

Artificial Intelligence in Web Searching

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Introduction

I am so inspired of shifting this work. I will be happy of receiving feedbacks from you in order to continue work on this document on the proper way. Some parts of this paper are not well written for which I ask for your understanding. I work on this work on my free time and sometimes I am very tired and can't finish the work in the form I like.

I believe that the information is the most expensive material in our commercial world. I hope that we can make it more mass. I believe that this way we can enable the right view of the user for his search. This way we will provide the ability to the user to not search for terms but for specific functionalities and relations with other objects with the search objects.

Chapter 1. Theoretical basis

1.1. Human like representation of knowledge

“In the first place, it seems to be well established, and notwithstanding strenuous efforts lately made in favour of the opposite opinion, philosophers are more and more inclined to admit, *that the knowledge of the absolute is not within the reach of human capacity*. What men have the power to know is, not what things are in themselves absolutely, but only *what they are relatively to man*; that is, how they appear to, and how they affect the human observer. All we can know is, what men perceive, and what men feel. *The constitution of our own nature, not the absolute constitution of things, is the proper object of human research*; and only in the constitution of man can we find, if we find at all the origin of human opinions and actions.”

[Hildreth, Richard; *Theory of Morals*; Boston; 1844; downloaded from Google Books]

The human mind is not able to explain and/or understand everything. The way science develops is to agree with some statements (kind of axioms) without presenting arguments about their truth and go ahead building decisions and other statements on them. [philosophical statement (I first have found it in papers describing works of Aristotle)]

Science in Aristotle's works is knowledge drag out from testing or evidence situations. Aristotle's proof method as a method of science, premises in necessity start arguments that can't be proved. The main cognitive method of Aristotle can be defined as definition-essence. It lays on defining of basic terms with synthesized creation of class characteristics of a specific event and on the other hand its main specific features.

[Valchev, Daniel; *Studies on history of European philosophy of law*; Sofia; 1999; the book is published in bulgarian language]

The way we humans make vision. I think that in any particular sciences people researching in it go ahead with making some suggestions on the test material (statistics) that they receive, and treating this suggestions as right until they found new test material not compatible with the suggestion. This way of thinking makes people able to work with statements with an allowed percent of mistake. Actually it is impossible to know everything in order to make decisions, but the life is shorter and man have to make decisions and collect life testing material (I am not sure is this the appropriate expression) at one time.

There is a definition of AI compatible with the process of thinking and managing thoughts that I hear at one of Cybernetic lessons I have been attending. It says that AI is able to do 3 main steps:

1. Solving problems
2. Recognizing patterns between a group of problems and defining a general way of solving this group of problems
3. Finding new problems.

I think that the intelligence is an ability to understand and manage many sciences (different in their object of discovery) and able to apply the knowledge to specific problems. AI have to store knowledge about many sciences and be able to make parallels between them.

I find connections between sciences (visually drew at <http://mapofscience.com/>). Like the connections described in Cybernetics (Ashby, W.R. (1956), *Introduction to Cybernetics*. Methuen, London, UK). I believe that the entire life has its beginning from one place, so some objects collected in sciences are inheriting one shareable approach (group(s) of similar object(s)/event(s)). In other words God (in science:superpower and supervision) creates the existence and every science is representing truly or not truly parts of this existence.

I remember the words of my teacher on literature from high school, she said once to us- "Reading poems is like swimming in a sea. When you see it for a first time it is like a flat surface, but when you go inside it you recognize it's lay."

In other words: When we read a poem for a first time we notice some objects and difficult relations between them, but when we go further reading it we found a lot of new objects inside them and a lot of simple relations forming the difficult bigger ones. So is it true that a difficult thing has in itself small simple things (this approach i call ontology down in this paper).

The primitives of AI systems should be objects that could store in its own other (down level) objects.

The human representation of knowledge is able to present objects/events by its functionality and/or not full semantic representation.

The statements in the human mind are dynamic, they can change at any time. The fact of growing sciences improves this thought. Intelligence is always updating its knowledge by adding new thoughts, completing others and even erasing some thoughts.

When we reach a statement that is stable (we don't find any evidence in future, present and past that improves something different, but only evidence improving the statement) we can be sure that this statement is true, otherwise every statement is true until we recognize (find) a prove improving that the statement is false and/or not complete (in the context of the problem/science in general).

I believe that the right way to create a machine based on AI is to “legalize” the mistake. It is a part of our world and especially part of the science. Storing information containing mistakes is not a critical problem if we can in future find this mistake and correct it.

I think that it is possible to store the whole human knowledge on any sciences in one ontology graph which elements of that graph contains in its own other graphs with the same capability of storing graphs in its own. This ontology storage have to provide the ability of updating and enlarging itself in order to enable storing the newest science suggestions and updating them when there is a prove of their (suggestions) not completeness or full falseness. This ontology model have to store the knowledge (testing material, suggestions and thoughts based on this suggestions) in one universal way for every testing material, suggestion and thought from any science.

The human mind is able to create relations between every statement in order to improve new ones or not (reasoning). In other words the human mind reacts reasonably and have the ability to learn his past experience in order to use it in future. In the human mind we find connections between objects/events and other objects/events.

There are a group of scientists believing in logical holism (world operates in such a way that no part can be known without the whole being known first). On the other philosophical hand we have logical atomism by [Bertrand Russell](#) (The world consists of ultimate logical "facts" (or "atoms") that cannot be broken down any further) [I have read about this two philosophical approaches from wikipedia.org]. I find this philosophical treatments dealing very well with the human mind. First of all the human vision don't requires deep knowledge in some field in order to take decisions on it and even he don't requires knowledge about the universe and the existence too in order to make the same decision.

In other words we can say that:

The fact that the intelligence is not fully explained in deep by the science is not an enough argument to stop the IT developers working on and creating fully functional AI. Even if this AI can't give answers to problems about the existence and universe it is still intelligence.

So reasoning is based on dealing with known issues (it in its nature can't be always right and complete) and the output of this process can be an issue for the next one. In the science the smallest not breakable construction element is the thought (in my opinion). Testing materials are presented like thoughts without earlier issues to base on (improvements of this suggestions are the test as its own), but they are thoughts too because of their information storage purpose. The human intelligence deals with

everything by presenting it in (“translating” it to) thoughts.

I was finding a science able to represent every science (all its testing material from the object(s) of discovery, all objects/events (ontology) and logic statements (laws) build on top of the testing material and relations between them) in its own. So Cybernetics (A \leftrightarrow B) is a good candidate. Mathematics (A \rightarrow B) and sciences based on it are capable to represent other sciences in its own because of its philosophical foundations (mathematical logic, set theory and category theory) parts of the logic.

I was finding an universal systematic method(s) for “translation” of one object/event from one science into other science (in this case the chosen one is cybernetics). So until now i find the language as the most universal method for this aim and Logic and Linguistic as collection of systematic methods dealing with free text as data related to language (free texts written in languages not supported by the system are (texts) not understood by the system).

Note: There are more than 80 sciences in the field of Logic.

Free texts not describing science are able to be treated as objects of discovery and test material sources of described sciences. Of course some free texts are even able to be understood by the system but this is only possible if text material is filled in well defined logic form.

Main idea of the Aristotle's theology is that the purpose is an insight definition of the creatures of nature. [Valchev, Daniel; Studies on history of European philosophy of law; Sofia; 1999] We can agree that we can't know in deep every object but we can define its aim.

1.2. Human like vision

With Mathematical Heuristics any problem can be solved by querying the knowledge base with special graph search queries and with the outputted group of results creating new ontology hierarchy and applying on it many techniques in order to find the right answer.

1.3. Structured diagram of the future system

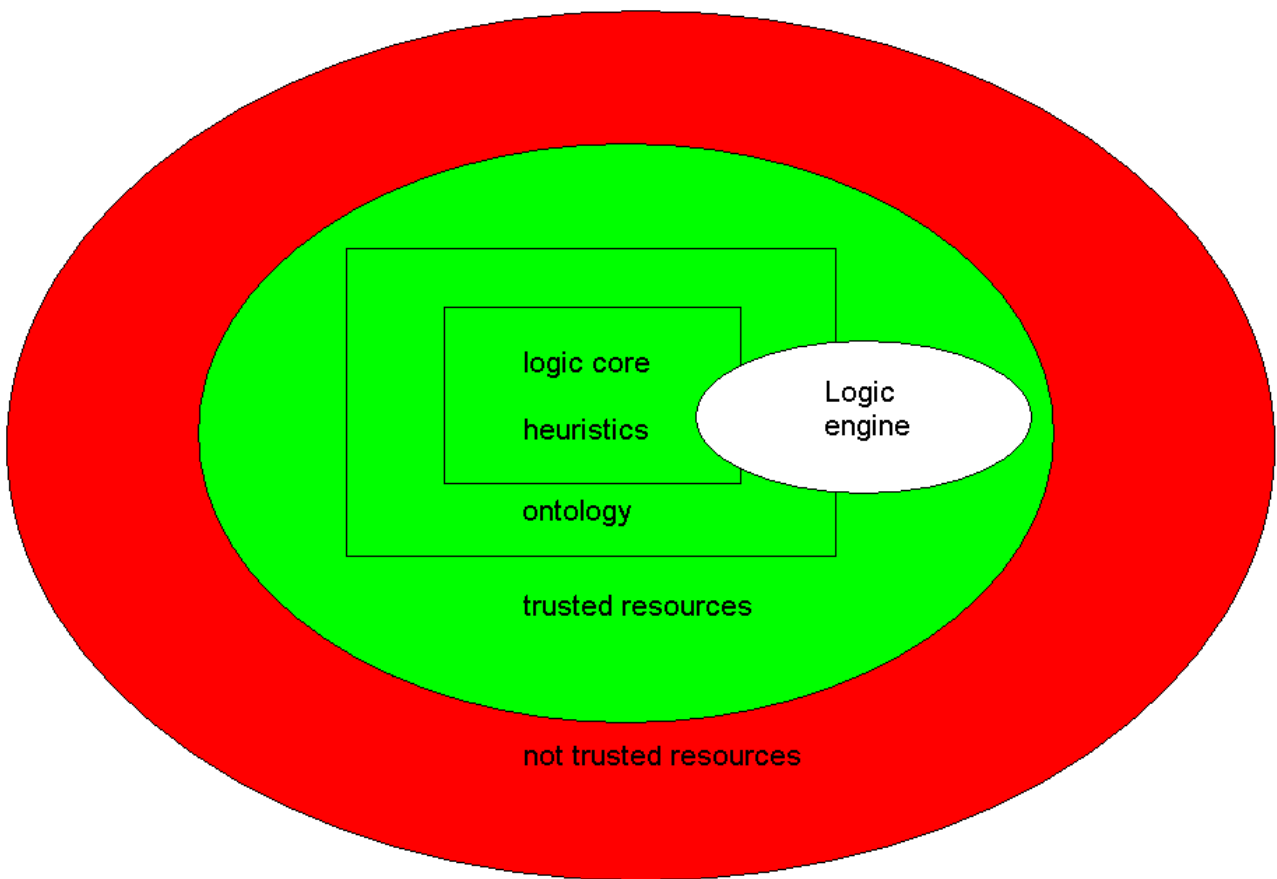


Figure 1.1: Data levels in the system

Square -> engines written by humans

Circles -> thoughts, relations and etc. indexed and presented (based on square layers and circle ones in some cases) by the system.

As show on the diagram the algorithm processing logic data (thoughts) is not fully written by hand. It is indexed and understood by the system through indexed materials from trusted sources (meaning of trusted and not trusted you will find going deep the architecture of the system).

The full functional processing of logic data is happening through not human written code but indexed materials.

1.4. Conclusion

I think that the knowledge base of AI have to be an ontology graph (with elements able to store in its own graphs with the same type of the main graph) with the aim to store in itself knowledge from many sciences (axioms, testing material, suggestions, thoughts based on the suggestions) in form of thoughts. This knowledge base in its own have to store data with primitive a logic statement. The system have to provide heuristic methods based on dealing with logic statements in order to provide reasoning.

Testing materials and axioms are going to be presented as logic statements with no proves.

Suggestions and thoughts based on suggestions are based on testing materials, axioms and other suggestions and/or thoughts based on suggestions so they have to provide proves (when the system declares new statement ad/or adds to its knowledge base new statement from outside source it must find as much as possible proves for this statement).

This proves have to be provided in order any time adding new statement or changing some one it to be synchronized with the knowledge base and every conflict raised to be watched (to find every prove for all statements in the logic conflict in order to judge right) in deep.

There is a possibility on which I am going to work. It is on the idea to present heuristics and the whole science presentation of the free text translation to logic statements into logic statements stored in the knowledge base. The idea is to provide new level of abstraction based on mathematical statistics on the whole process from translating free text into statements and dealing with logic paradigms in order to be able to understand in deep the grow of the system and manage it better.

Note: Many times Science is presented like a group of data: testing material, suggestions and thoughts based on this suggestions. I make this statement only for this paper, every science containing in itself well defined logic form is able to be presented in ontology logic based knowledge base. I point this parts of the science in order to provide my explanations with more examples.

Chapter 2. System basis

This written by reading documents about Ontology (computer science), Logic (Natural Language Processing) and Heuristic Mathematical Methods.

2.1. Main processes / Architecture

Input data – free text

Output data – graph (of elements containing in its own objects with the same capability (by the same type)) of sentences (logic conclusions)

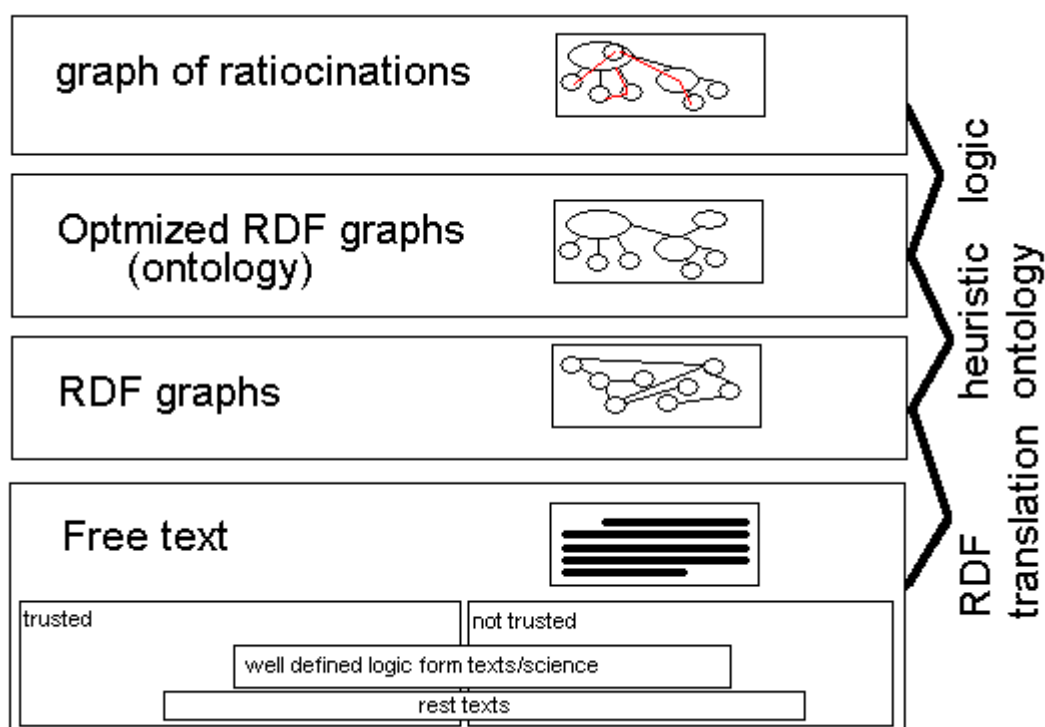


Figure 2.1: Levels of abstraction creating knowledge base from free text

On the figure 'well defined logic form texts/science' is written in meaning that some sciences don't have well defined logic form (or form not appropriate for the system-logic form taking more computations to calculate then other possible formulation) texts in the web but they are written by hand in order to provide the fast and safe execution needed for the system. Sciences possible attending this group of specific ones are logic and mathematics. Other though expressed with the sentence in the figure is that it is possible the system to attend a free text material in well defined logic form and it is going to be indexed and represented in the system no matter that the article is not describing some specific science (in the article is not written in which science is part of and in the system is not found article describing the material as part of any science or the humans reading the database don't know of existing of science in the field of the material or this material is not object of discovery of any

science described in the system).

The last step takes the main idea. This is the place where the machine is expected to take decisions and collect the main idea of the inputted text.

First of all it will be explained the order of loading texts. The indexing have to start from a trusted resource (example: wikipedia.org) what we do actually is to index the all information there and the links to other pages in the web represented as parts of the object in the sentence containing the link. What i am trying to explain is how we connect new pages with the existing one. In the ontology graph (tree) we have to store the links to materials and their value (`article name`) of course we are not sure that from the first time we will have a truly specified link and we can go further, but i will look back on this problem below.

With the created graph we can form a big knowledge graph containing all the materials collected ever (until now i don't think about erasing some materials when they are inappropriate, only storing them with low ranks) by the machine. Up on this tree we have to place laws for the materials. What I mean is that we must have statements that says something like this: "Every link containing 'click here' replaced with the last contextual object" of course it is going to be stored in logic form and expressing it here will be drawing special symbols from the logic science. The idea over here is to provide the ability the text to be automatically checked by logical statements provided in it. Of course at first stages we have to write the statements by hand but by growing the tree it will collect objects containing laws about itself and every object placed down has to obey the rules provided by all upper level objects (*). Even something more. We can go through many trees (may be it is more correct saying many articles, because when they become trees they are concatenated in one big tree (ontology graph)) and finding patterns. And even further, going over this trees and finding patterns described and/or applied in other trees.

But there is one ability that we have to provide. We have to write the machine meaning of the words used in the laws. So we have to provide a way allowing when we read from the upper level law "subject" to go to the graph and find the object related to this word. It seems not easy. But we have a discrete group of words (terms) to be described with (translated to) search algorithms in graph. But the good thing here is that this are words only from the science logic (but not the whole science) and they seems to be well defined.

Here I want to write some words about the level of abstraction provided by every data processing layer over there. First of all when we define this group of words specifying specific operations may be we will face the challenge that we have to know the down level object value in order to provide the right algorithm. So every upper layer object (layers of abstraction) have to contain in itself a graph of down level objects and their values. We can provide a new group of words to relate to this low level objects.

2.2. Main engine

Every high level ontology hierarchical object/event has the right to provide laws for the objects/events down the hierarchy. On the top of the hierarchy is the logic and it provides a full philosophical model of dealing with raw statements directly translated from free text. In this phase must be written some general laws and then let the system to fill the hierarchy about the logic and the rest articles.

The ontology hierarchy is not the same as the object oriented hierarchy provided by inheritance. In this hierarchy are able to be added compositional parts of the objects/events and upper level objects can declare laws for this compositional objects (this is because we provide search specific graph algorithm in order to find correct and not correct objects to specific law, look *). In other words this is more like a hierarchy based on law (logic in basic) then on functionality. I find logic presentation the best complex/universal way of presenting functionalities between objects.

Resources from not trusted sources are presented in the knowledge base by main upper object (root of the tree-graph) (specific status is applied to this object: not trusted) in their hierarchy the article's title and it's URL address. This politic of the system do not let this objects deal with the main laws and its knowledge stored only for information, not used in future works based on AI before its status becomes trusted.

When the status of one object is “not trusted” this prevents laws from this article to affect upper level logic (laws) even if there is a relations between them, when in the object or in its ontology hierarchy is found a law in conflict with low from upper level this law on the article is marked with low index of truth (the idea is to make ranking by truth and false to an article). For every law in the article is calculated truth rank that is function from laws that are not understood by the system, laws that are in conflict with the system trusted ones (it is not needed the law to be provided from an upper level object, because in a not trusted object we can have a hierarchical ontology of laws and they all are not trusted and called upper level laws from the view of down level laws in the article's hierarchy) upper level laws and laws containing upper level trusted laws or being purely their copy. This kind of ranking is not described here, it is possible to use special (special because of their ability adding specific operations by a human in order to deal with some data storage problem of big databases) statements to store the percents of truth in order to make this ranking event (this characteristic is described down on this document) based.

Note: It is a recommended practice defining the relations between the objects of one system (in one graph) in one place, in the object of the system (object storing the graph), rather than separating their definitions and placing them into the objects (elements of the graph) by declaring every possible iteration with the rest of the objects (elements of the graph). This kind of defining is going to be easy processed (it is a view of the author, he hasn't tested it) by heuristic methods.

2.3. About the logic data and relations between them in the ontology model / About Reasoning

When we want to provide the ability of adding laws from free text we have to be very careful. We have some protection mechanism by the ontology model (*) so every law added at some level will affect only objects (laws) related to it (upper levels laws) and/or placed down to it. We have to provide some heuristic methods and logic once (especially Venn diagram) to watch the changing of the data (statements). So knowing when adding new law what is going to be changed. This topic is more design decision related to the concrete purpose- behavior (business logic) of the data collecting and machine learning and don't contains any issues needed to be explained here.

I hope that we will reach the moment when we got a big database of many statements collected from many places explaining about a lot of sights of the human life. We have to provide the best way of searching and making it easy to update, upgrade and manage this database.

We know that the logic statement is based on some arguments. In other words we have some input data and on functional computations we provide an output. So we can connect this two parts in order to make an event based logic system.

Every statement must have in itself a list of all input data primitives and their values. What i mean is to write down every statements situation from which we create a new statement (**). When one statement is changed we have to go down and up the tree to find every statement based/related on the changed one. When found statement like it we have to rethink it (until now only for down level objects, i have not worked on the idea for the opposite and/or both down and up level objects) (to reapply the methods for this statement once again erasing the result from the old apply) and when the last statement is changed to make the same think for the statements related to it down the ontology tree.

This will give us one extra ability to provide the user to query about the arguments of one or other statement.

2.4. Meaning of upper level objects

I want to say that every object presents some relations of words in free text level of abstraction. Every object is created in order to store the functionality of some word with other once and logic core of the system so this functionality can be called thought the same word(s) that created it.

If upper level object is called (in free text stage) and when it is sure that there is an equivalence between the called object from the text and the same upper level object (not other one) the functionalities of the upper level object is referred in the context of this down level object. This way we try to provide understanding of words – by

their functionality. So going ahead we have many ways of dealing with this relation (calling). Some of them are to treat with the need of augmentation of objects, other with the correctness of expressions by treating every functionality presented in the object as the only way of calling it and respectively creating a temporary law (temporary- not written/added law to the system but basing on it the system have to manage the relations/callings to the object).

2.5. Structure of objects

The object in its own collects two types of data: logic statements and graph of objects.

Logic statements represent the relations between the objects and the objects in the graph. Objects in the graph theoretically don't have the right to now each other in order to interact with their neighbors in the graph.

2.6. Stages of working from free text to graph of ratiocinations

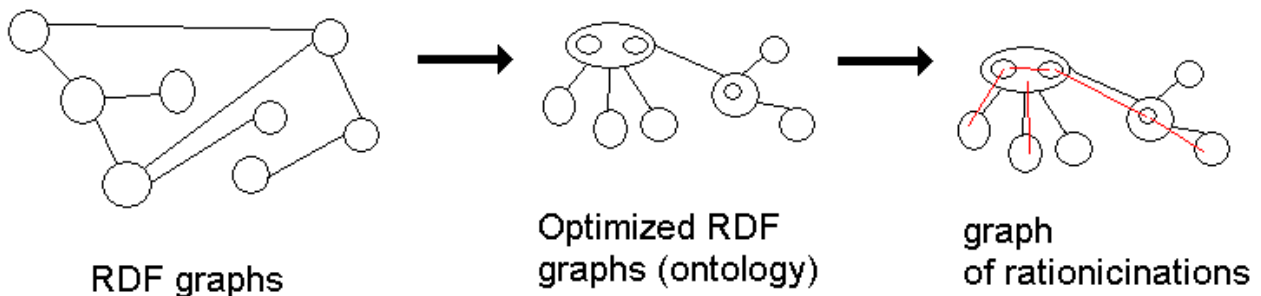


Figure 2.2: Drawing of the processes of creation of knowledge base

At the first stage free text is translated into RDF graphs. This graphs are not hierarchical. This graphs represent only the linguistic meaning of the text, without any logic optimizations. In this stage we can have more than one object presenting only one object in effect of calling it with different adjectives (characteristics).

In a result of logic parallels between objects from the article (the parallel is made reflecting and merging two or more objects from the article in parallel to the merging of objects from the article and the system, this process have to be made in parallel in order to apply the laws from the system and on the result of applying the system to judge is some object have to be merged or not)*** and objects already stored in the system at the second phase every object is collected in object and its relations with other objects are presented in third party objects (upper level objects) in which they are collected.

Note: When we work with not trusted source the highest object in which are presented the relations of all objects in the article is defined as URL of the source and/or other specific way useful for recognizing the source.

So now we got this optimized ontology graph. It contains levels of graphs. Next we provide some kind of logic understanding by the machine in which we know why something is as it is. We draw logic connections and when we change something (objects - graph, logic) we can find is this change is affecting other objects. This understanding is not always able to be found (you can see on the diagram) not in every object is able to find logic connections and provide reasoning and event based logic system. Because of not enough ontology base and deep indexed knowledge on some field the system can not be able to draw connections between logic statements.

2.7. Presenting history in optimized RDF graphs

As I mentioned above that objects' relations with other objects are presented in third party objects (upper level objects) so history of objects is presented this way too. With this difference that when we want to present history in our system we have to have indexed as trusted source articles explaining topics related to history (about dates, years etc.).

I find this scenario as general one for every particular science without which we can't present some kinds of human life in our system.

2.8. Specific Graph Search Algorithm (Explanation)

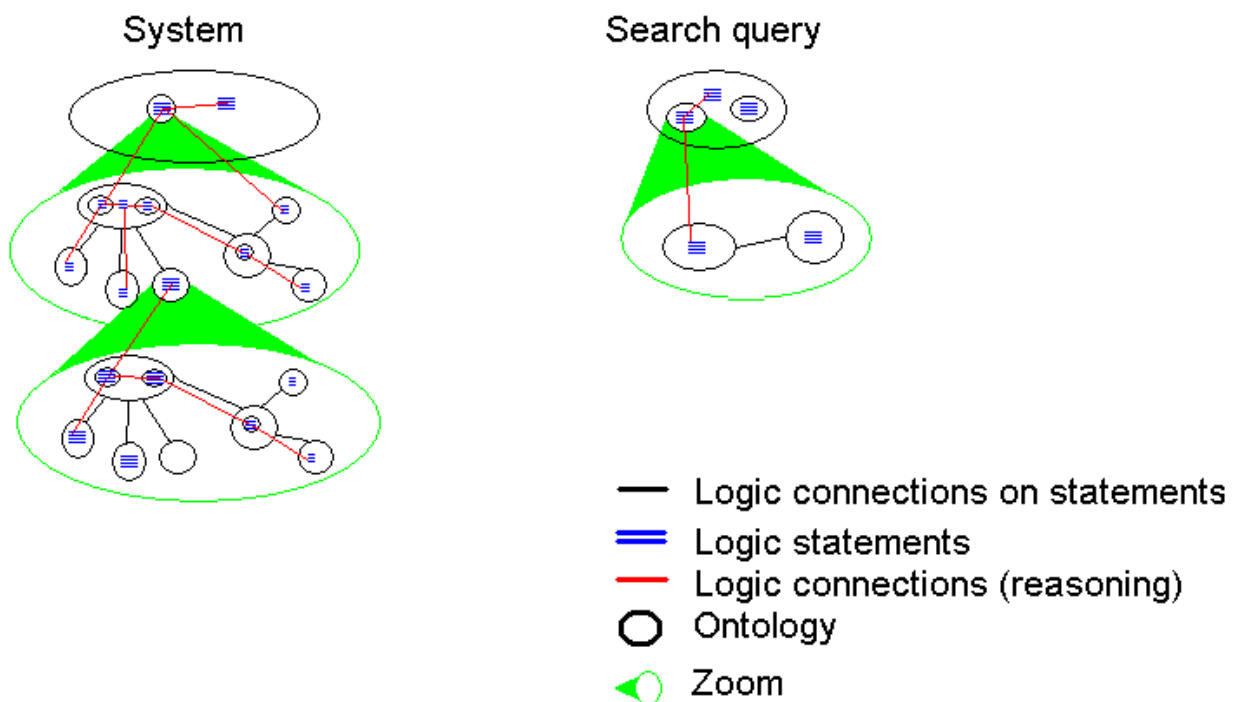


Figure 2.3: Illustration of the two parts of search process: system and search query Elements from the diagram:

- the search query is processed as usual free text (RDF, optimized graph (ontology), reasoning-ratiocinations)
- in its own the search is based on levels, every of which independent and their result available for upper level search processes:
 1. graph search based on ontology not on the relations between the objects
 2. logic statements search based on graph structure/relations between objects in the graph
 3. reasoning search based on understood relations between logic statements

1 -> Finding compositional patterns for the objects

2 -> In the search query we can have used logic words pointing groups of objects (in free text words and phrases like: “all”, “no one”, “less then”) this logic expressions are processed by the logic core of the system.

3 -> Comparison between the lists of reason relations between logic statements.

Notes: You can see on the diagram an object without logic statement in itself. This object is supposed to be mentioned in the indexed article, but not found enough knowledge to be defined so everything that we know about it is its connection in the graph with other object(s) and nothing more.

If the resource is with not trusted status it is more sure to find in it objects like described in the note above.

2.9. Graph of objects

In its own the graph presents relations between elements in it. Here the graph is only an array of objects the relations of which are presented in the logic statements.

2.10. Future works

The comparison based on ontology hierarchy is a comparison for equivalence of statements in the ontology model and extra statements describing the ontology. We can provide this feature in order to let the system define its own ontology types and make them more dynamic (ability to describe one event/object as part of one hierarchy in some conditions and as part of other in other conditions) comparison the statements. Letting the system define its own ontology types described in free text and providing only logic methods for dealing with the whole system (without ontology methods). But we have to not destroy the ontology model presented as graph because this is going to increase operations during search when executing a query (in my opinion it is faster to search for graph in graph then searching for one list in a group of lists).

The process of creating ontological model is based on algorithm that is able to be translated into logical statements. I hope we can go further and provide the ability of

dealing very deep in the process of translating free text into logic statements and to be able to do this with other languages without programming it by hand but letting the engine index papers describing needed language.

Providing reasoning is not a right move until the moment we have indexed a lot of knowledge about logic and we are sure that it is going to process reasons like the human processes. I am not sure what articles are going to be indexed in order providing this capability and what is the way to check their reaction to be used with this purpose. But looking in future we can enable the ability to emulate some situation based on ontology and (plus) statements from one article or more articles in order to provide decisions (like math tasks), collecting this decisions and declaring new statements based on this statistical (making conclusions about objects/events without information about them but only using information about related objects/events) and/or theoretical (statements with improved logic argumentation) data.

In aim of enabling better text understanding we have to think about upgrade of the system with Semantic (science deeply connected with Logic) - the semantic theory of models and providing at least the two main approaches for our system: solving problems for the naming (dealing with dynamic references to every object) and solving the problem with the meaning (analyses of the concept of meaning, synonym, homonym, analogical truth).

2.11. Final words

From Wizard Book n. Hal Abelson's, Jerry Sussman's and Julie Sussman's *Structure and Interpretation of Computer Programs* (MIT Press, 1984; ISBN 0-262-01077-1) I read that “the language provides a framework where people organize their ideas about processes” [<http://mitpress.mit.edu/sicp/full-text/book/book-Z-H-10.html>]. In this background I will look at our system.

Primitive expressions (logic primitives from the science logic hand written with their functionality) and their combinations (laws and abstractions based on words (word which logic functionality is explained up on the levels)) creating abstraction (in main aspect this are ours ontology graphs). Our system provides searching of functionalities and not so much searching by name, but name (specific term) is replaced with functionality relations which are paralleled in many levels of abstraction.

But the most beautiful part of the system in my opinion is the last part when it is trying to find/recognize reasons for one or other logic statements. I like it because this shows the collaboration between the three separated parts (shown above) making them one big system.

Related works

I found this articles while I was searching for RDF and Logic. I choose to concentrate your attention especially to this articles. I haven't made a deep research on this field or close to this other fields in order to find the most appropriate article related to my work, but I find this articles dealing with the main ideas and problems in my work.

Peter Suber; *Translation Tips*; Philosophy Department, Earlham College;
<http://www.earlham.edu/~peters/courses/log/transtip.htm>

Guidance of translating from English into logic. Truth-Functional Propositional Logic, Predicate Logic: Singly General Monadic; Predicate Logic: Multiply General Monadic; Predicate Logic: Polyadic.

Abraham Bernstein, Esther Kaufmann, Christian kaiser, Christopher Kiefer;
Ginseng: A Guided Input Natural language Search Engine for Querying Ontologies;
Department of Informatics, University of Zürich, Switzerland

Kate Byrne; *Tethering Cultural Data with RDF*; School of Informatics, University of Edinburgh

Especially “2 Translation to RDF” on page 2

Aristotle; *Categories*; Provided by The Internet Classics Archive, Translated by E. M. Edghill; <http://classics.mit.edu/Aristotle/categories.html>

* in technical prospective we have to search for every possible not correct (disobeying the law) object by searching for all possible correct objects, grouping a group of objects and parallel this group with group containing the all objects from down to the law levels; search for all possible not correct objects with the law and do the same parallel with this group of objects and all objects down the levels;

Note: If it exists an object not in this two groups it means that this is an object out of this formulation of the law, if there is an object in the two groups of not correct and correct ones it seems that the law is not well defined. This cases must be searched too.

** in technical prospective it is searching down - (*) and searching up - (for) laws affecting the statement

*** not clear enough. The ontology can provide different meanings of word (going deep in many articles the system can make difference between them) who is thought to be equivalent (or synonyms by the linguistic to RDF translation of the article used in two places.

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