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Improvement In The Usability Of GIS Based Services By Applying Semantic Ontology

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Abstract: ***After the invention of GIS Based services in the web and the desktop areas it becomes the most widely used services over the internet and because of its tremendous capabilities of giving accurate and most efficient information about GIS related queries of particular organizations, for users or industries these services are on the peak of popularity. Now days there are lots of options available in the market who provides these GIS related functionalities to the users such as for e.g. ArcMap, GRASS and Google map APIs etc.***

This system improves the user usability on geo services. Purpose of this system to develop a user convenient system related to GIS that help any normal user to handle it in its natural way. User do a spatial thinking in his/her mind according to that some natural question where generated from this system take that questions as it is and make that questions. Filter those questions in a way that system can understand it and produce an exact result. Semantic concepts give a common and meaningful data format by integrating this this concept in GIS which will come to know as Geosemantic. An OWL file provides well defined relationship between the object by mapping with real word things.

Keywords: GIS, Semantic, Geosemantic, OWL, Spatial thinking.

1. INTRODUCTION

Natural language is the language that can be used by the any normal user. Language in which user can think. Here the system concerned with the spatial thinking of normal user with the natural language. According to natural thinking of the user whatever the questions comes in users mind in a general way that questions are directly handled by the system and which gives the exact answer according to the user's need, according to user's thinking. Means we develop a system in such a way that it can thinks according to user's point of view. So the user can easily deal with the system which is related with the geographical information.

In this system some methods and techniques are used to evaluate a user's questions. Such as stop word removal, Stemming, Tokenization where these methods helps to evaluate a user's question in a machine understandable form. OWL file provides a system to define an object with a meaningful way which provides a relationship with a real world object. Protégé tool helps to develop OWL files. Ontology framework defines a certain rules and regulations. Finally system can map these object with the geographical information, geographical services. This geo information provided by certain GIS tools such as ArcMap, Google map etc.

Application should be designed in a way so that user can execute any service with minimum key strokes. User should be free from following methods, syntax and predefined rules and regulations to find out required geographical information. System's different modules are communicating with one another on the following scenarios:

1. From User Question layer module to semantic layer module
2. From semantic layer module to implementation layer module.
3. From implementation layer module to answer extraction module.

User Interfaces for this system interacts with user while giving Spatial Questions as input to the system, while giving determining previous reports and answers.

Hardware Interfaces for this system interacts with secondary storage memory while reading OWL Ontology Files for semantic analyzing. System also interacts with secondary storage memory while accessing GIS API or tools.

2. LITERATURE SURVEY

D. W. Rhind and N.P.A. Green [9] focuses on user requirements for geographical information system within the community of scientists in the Natural Environment Research Council (NERC) in Great Britain irrespective of the community's

1. Diversity in terms of geographical dispersion of users.
2. Variety of computing skills which exist
3. Properties of the data held in each institute of NERC
4. Scientific and contract research being undertaken

Along with study of user requirements they also discuss compatible characteristics of spatial data structures and how these match the functionality identified as required. And in accordance with this analysis, a conceptual design for a NERC GIS is described.

Agustina Buccella et al.[10] integrate some current approaches based on ontology-driven geographical information integration. Many new technologies have been developed to capture a large amount of information about the earth. These technologies can be combined with enhancement in the distribution of GIS on the web that leads to the proliferation of different geospatial information repositories and the consequent need to integrate information across repositories to get consistent

information. To handle such situation, many approaches use ontologies in the integration process.
Krzysztof Janowicz[11] contend that trends such as big data, Linked Data, Smart Dust, Digital Earth, and e-Science need a a radical paradigm shift in ontology engineering away from a small number of authoritative, global ontologies developed top down, to a high number of local ontologies that are driven by application needs and developed bottom up out of observation data.

3. IMPLEMENTATION DETAILS

The basic ideas of designing a question-based user interface that integrates different levels of ontology's (spatial concept ontology, domain ontology and task ontology) to guide the process of extracting the core spatial concepts and translating them into a set of equivalent computational or operational GIS tasks. We also list some typical spatial questions that might be posed for spatial analysis and computation. The principle introduced in this paper could be applied not only to desktop-GIS software but also to web map services.
For convenient understanding of the system we are dividing our system is in to four parts:

1. preprocessing
2. Reasoner
3. Ontology Rules
4. Answer Extraction

Collaborative workings of different parts of our system were shown into the architecture scheme (Fig.1). User's questions are input for the system and ontology based result delivered by passing data through four stages in system.

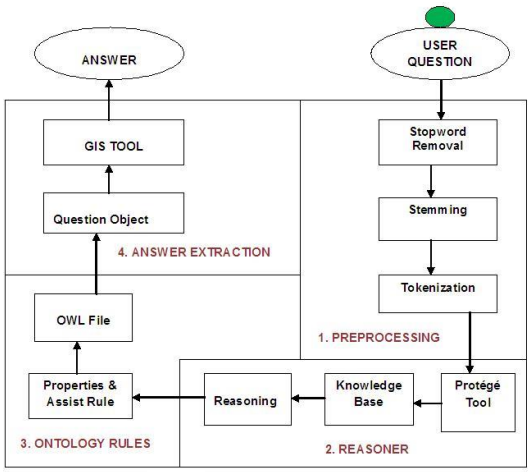

Fig.1 System Architecture

User question

User is the most important part of any system so as here, we developing our system according to user's point of view. We are making our system in a way that user can easily interact with that and get the appropriate result according to his/her request. We cannot predict what type of user will approaches to our system. User may be knowledgeable person or any unknowledgeable person.

In our system we are making our system for users convenient. Here user can deal with the geographical information so before user going to interact with the geographical system before start using geospatial services. User thinking on that how to interact with that in our system it is related to geographical information. So user think on geographical related information i.e. how to use? What is happening where? etc. So according to the users thinking on geo related some questions are arrives is user mind. He/she thinking on geographical information in his/her own natural language. This is a spatial thinking of a user.
So that first input or data set for our system is that user natural thinking in the form of natural/general questions. These questions are further handle by the other parts of system which described in detail below.

3.1 reprocessing

Preprocessing is the first step in a system which takes the user input in the form of natural language and evaluate that input in to an appropriate format give to the next step of system which is Reasoner. Preprocessing perform the basic operation on users input question. This makes that input into a machine understandable form. Certain steps involved in the Preprocessing which are described below.

3.1.1 Stop word removal:

In this whole sentence in the form of questions will be filtered out. So that only useful and meaningful words will be sorted out from a process of stop word processing. Stop word removal sorted those words and removed that from original question given from a user. Typically stop word lists contain words that don't carry as much meaning, such as determiners and prepositions Words like *the*, *is*, *at*, *which*, and *on*. Due to stop word removal process we get only main required worlds which are really useful for answering to the user's question. By using this process we are improving the answering performance of system. The word in a whole query of users question where words are preceded by the plus sign (+) defined as the stop words. We are using this stop word removal process because those words are not indexed in web pages and thus are not used in search engine queries. At the end stop word removal module gives us an only definite words which is useful for further execution process.

3.1.2 Stemming:

A stemming is a process of linguistic normalization, where variant forms of a word are reduced to a common normal form. We can use a stemming for increasing a performance of the system to provide an exact result from a system. Variables having an ending part or any suffix taking of it is known as a Stemming. For example –ion, –ions, –ive, –ed, –ing. We search through this suffix by using a stemming structure where we are using certain rules and regulations to find out stemming part.

Stemming is a process of removing prefixes and suffixes from words. By using stemming process we can combine word forms to avoid mismatches that may be occurs during a searching time. This makes a system more understandable according to user's view.

3.1.3 Tokenization:

Firstly we are having a raw state which is our systems inputs comes from user's minds in the form of natural language. By using a tokenization process without changing its meaning whole text, it is segmented into sequential manner of words and sentences which represent a token. A *token* is an instance of a sequence of characters in some text that are grouped together as a useful semantic unit for processing.

3.2 Reasoner:

3.2.1 Protégé tool:

Once we got the token of user's natural language spatial thinking question. We are providing that token to the protégé tool. We are having tokens in the sequential, hierarchical forms so by using that sequence protégé tool makes an OWL structure of that token. That is a Web Ontology language. OWL is an ontology language formally defined for the *Semantic Web* where it provides a meaning to the data represented on it. This OWL provides classes, properties, individuals and data values which will be stored as a Semantic web documents. That document contains a RDF (Resource Description Framework) structure where it provides a common platform for the integration of data. With a RDFS structure each token within a sentence can be map with a real world object. In that it makes a relationship between current object and existing object. This makes a whole data presented over web in a suitable formant by linking them together with the meaningful related existing object. (XML). This protégé tools helps to load and save OWL and RDF ontology that allows us to define, edit, and visualize classes according to tokens. This executes reasoners such as description logic classifiers.

3.2.2 Knowledge base

This system can solve a difficult problem in to an appropriate manner. Knowledge based system is a productive Artificial Intelligence system. It adds powers to the solution and concentrates on effective solution. It provides knowledge based processing approach.

3.3 Ontology Rules:

Ontology shares similarities between different structures. It describes instances or objects, concepts, attributes and relationship in between classes and objects. Where rules are the statements in the form of conditions where relationship is defined like if then etc. by defining rules we are making a relationship between classes and subclasses. Here the objects are classified by classes and is-a-subclass defines a further classification between object and relationship between them with the help of taxonomy.

3.4 Answer Extraction:

The object extracted from OWL files that are provided to a GIS tools which provides us geographical information. According to that object, according to user's questions exact objects are filtered out and due to which exact query will be given to a GIS tool so that exact result will be generated according to user's request. That answers in the form of any GIS service which will going to show to a user. Here is the definite result comes from a normal users point of view, from the normal users natural thinking about geoinfromation. This is a form of Geosemantic concept.

This algorithm explains a step by step process of an execution. When user provides a question in the form of natural language by the process of stopword removal, stemming, tokenization whole question will be filtered. Token file store a sequence of words. Through which token words are relate with a particular meaning. That is a data file that contain more information related to that object e.g. Distance→Km, Height→ft etc. where ontology provides a hierarchical structure. That can be handling with the procedural program.

4. CONCLUSION

The contribution of this work is to provide a better platform for any normal user according to his/her spatial thinking in a natural way that can be easily handle by system which leads to generate exact result according to user's request. Normal questions that come in user's mind that can be handling well that uses a semantic and Geosemantic framework for designing new GIS user interface.

In Future work our topic leads to generate a new concept on artificial intelligence in area of geoinfromation. Our framework has different ontology structure that useful in further research and improvement on spatial reasoning in web. This leads to develop a more powerful data over web. This proposed system leads to development into Intelligent GIS application.

REFERENCES

[1] P. A. Longley, M. F. Goodchild, D. J. Maguire, and D. W. Rhind, Geographic Information Systems and Science (Third Edition). Hoboken, NY: Wiley, 2011.

[2] M. F. Goodchild, "Spatial thinking and the gis user interface," Procedia-Social and Behavioral Sciences,vol. 21, 2011.

[3] F. T. Fonseca, M. J. Egenhofer, P. Agouris, and Cmara, "Using ontologies for integrated geographic information systems," Transactions in GIS, vol. 6, 2002.

[4] D. Mark, M. Egenhofer, S. Hirtle, and B.Smith, "Ontological foundations for geographic

information science," A research agenda for geographic information science, 2004.

[5] Y. Gao, S. Gao, R. Li, and Y. Liu, "Asemantic geographical knowledge wiki system mashed up with google maps," Science China Technological Sciences, vol. 53, 2010.

[6] K. Janowicz, "Observation-driven geo-ontology engineering," Transactions in GIS,2012.

[7] N. Guarino, "Semantic matching: Formal ontological distinctions for information organization, extraction, and integration," in Information Extraction a Multidisciplinary Approach to an Emerging Information Technology, M. Pazienza, Ed., 1997.

[8] R. G. Golledge, "Primitives of spatial knowledge," in Cognitive aspects of human-computer interaction for geographic information systems. Springer, 1995. Information Systems and Science (Third Edition). Hoboken, NY: Wiley, 2011.

[9] D. W. Rhind and N.P.A. Green, "Design of geographical information system for a heterogeneous scientific community", International journal of geographical information system, Volume 2, Issue 2, 1988.

[10] Agustina Buccella, Alejandra Cechich, Pablo Fillottrani, "Ontology-driven geographic information integration: A survey of current approaches", Computers and Geosciences, Volume 35, Issue 4, April 2009.

[11] Krzysztof Janowicz, "Observation-Driven Geo-Ontology Engineering", University of California, Santa Barbara, US.