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Knowledge Engineering and Machine Learning Group
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Title:

Proposal for Using NLP Interchange Format for Question Answering in Organizations

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11-13th July , 2013
University of Washington, Seattle

Outline:

- Context
- Research & Related Work
- Goals of Proposed Method
- Scope of Activity
- Proposal Method
- Conclusion
- Refrences

➢ Context:

1- Introduction

- **Knowledge :** Knowledge is considered a key factor for enterprise prosperity at present and future.

- **Knowledge Management:** By facilitating the process of creating and sharing knowledge, and through providing positive working environments and effective rewarding systems, knowledge management accelerates enterprise learning and helps the enterprise adjust itself to todays rapid changes and hence survive in pace with these changes [Aggestam. L, 2006].

- **Semantic Web Technologies (**viewpoint of an organization**):** Should be motivated by the improvement of learning-oriented mechanisms, including both cultural and structural aspects. Such an approach to achieving a "semantic learning organization" gives a complementary perspective to existing "educational Semantic Web" propositions [2].

2- Learning Organization & Question Answering System (QAS):

- Ontology-based QA system: The knowledge based data, where the answers are sought, has a structured organization. The question-answer retrieval of ontology knowledge base provides a convenient way to obtain knowledge.

- Accessing structured data such as that encoded in ontologies and knowledge bases can be done using either syntactically complex formal query languages or complicated form interfaces that require expensive customization to each particular application domain.

- Answering to semantic questions will help increase the capability of learning organizations

➢ Research & Related Work:

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1- CLOnE - Controlled Language for Ontology Editing

- A controlled language for ontology editing and a software implementation, based partly on standard NLP tools, for processing that language and manipulating an ontology.
- The input sentences are analyzed deterministically and compositionally.
- It was implemented as a simplified natural language processor that allows the specification of logical data for semantic knowledge technology purposes in normal language.

Fig. 2: Bottom-up construction of an enterprise ontology[Sang-goo Lee, 2008]

2: QACID - Question Answering system applied to the Cinema Domain

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- Collection of queries from a given domain which are analyzed and grouped as clusters.
- Mapping between words in NL queries into KB by using string distance metrics.
- SPARQL generator replaces the ontology with instances mapped for original NL query.

3- ONLI - Ontology Natural Language Interaction

- Is used as front-end to the RACER reasoner and to nRQL, RACER's query language.
- Transforming the user's natural language queries into nRQL.
- No details are provided regarding the effort required for re-purposing the system.

4- QAAL

- Analyzing the types of input, query processing method, input and output format of each system and the performance metrics with its limitations.
- Template based approach for fast retrieval of answer.
- Using Graph Matching Algorithm and Spread Activation Algorithm for query matching with the ontology.

5- QuestIO - Question-based Interface to Ontologies

- A natural language interface for accessing structured information, that is domain independent .
- It brings the simplicity of Google's search interface to conceptual retrieval by automatically converting short conceptual queries into formal ones in SeRQL.
- It works by leveraging the lexical information already present in the existing ontologies in the form of labels, comment and property values.

6- PANTO- Portable nAtural laNguage inTerface to Ontologies

- Accepts input as natural language form and the output is in SPARQL query.
- Using WordNet and String metric algorithms for mapping.
- Converts Query Triples form into OntoTriples form which are represented as entities in ontology.

7- QASYO - Question Answering System for YAGO Ontology

- Accepts queries expressed in natural language and YAGO [18] ontology as inputs and provides answers.
- There are 4 phases: question classifier, linguistic component, query generator and query processor (as a waterfall model).
- NL query gets translated into a set of intermediate, triple-based representations, query-triples, and then these are translated into ontology-compatible triples.

➢ Goals of Proposed Method:

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1.Conceptual framework for the notion of a semantic learning organization with using semantic search model instead of using normal keyword search model is provided.

2.Designing and presenting a method to translate user´s semantic queries into well-defined queries using the results of NLP Interchange Format (NIF) to answer the semantic questions.

3. Semantic Question Answering for learning organization architecture will be used to overcome the Weaknesses raised from the different QA models.

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Scope of Activity

A- Learning Organization Ontology

- Organizational architecture is faced with a semantic shortage between humans and systems for having a precise and general understanding of them.

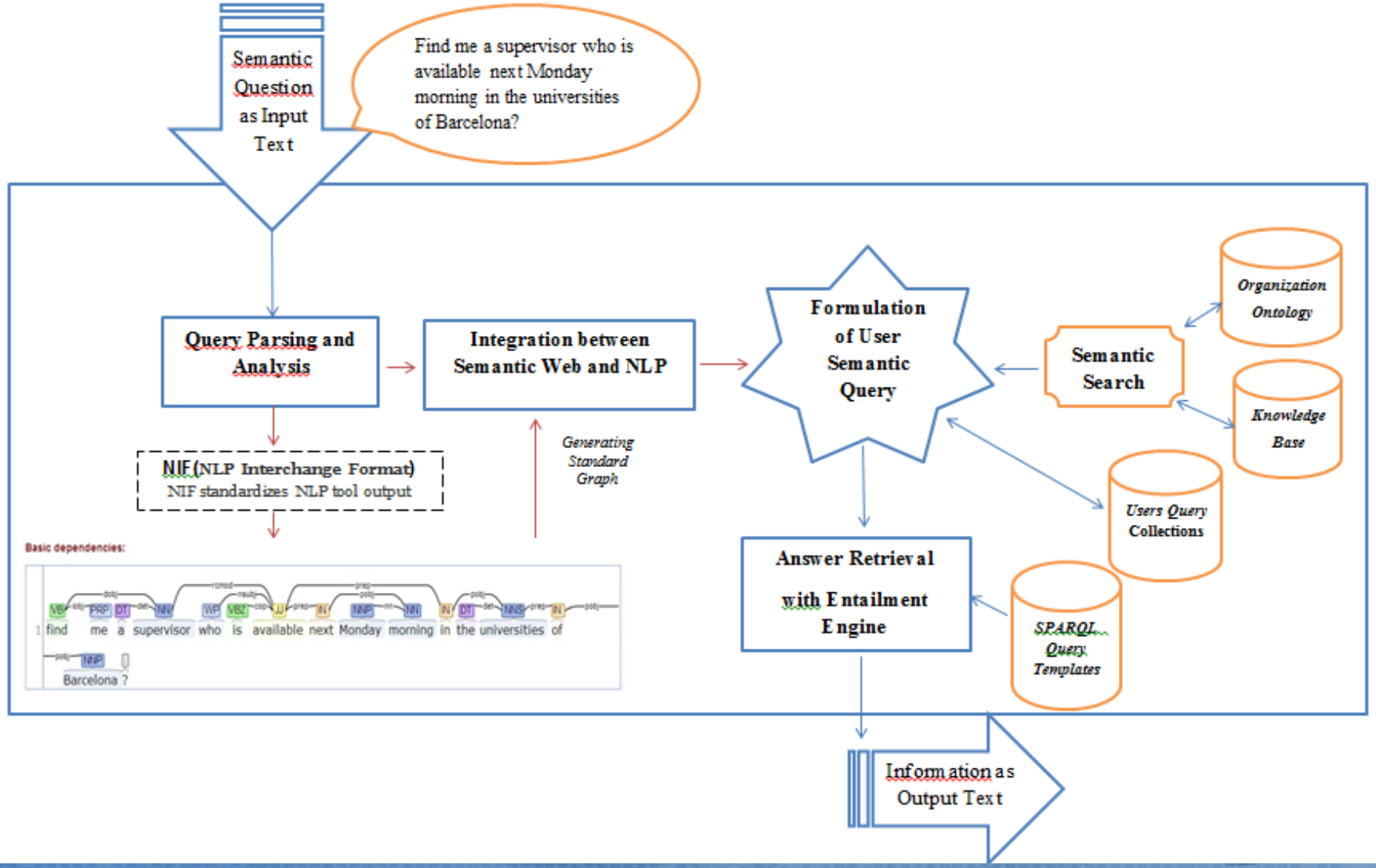
- Our goal is not only to design a 'conceptual' ontology model but also to implement it as an operational ontology.

B- Translating Natural Language Questions into Well-defined Queries

- There is no publicly known robust engine to manage a large KB with practical performance.

- Increasing the machines' capability in understanding the organizational structure and intelligent-making.

➢ Modelling of Conceptual Question Answering Method in Learning Organizations



➢ Modules of Conceptual Question Answering:

- **Query Parsing and Analysis:**

1- Identify the type of a question, type of an answer, subject, verb, noun, phrases and adjectives from the question.
2- Separating the Tokens, analyzing the meaning and reformulation of question.
3- Using word segmentation algorithm. the input query is divided as keywords which is further subdivided and searched in knowledge base to get correct answers.

- **Integration between Semantic Web and NLP:**

1- An NLP Interchange Format for integrating NLP applications is presented by [6].
2- NIF addresses weaknesses of centralized integration approaches by defining an ontology-based and linked-data aware text annotation scheme.
3- NIF is an RDF/OWL-based format and consists of a vocabulary.

➢ Modules of Conceptual Question Answering:

• Regenerating of Semantic Query: the formulation of query is generated with the help of YAGO[18] and WordNet [19].

- **Semantic Search:**

1- using Conceptual Graph Matching algorithm.
2- given question is framed as conceptual graph.
3- RDF model is organized and graph patterns are used to formulate and encode constraint queries for locating sub graph in RDF network.

- **Graph Matching in Ontology:**

1- CG acts as an intermediate language for mapping natural language questions and assertions to a relational database.
2- CG contains concept, concept relation and argument.
3- RDF triples are visualized as directed labeled graph in which subject; objects are represented as nodes and predicates as arcs.

➢ Modules of Conceptual Question Answering:

- **Searching Ontology Nodes:**

1- Using Spread Activation to search the nodes in ontology as in semantic manner.
2-Exploiting relations between nodes in ontology (terms, class, object etc).
3- Relations are labeled directed or weighted manner.
4- SA creates initial nodes that are related to the content of the user's query and assign weights to them.
5- Activating nodes with different nodes on ontology by some rules.

- **Template based Approach:**

Three types of question classification methods: Machine learning approaches, knowledge based approach and template based approach.

➢ Modules of Conceptual Question Answering:

- **Answer Retrieval with Entailment Engine:**

1- Using entailment techniques to infer semantic deductions between a users´query collections and the SPARQL query collections.

2-the system to associate new incoming queries with their corresponding SPARQL expressions in order to retrieve the answer sought from the RDF database.

➢ Conclusion:

- Using ontology-based tools by striving to translate natural language queries into well-defined queries and retrieving exact answers.
- Using semantic search approach interoperability for NIF components, web services and question-to-query algorithm .
- Performance of question answering system of getting exact result can be improved by using semantic search methodology.
- How to find an answer from organizational knowledge base?
- Finding and evaluating that what kind of responses to a semantic question are appropriate in order to enable a computer to answer questions in a manner which is natural for human interaction.

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Thanks for your patience.

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