ontology are bought from heterogenous data Sources.

→ The transformation of RDX Syntax can be avoided if data is queried in SPARQL and query language and protocol instead of RDF or owl.

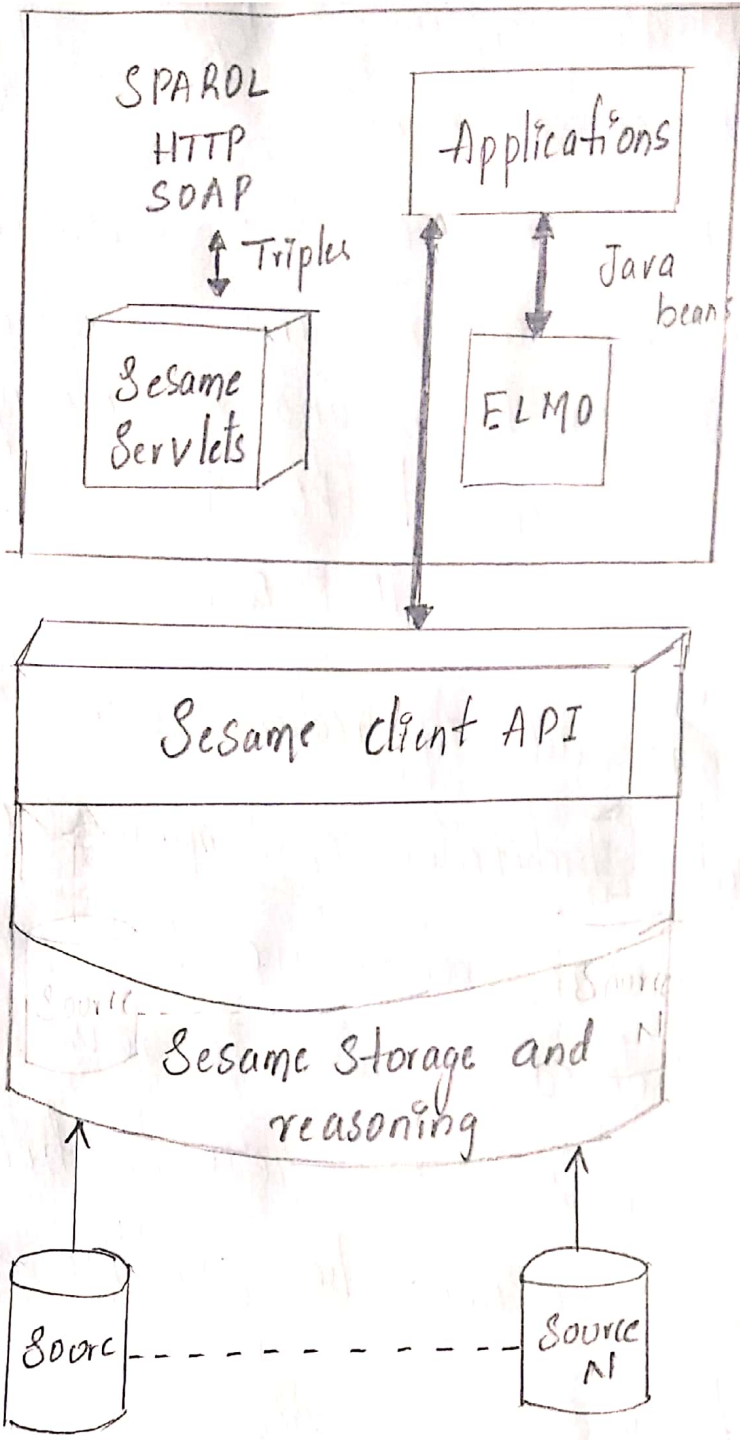



fig: Generic Architecture of Semantic web Application

At present all the Semantic application are limited dey the number of data Sources they can use. So, the data Sources are already known on the Application developers and their mapping can be done manually. where as in the near future it is

→ been expected the new data sources they can use. So, the data sources are already known to the application developers and their mapping can be manually.

→ whereas in the near future it is been expected that new data sources will be determined and perform automatically.

→ They are some rules that have been defined inorder to compute the triple areas.

## Sesame:-

Sesame is a well triple store has been based on java technology.

→ It allows specifying access privileages as well as creating topology in any of the query language

→ So they are two languages supported by the Sesame one is SERQL and the other is SPARQL

## ELMO:-

ELMO is a development toolkit of two parts

1. ELMO API
2. Set of tools

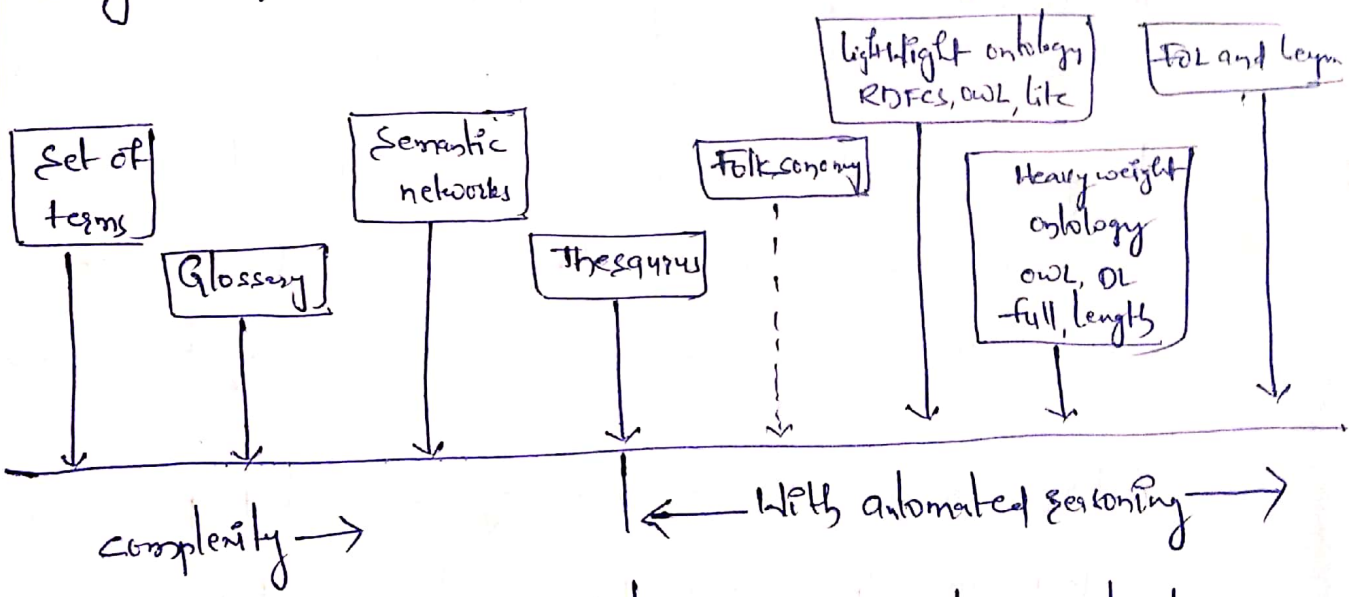
Example

The user created application does not corresponds to an ontology. This is because the schema of a database or a UML class diagram is only related to the application. This schema of a database is potentially regarded as conceptual model of a domain which is not shared among the members of the community.

(i) The level at which the ontologies are to be modelled

(ii) The least expressivity needed from ontology point of v

The criterion that helps is distinguishing different ontol structure is the complexity. The most commonly prefer ontological structures with respect to complexity is give




organization of ontologies according to complexity

(i) Glossary:

These structures are also identified as controlled vocabularies and are most simple structures among all. It is an agreement over the semantics of the set of terms.

② Semantic Networks

These structures are the complex structures that not just specify the hierarchy between the concepts but also describes the related terms and aliases. On the other hand, the measures can be described as the simplest structures that supports logic-based reasoning. The hierarchies involved are broader as well as narrower relationships with are transitive in nature. This implies, if an term belonging to the narrow relationship also belongs to it's direct parent and also its ancestry

③ Folksonomy :-

These structures are regarded as weaker models that does not contain any explicit hierarchies. Folksonomy often comprises data corresponding to the social context of tags. i.e group of users that utilizes the information. Perhaps, these structures gain success in extracting hierarchies and also relationships among the tags.

④ Light weight Ontology :-

These structures includes those ontologies that specify the differential between classes, instances and properties. Also the structure holds a specify a sufficient amount of description regarding the classes and so on.

⑤ Heavy Weight Ontology :

These structures presents the accurate description on how the classes are generated from classes. It also presents complex set rules that restrict the properties applied on the classes.

⑥ First Order Logic (FOL)

These structures exist at the end of the spectrum. It is useful for defining the instances present in the concept. Also It specifies the cases wherein the related instances are related by deploying certain relationship. However, if the concepts contains one or many restrictions. It is possible that the semantics will be correctly interpreted by the user

Finally, at the end of the spectrum the role of the computer is significant in reasoning with ontologies.

Ontology Languages:

The ontologies has the greatest importance in the architecture of the semantic web. The architecture potentially presents the motivation in designing ontology languages across the semantic web. In particular, the languages including RDF and OWL are most prevalent for the distributed and open environment of the web.

The semantic web can be understood clearly by representing the existing web resources with ontology based meta-data besides this It can publicize the content of data by conveying the data and scheme in the standard ontology languages

Ontology languages in particular to semantic web play a major role in defining the concepts existing within the ontologies. This is performed by using unique identifiers (URIs)

1. ELMO API:

It provides interface among a group of java beans consisting ontological classes and triple store which can be manipulated using java beans

2. Set of Tools:-

The Second Component comprieses set of tools used for servicing RDF data.

Semantic web Application with Social Network Features:-

To build a Semantic web application, the developers must clearly undustand the meaning of data, its importance and the sources of information for the Application.

→ The meaning of data must be represented by formal description and processed to produce useful information

→ The source of information must be varied, heterogeneous and realistic