A Review on Reasoning System, Types and Tools and Need for Hybrid Reasoning

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***Abstract*—** Expert system is a programming system which utilizes the information of expert knowledge of the specific domain to make decisions. These frameworks are intended to tackle complex issues by thinking through the learning process called as reasoning. The knowledge used for reasoning is represented mainly as if-then rules. Expert system forms a significant part in day-to-day life nowadays as it emulates the expert's behavior in analyzing the information and concludes decision. This paper primarily centers on the reasoning system which plays the fundamental part in field of artificial intelligence and information based systems. The hybrid reasoning system is defined as a reasoning which integrates two different types of reasoning that must provide qualitative and quantitative forms of reasoning. The qualitative measures are efficiency, reliability, productivity and robustness whereas quantitative measures include time, multi-criteria optimization and resources like mass and so on.

Keywords*—*component; formatting; style; styling; insert (key words)

I. INTRODUCTION

Expert system forms an essential part in day-to-day life nowadays as it emulates the expert's behavior in analyzing the information and concludes decision. It has proved to be the significant tool which is based on expert's knowledge and interpretation for building intelligent decision making systems. An expert system is a computer system that surpass the decision-making capability of a human expert as per defined in the field of artificial intelligence. Expert systems are designed to solve composite problems by way of thinking through the knowledge, represented mainly as if–then rules. The knowledge base consisting of information regarding respective domains and inference engine that helps to find the solutions for the problems. The user interface is also one of the major component with which the communication take space between the expert system and external space. First we must have a knowledge base then we require a programming system that will facilitate us to access the knowledge for reasoning purpose and helps in decision making and problem solving. Inference engine is an element of the system that applies logical rules to the knowledge base to deduce new information. User interface is one through which the user can communicate with the expert system.

"A reasoning system is a software system that uses available knowledge, applies logical techniques to generate conclusions". It uses logical techniques such as deduction approach and induction approach. Representation of knowledge focuses on designing computer representations that capture information about the world that can be used to resolve composite problems. Each and every knowledge representation language has a reasoning or inference engine as part of the system. Basically there are three major types of reasoning Deductive, Inductive and Abductive reasoning. In Inductive reasoning approach decisions are made by going through detailed principles in order to arrive at a precise conclusion. Example of inductive reasoning is as follows "John hails from Russia and Russians are tall, therefore John is tall". Deductive reasoning approach follows Inferencing proofs from previously determined clause. For example, "All men are mortal. Krishna is a man. Therefore, Krishna is mortal." Abductive reasoning is the one that does not perfectly match with either inductive or deductive reasoning. When there is incomplete information about the problem domain with partial observations abductive reasoning is used followed by most possible solution. Moreover doctors use this kind of approach the most because the decision depends upon test cases and evidences. Most of the security applications have been rule based including real-time data. Amalgamation of expert systems technology with additional artificial intelligent methods or with precise classical numerical methods adds more effectiveness. This led to the development of hybrid reasoning system.

II. LITERATURE SURVEY

The Semantic Web Stack represents the architecture of the Semantic Web. World Wide Web Consortium (W3C) is a global body which started a united association called semantic web. This standard allows general data formats on the Web. The 1ayers of semantic web stack has user interface, application, trust, proof, unifying logic, querying SPARQL, ontologies OWL, rules RIF/SWRL, taxonomies RDFS, data interchange RDF, syntax XML, identifiers URI and character set Unicode. Proof component is the third layer gives information regarding the agent providing information and to check its validation. Trust layer ensures that the information provided is valid and there is a level of confidence in the resource that provides the information. The proof generation and trust layers are supported only by CWM reasoner.(Dieter De Paepe). Closed World Machine [CWM] was in Python by Tim of the Consortium which reasons via N3 rules. Notation 3 is one of the RDF formats that stores triples within a query able triples database. It performs inferences as a forward chaining inference engine along with that it also has many built-in functions such as string matching, fetching the resources, all using an extensible integral built-in package. CWM is excellent for experimenting with RDF and RDFS and some OWL .CWM's rule based reasoner can't cover all of OWL l It's good as a Unix tool that you can call on or after the command line.

Drool based pattern matching algorithm is used to develop the reasoning efficiency. It is done combining and eliminating the rules. It is performed to make the algorithm stronger on evidential reasoning. This type of reasoning is suitable for various special topic maps. Topic maps have constraints of rules. There was need for a specific tool which can be used for editing rules. A tool is developed which is comprised of topic maps. It has very simple form of representation and clear semantics. The topic maps should be imported to processor while creating rule files. The processor is based on the Rete an optimized pattern matching algorithm integrated into drools.(Yong Xue)

Drools provide complex event processing [CEP] and temporal reasoning through its Drools Fusion Module. But it cannot operate with spatial relations even though with SWRL because of its low level operators. Temporal concepts are represented by XML schema, dates, time and duration. A mechanism is developed which has capability to operate both spatial and temporal relations using inline functions. The events are represented in the form of 2D polygon. This concept may not be an optimal solution but can be a new way to Spatio-temporal concepts.(Merilinna)

In fixed state system a technique is used to evaluate the accuracy of the state variables. It is known as model checking technique. It is necessary to verify each state variable of the system with its specification. Model checking suffers proper mathematical language problem while performing this technique. Description logic is one of the important formalism of knowledge representation. It provides Inferencing based on tableaux technologies. To handle the problems with the bounded model checking there are two different types of encodings in the form of consistency check in DL was introduced. This is implemented by means of Description logic reasoner fact++.(Shoham Ben-David)

Inference engines like pellet, Racer and fact++ support classification, consistent checking and realization which are basic operations in ontology. OVL [0ntology for Vietnamese Language] was developed to share the Vietnamese processor. It has two major units inference services and user easy access in evaluation process. Inferencing is done using pellet reasoner because pellet facilitates the programmers to integrate their own language with pellet. Jena and OWLAPI being important interfaces are a part of pellet reasoner.(Dang Tuan Nguyen)

Pellet is compatible with both Protégé and Jena. A built-in ontology developed for semantic web assisting purpose uses pellet reasoner. The developed prototype generates results in the form of assistance by considering the information and rules by means of pellet. The prototype follows generating different ontologies for various aspects like food habits, diseases, workouts and personal health charts. Individual ontologies are integrated. The resulting prototype generates a food chart, exercise names and other health details of the diabetes patient.(Irshad Faiz)

Resource description framework [RDF] is a framework providing description of information within a significant and easy form. In semantic web Resource description framework scheme allows computer to search and find out appropriate information from a web document.OWL can be improved compared from the two described earlier. This is analyzed by developing an information retrieval framework with better precision of results. It comprises of Jena semantic framework with pellet reasoner. (Swarup)

III. REASONING TYPES

"A rule engine is a software system that fires the rules defined in a runtime environment". The main reason for using rule engine is its feature of declarative programming; it allows expressing what to do in terms of sequence of operations. There are many approaches in the methodologies of how these systems go about thinking. Forward chaining, which is immediate responding and data driven is one of the basic approach in Inferencing. Backward chaining is another form of reasoning approach which is widely known as query driven and passive form of reasoning. Forward chaining is known as "data-driven" approach, in which facts are inserted into knowledge base. These asserted facts are matched with rules resulting in one or more rule matching perfectly. Then the rule is executed by the schedule known as agenda. A CLIP is an example of a Forward Chaining engine. Backward chaining is known as "goal-driven" approach, in which a decision or a statement is assumed and it will be satisfied by the rule engine. It continues this process of deducing the subgoals that satisfy the condition until either the initial conclusion is proven. Prolog is a logical programming language widely used in linguistics and in the field of artificial intelligence. It follows Backward Chaining reasoning approach. Deductive reasoning starts with the common and general statements moving to more specific. To use deductive reasoning the problem must generally be formatted in such a way that the conclusion should be obliged to be appropriate if the property or the condition

based on the grounds of domain remains true. The entire idea is to build up a new knowledge from formerly given knowledge. There are different types of reasoners accessible for reasoning.

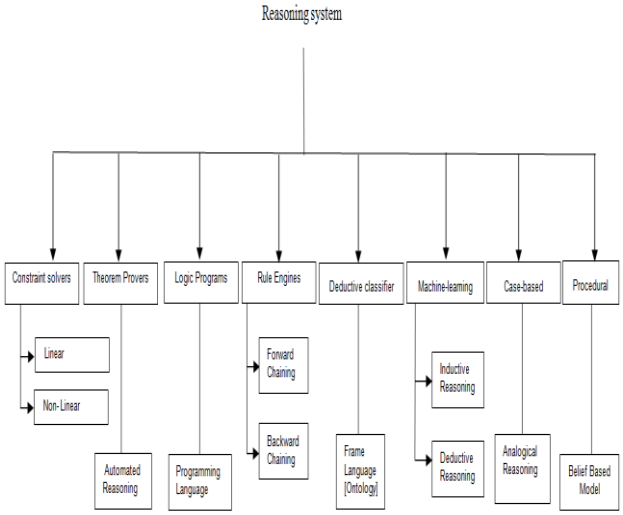

Figure 1: General classification of reasoning types

"Constraint Programming represents one of the closest approaches computer science has yet made to the Holy Grail of programming: the user states the problem, the computer solves it"(Freuder). Constraint Solvers solve constraint satisfaction problems (CSPs) supporting constraint programming i.e. it is a model where associations among variables are declared in the form of constraints. A constraint is a clause which must be satisfied by any suitable solution to a problem. Constraints are defined as major requirements which must be fulfilled by any appropriate answer to variables within given domains. Constraint solvers use the technique in which first they search the requirements and then propagate them to acquire solutions and resolve most favorable solutions. There are many ways to solve CSP one of the way is using linear programming, the other is non-linear method. For example, they may be used to estimate most favorable scheduling, design of proficient integrated circuits or maximize productivity in a manufacturing process. Consider a mathematical model consisting of requirements. Each requirement is represented in the form of a linear equation and process is carried out by forming linear relationships between these. This type of method of achieving best results from the mathematical model is called as linear programming.

The best results may be in the form of maximum profit. Linear programming method is a unique case involving mathematical optimization. Linear functions include calculus. Optimization is the process of deciding the best result from all possible solutions. Non-linear programming is the process of solving an optimization problem in which the constraints are termed in terms of equalities and inequalities. These constraints are defined over a set of unknown real variables, with the end goal function to be maximized or minimized. Generally each constraint in the system can be represented either by a linear function or non-linear function. These constraints are also called as objective function. Mathematical optimization deals with both linear and non-linear constraints. There is a sub-field to solve optimization problem with non-linear constraints separately.

Linear programming is a form of mathematical programming. This can be made functional in various fields. Majorly it is used in mathematical models. They may also help in supporting engineering problems. The theory of linear programming is not suitable for business and economics. Many transportation industries employ this logic. As it is specialized in solving the assorted problems, linear programming is widely used in manufacturing industries. It follows a systematic way of solving like scheduling the tasks, assigning the work for each task then design of the system. A language was invented to solve the above called as general modeling language. Later General Algebraic Modeling System (GAMS) was discovered. It is a high-level modeling system. It is used for solving linear optimization problems. It also helps in optimizing non-linear and mixed-integer system. A mixed integer linear programming (MILP) formulation is performed. It is designed for a bi-1evel mathematical program with equilibrium constraints (MPEC) considering chance constraints. The strategic power producer used here can maximize its total benefit. It is done by determining bidding price and bidding power output. The MILP problems are solved using GUR0BI 6.5 interfaced with Python 2.7 (Fan).

Theorem provers' use programmatically preset methods to prove theorems in mathematical model. Theorem provers are also called as automated reasoning system due to its reasoning capability using proofs. Automated reasoning is considered as important subfield of artificial reasoning. The techniques used in automated reasoning include calculus. There also exist different approaches like fuzzy and Bayesian inference methods.

Automated Reasoning (AR) refers to reasoning in a computer using logic. Automated reasoning has been an active area of research since the 1950s. It uses deductive reasoning to deal with problems such as constructing formal mathematical proofs; verifying that programs gather their specifications; modeling human reasoning.

Robotic platform is one of the emerging technologies these days. In the context of task planning every action is defined by the certain set of preconditions accompanied with effects expressed in a language. A paper was published on this regard to extend the features of robots.

Logic programs are the software programs written by means of various programming languages. It presents direct representation of the constructs used in mathematical model to solve problems. Logic programming has various approaches in solving and is having huge range of application in numerous fields.

A programming language is a formal language that specifies a set of instructions. These set of instructions can be used to produce various kinds of output. There are many languages used for programming. The main goal of the program is to execute specific algorithms. Prolog was the first logic programming language. It was introduced in the year 1972. It is a declarative programming language. The information is asserted in terms of facts. In this way knowledge

base is developed. The knowledge base also carries rules in it. The relation between facts and rules are expressed in the programs. A query is generated and run over these relations. In this way computation is carried out. In 1958, another programming language is introduced called LISP. It stands for linear integrated structured programming language. It was the first functional programming language. Later C was developed between l969 and l973. C is a system programming language used for the UNIX operating system. It remained popular. C++ combined object-oriented and systems programming. A new language called LPL which stands for Liner Planning Logic is developed. It underlies linear programming languages such as Lo11i. This language presents the main ideas behind the theorem provers providing a practical presentation of its performance on the problem of task planning for the robot which is fixed with six legs named RHex(Kortik). Program verification theory has been around since 1960's however practical tools for this purpose were developed in 1990's. a technique supporting the software engineer to find the invalid statements with respect to program's specification is developed by introducing visual techniques. Automated theorem provers have contributed effectively.(Daniela da Cruz)

Each discrete rule in the rule engine represents a specific conditional logic. Many rule engines implement reasoning capabilities. A rule engine is a software system that fires the rules defined in a runtime environment. The main reason for using rule engine is its feature of declarative programming; it allows expressing what to do in terms of sequence of operations. There are two basic approaches in Inferencing.

Data driven approach in which the Inferencing moves form collected data to a particular conclusion. This is called forward chaining. The other approach is goal driven which starts with a statement and searches for the rule that satisfies the statement. This goal driven approach is called backward chaining. CLIPS (C Language Integrated Programming System) are an example of a Forward Chaining engine. In deductive reasoning conclusions are drawn on the basis of proofs. It will not decide by mere assumption or a predetermined clause. In backward chaining it sets objectives all together which they land in the knowledge base. The inquiry in backward chaining is coordinated downside up. Backward chaining is an excellent tool for precise types of problems. It includes medical diagnosing system. It is also famous for debugging purpose. Compare to forward chaining, in backward chaining reasoning is carried out with a few facts or data with large number of rules.

"Fuzzy 1ogic is a form of many-valued 1ogic in which the truth values of variables may be any real number between 0 and 1". Fuzzy logic has been useful to several fields, from control theory to artificial intelligence. Fuzzy logic is a rule-based framework that can rely on the realistic experience of an operator. It is particularly useful to capture skilled operator knowledge. Fuzzy logic can be considered as a subset of the artificial intelligence. A fuzzy rule-based expert system is developed for medical system assistance. Forward chaining approach is used in Decision making in this system based on the person's identity, symptoms and signs(M. Arabzadeh Ghahazi).

An expert system that uses backward chaining approach is developed. The inference engine can act and work both forward engine and backward engine chaining. For evaluation purpose forward chaining is used and sensitivity analysis is performed using backward chaining(Tripathi).

Deductive classifiers arose somewhat afterward the rule-based systems. They presented a new tool for representation of knowledge known as frame languages. Each domain is represented as a class. Classes belong to a set. Each class will have subclass. The relation among class and subclass is described by the frame language. It is pretty similar to the object-oriented model. Frame languages have formal semantics to systematically describe. Deductive classifier gets its input through this semantics. This given model referred as ontology. Deductive classifier analyzes it and check the consistency. It checks various relations and gives conclusion. If the results are inconsistent then classifier will declare it. If the ontology is consistent then the classifier can then do further reasoning. It describes additional conclusions about the relations of the objects in the ontology.

In semantic web ontologies are widely used to describe models using classifier. Tim Berners-Lee invented the World Wide Web. In order to develop the web with intelligence to reason as per the human requirements he introduced the concept of semantic web. Semantic web supports allow exchange of protocols on web. The standards support common data format like Resource Description Framework (RDF). According to the W3C, "1t is the Semantic Web that provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries". RDF will not be sufficient, to represent complex information. Another semantic web language was developed called as web ontology language (OWL). It is possible to represent rich and complex knowledge regarding things and relation among them.

Hybrid approach emerged to provide more efficient performance of the system that standalone approach cannot achieve. Rule based reasoning and ontological reasoning was integrated to develop a hybrid reasoning system for power transformer fault diagnosis. Multi-agent system and Gaia methodology is used. As it is known already that ontology represents concepts and relations in a particular domain. OWL can also be used to extract new information. Knowledge base has all the information from which queried results can be deduced using ontology reasoner. Fact++ reasoner is used to implement this system. (Farhad Davoodi Samirmi)

A machine learning system performs reasoning with the help information gathered over time. It analyzes depending upon the experience. The necessary information must be fed for training purpose. The models similar to the problem must be trained into the system. It will infer by comparing the information in training set with input set. Machine learning system use inductive reasoning to get a statement for a set of rules observed as a conclusion. It performs Inferencing in such a way that it should obtain proper result by going through generalized rules and functions. These necessary functions and rules are learned and used to manage future activities. Deductive reasoning obtains knowledge using well recognized

methods (logic). The knowledge is not new but it is implicit in the initial knowledge. Its foundation is mathematical logic.

Case based reasoning systems provide solutions to problems by using analogical reasoning. The solutions are obtained by comparing it with the similar case. The similar case history and results are stored in the database. Analogical reasoning study case histories to induce solution.

Case Based Reasoning frameworks are regularly utilized as a part of specialized help and call centre scenarios. They also support various fields like agriculture, medicine and law. It is the process of arriving at a solution of new problem on the basis of the solutions of previously-solved similar problems. In contrast with rule based framework which is helpful where just a single or a couple of answers for an issue are possible, CBR frameworks are valuable in tackling complex issues with numerous elective arrangements.

Case based reasoning approaches involve finding a similar past case from which problem solving becomes easier. The very first process done here is retrieval of past cases followed by reusing the past case to find solution for the problem then revise if it is necessary lasts retain the new solution. SCINA is a case based medical reasoning system. It is developed for the diagnosis of myocardial disease. A case library is developed including the details of each case. The system uses image analysis software and map analysis(M Haddad).

In artificial intelligence, a procedural reasoning system (PRS) forms specialized framework carrying out complex tasks. It has developed as a real time reasoning system. Procedural Reasoning system is based on the BDI [Belief Desire Intention] framework. The main constituents are beliefs and desires. Beliefs are the statements given by specialists as valid as per current state of the world. Desires are those objectives and aims of the agent's present plan. Both beliefs and desire are necessary for accomplishing those objectives.

Fuzzy models deals with uncertainty in the information. It also handles ambiguity, vagueness and imprecision but cannot handle probabilistic uncertainty in the information. There is a need for the establishment of prediction model to handle both fuzzy and probabilistic uncertain information. A paper is published with a new belief rule base (BRB) model with large-scale data. 1t is used to predict cloud computing security state. Evidential reasoning algorithm is used.(HANG WEI)

IV. HYBRID REASONING AND ITS NEED

Each of the reasoning approaches has some merits and demerits. Instead of working with single reasoning system and compromising with their limitations there can be a possibility of combining different reasoners to increase the efficiency and reliability of the system .The attention on theses frameworks coordination, particularly as to modular methodologies, originated from the way that most insights of noteworthy scales are made out of an enormous measure of procedures or use multi-modular input and output. In order to produce artificially intelligent software of extensive insight, integration of these modalities is indeed required. "Modality is a way of representing information in some physical medium. Thus, a modality is characterized by its physical medium and its specific method for portrayal". Modalities also refer to ways of information representation rather than to the human sense. Humans use various ways to represent information and these various ways of information representation may refer to the same sensory modality like images and text are different ways of representation but modalities ie.ways of information representation, for input and/or output. In contrast, a single-modal system is defined as a system using the same modality for input and output. These modalities are various forms of reasoning systems used in decision making systems.

V. REASONER

A programming system in which logical techniques are applied on the data to generate new information or conclusion is known as reasoning system. The important role played by the reasoning strategy is in the implementation of knowledge based system and artificial intelligence. Semantic reasoner like CWM, Drools, FaCT++, Flora2, Gandalf, Prova, Pellet, Hermit, ELK, CEL, Jcel, RacerPro, Jena, RDFSharp are used. DL reasoner such as FuzzyDL, KAON 2, MSPASS, QuOnto, SHER, TrOWL.

A semantic reasoner, also known as rule engine can be defined as a programming system capable to infer logical conclusions from a given set of asserted facts. Description logic language and ontology language are often used to specify the rules for inference process. The most common logic used by many reasoners is first-order predicate logic. The process of inference basically carries in two ways, one is forward chaining and other is backward reasoning. The semantic reasoner CWM, Drools, fact++, flora-2, Gandalf, Prova, pellet, HermiT, ELK, CEL, jcel, RacerPro, Jena, RDFSharp and description logic reasoners like cerebra engine, fuzzyDL, KAON2, MSPASS, QuOnto, SHER, SoftFacts, TrOWL are generally used for reasoning.

Every web resource has its unique identity known as Uniform Description Locators (URLs). These urls are interlinked through hypertext links. Hence documents and other type of information can be accessed via the internet. This is called World Wide Web. The semantic network is one of the former logic used for knowledge representation. After semantic reasoner RDF (Resource Description Framework) came into existence. It is an extended formalism of KL-ONE. To exchange the information on web RDF is a standard model used. After the RDF, there comes Description Logic (DLs) a knowledge representation language. DLs are used in artificial intelligence to explain and reason about suitable concepts of an application domain.

CWM (Closed World Machine) was written in Python language. CWM is a forward chaining reasoner. It can be used to query the requirements. It checks the information in terms of its accuracy, completeness by using transformation and filtering operations.

CWM is extended to include the rules. Its foundational language is RDF, extended to include rules and uses RDF/XML or RDF serializations whenever required. As the reasoner is implemented using python, it becomes a part of web application known as SWAP (Semantic Web Application

Platform). It is open source software. It can be found under the W3C software.

Rete algorithm is most commonly used in production rule system which is a rule based expert system. Drools concept came into existence with an improved Rete algorithm using both forward and backward chaining approach. An American multinational software company named Red Hat developed Drool. Drool is open source software. It is written in java.

The description logic system needs interface for communication. A standard interface was introduced by Dl Implementation Group (DIG). It is in XML format. FaCT is a Description Logic (DL) classifier. It stands for Fast Classification of Terminologies. OWL-DL reasoner earlier had FaCT reasoner but FaCT++ forms extended version of FaCT. Both of these use same algorithms but only differ in their internal architecture. The language used for implementation is C++. This reasoner supports as an efficient tools with more portability. It has additional features. FaCT++ is released under a GNU compiler public license. It is available for download both as a binary file and as source code. In order to build a DIG version of a reasoner, the XML parsing library Xerces-C++ is also required. The following tables shows different type of reasoner with the properties like methodology used, platform, implementation tool or environment, availability, language used, license with core supporting languages listed.

Table: 1 List of Some Reasoner

Sl. No	Reasoners	Methodology	Platform	Implementation language	Availability	Rule support	License	Core language
1	CWM [Closed World Machine]	Forward chaining	SWAP[Semantic Web Application Platform]	Python	Yes	Yes	W3C software	RDF/XML/N3
2	Drools	Forward and Backward chaining	Cross platform	Java	Yes	Yes	ASL 2	Java
3	FaCT++	Tableaux-based reasoning	Windows, Linux, Mac OS	C++	Yes	Yes	LGPL	OWL DL, OWL 2 DL
4	Flora-2	Logic Programming with Defaults and Argumentation Theories [LPDA]	Linux, Unix, Microsoft Windows, Mac OS	SB-Prolog	Yes	Yes	Apache License 2.0	Unified language of F-logic, HiLog, and Prolog
5	Gandalf	Semantic web rule engine	Embedded platform, Microsoft, IBM, ORACLE	PHP	Yes	Decision rule support	GPL license	PHP, Angular.js[GUI]
6	Prova	Imperative and declarative programming	Middleware, Rule based platform for distributed agent programming	Prolog and Java	Yes	Semantic web rule engine	Sourceforge	RDF, RDFS, OWL, SPARQL, HTML
7	Pellet	OWL 2 DL reasoner	Linux, Unix, Microsoft Windows, Mac OS	Java	Yes	Yes	AGPL	RDF, OWL 2 DL, Java
8	ELK [Elastic Search, Logstash and Kibana]		Linux, Unix, Microsoft Windows	Java	No	Yes	Apache	
9	CEL [Classifier for EL]		Linux	LISP	No	Yes	Apache	
10	Jcel	It is an OWL API used as a plug-in for protégé	Microsoft OS	Java	Yes	Yes	Apache	RDF, XML, OWL
11	Racer Pro		Microsoft OS	Java	Yes	Yes	BSD-3	XML, RDF, RDFS, OWL parser
12	Jena	Semantic web framework for java	Microsoft windows	Java	Yes	Yes	Apache	RDF, XML, OWL, OWL-

								DL, SPARQL
13	RDFSharp	Light weight C# frame work	Linux, Unix, Microsoft Windows	C#	Yes	Yes	Apache	RDF, SPARQL, XML, RDFS, OWL-DL
14	Fuzzy DL	Backward chaining	Windows, Linux, Mac OS	Java, C++	Yes	Yes	GNU General Public License version 3.0 (GPL v3)	OWL, XML
15	KAON 2	hyper tableau-based decision	Linux, Unix, Microsoft Windows	Java	Yes	Yes	LGPL license	SWRL/RDF/OWL 2/SROIQ

CONCLUSION

In this paper expert systems, reasoning system, types and tools are explained. A generalized classification of reasoning system is presented. The paper explains different approaches employed in reasoning system along with the information of the tools used. A table consisting of list of fifteen reasoners with their properties is presented. As hybrid reasoning has been emerged as one of the booming technology in artificial intelligence, its need is explained.

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