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Semantic framework for ontology based information modelling

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ABSTRACT

In this paper, an efficient environment in medical domain for information structuring, indexing, and recovery is presented. The framework is based on ontology modelling, XML and behaviour. The significance of developing a support system for medical diagnosis and treatment is evident to improve the timeliness and accuracy of the treatment given. This work reflects a particular domain of the Clinical field, which is indispensable to human existence. It aims at developing a case -based reasoner to match a new case with several cases already recorded in the clinical database. This incorporates identifying a set of relevant problem characteristics, matching the case and returning a set of sufficiently similar cases and determining the best diagnosis from the set of cases returned. The system aims at providing the most relevant set(s) of result that matches best with the input given by the patient. The objectives are to design a system that would provide pertaining to the medical field answers relevant to the current patient alone, Immediate, accurate and well-structured response and two-way information. Recommender systems can utilize this framework for providing suggestions during diagnosis.

KEYWORDS: ontology, framework, modeling, information retrieval

1. INTRODUCTION

The huge quantity of information in medical domain requires effective knowledge in integrated technologies to help in significant acquisition and knowledge sharing. The need for adaptive, faultless and semantically correct information distribution is dependent on processing of information.

The representation of the knowledge in medical administrative repositories must be represented by a semantic framework representing information content and flow. A semantic framework is built with ontology that represent information model that has domain-specific vocabulary built with relationships characterizing collective domain information. The responsibility of ontologies for information depiction, indexing, and recovery is well known in the area of semantic-web. For many decades natural language processing for effective concept extraction was studied. In this paper, a framework that combines information acquisition techniques and ontology modeling is studied. The framework called CITATION is commonly used in medical domain and is found in web.

Modeling information methodology: During modelling, a flexible metadata configuration that represent huge starting information was built using extensible markup language. The correlation among starting information and bearer extended markup language object is got with identified semantic unit/subunit. Metadata provides description of initial sources using content definition, location and. version-keeping mechanisms. Metadata uses the object classes to keep initial content with semantical information, while preserving mapping in internal content base. Tokens from users queries are extracted, filtered with user's individual qualities and matched with internal ontology. The platform architecture is shown in Fig-1 which has the modules given below.

Ontology Server: In ontology server, standard regulations are documented. This module takes care of domain ontology coherency depending on exact reliability constraints set by COM. The whole framework relies on Protégé library that helps in complicated ontology-improvement and information-achievement framework. The deployment helps in core CITATION services presented in web-based submission.

Conformation Module:Natural language is used for interaction. The tokens of importance are extracted, improved with external and taken care to fit individual user summary.

Extractor Module: External information resources are morphologically and syntactically analyzed using external tools to create the external markup language equivalent. Initial content is enriched with statistical information.

Information Module: The information representation, indexing and retrieval is done in this module. Ontologies are used for semantic indexing of the attached file in a weighted manner. The extended markup language equivalent of the initial information is stored in a solid E-R representation. One-to-one mapping is achieved through naming convensions based on the XML elements hierarchy.

Processes used: The important processes that are used are: Information extraction and Query Processing and Document Retrieval (QPDR)

Information Extraction: The administrative information in medical domain contains mainly text. Hence, sophisticated text management methodologies are adopted for effective information extraction. It is done in three stages:

1) Preprocessing operation mainly on statistical and syntactical analysis of the imported documents

2) Semantics-based segmentation and feature extraction that results in structuring of information and
3) Storage of the extended markup language equivalent in the E-R repository.

QPDR: The QPDR technique preprocesses the query mainly to extract the tokens that are of interest, structures the outcome in extended markup langage, augments the tokenized information, makes a token-by-token conversion using external dictionaries, filters the tokens in accordance with user's profile, and does a subjective match against entities of the domain ontology. The semantics based information retrieval process is presented in Figure1 and QPDR functionality is depicted in Figure 2.

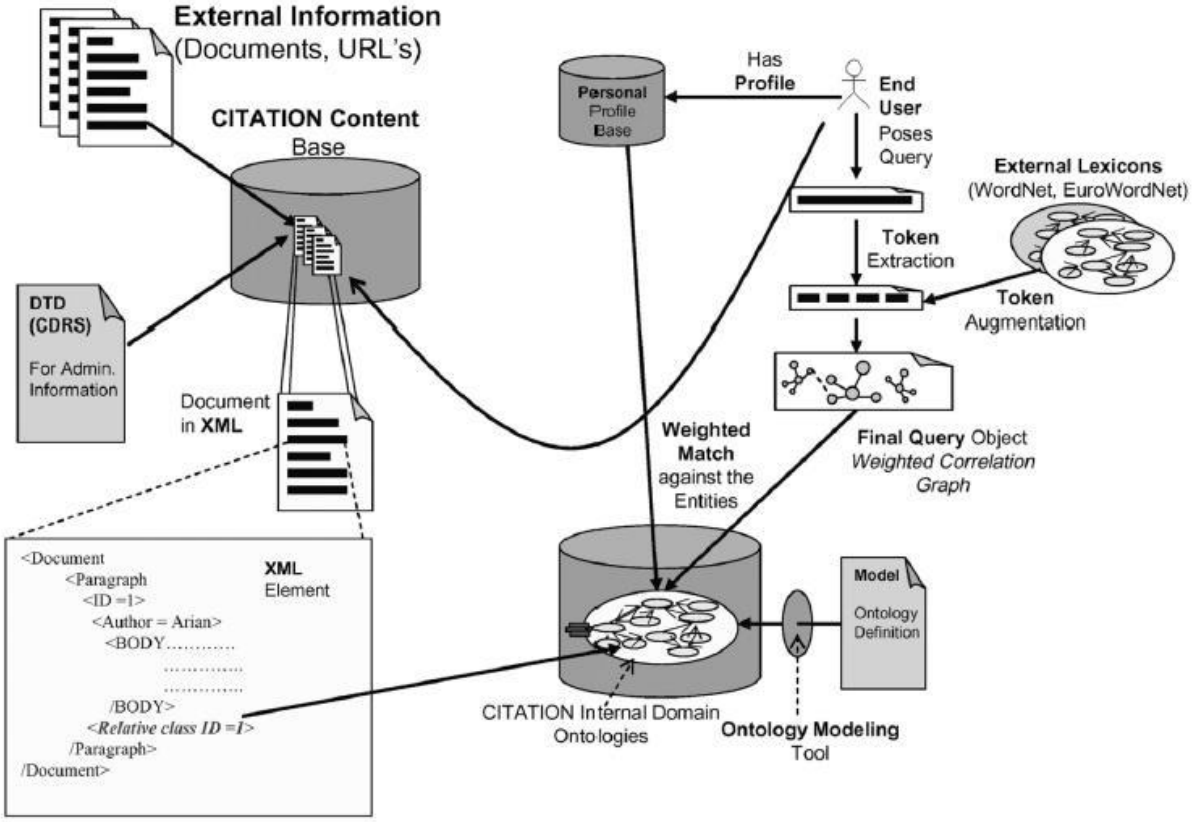

Figure.1.Semantics-based information retrieval process

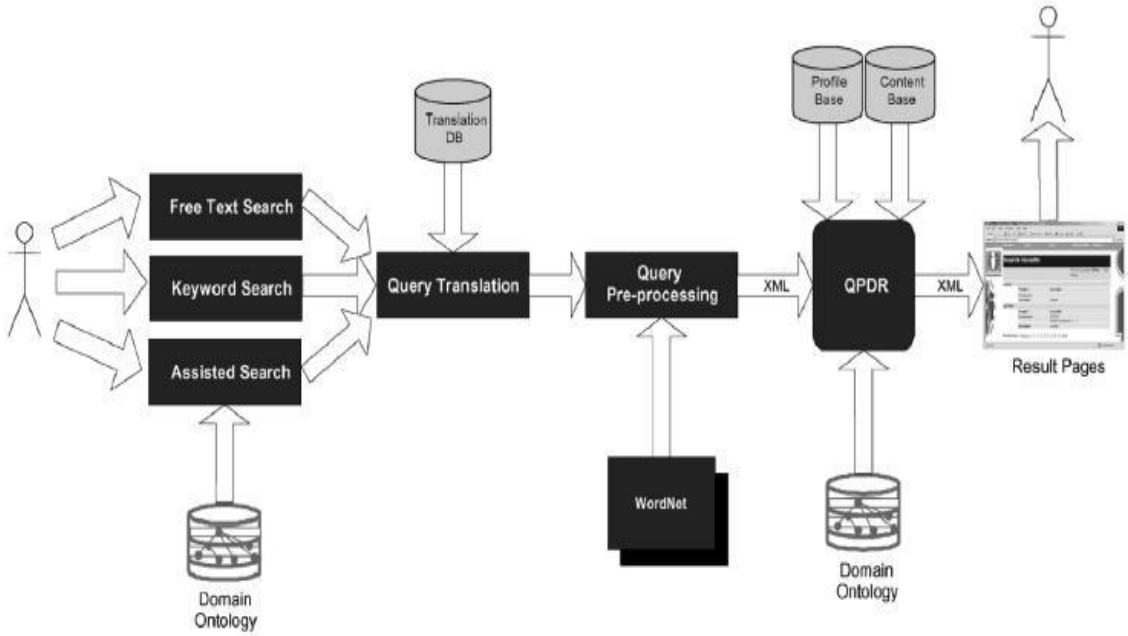

Figure.2.QPDR functionality

Software tools used: Many tools are offered to develop ontology in medical domain. Many ontology editors are available to execute the steps above and our work is restricted to Protege and swoop to achieve interoperability and usability.

Interoperability: Ontologies are for sharing, exchanging and interpreting information. For achieving wide range of applications, compatibility on syntactic and semantic levels is required.

Usability: The benchmark method is the use of expanding and contracting multiple tree views. A graphical representation can be useful for ontology editing functionalities that modify the concepts and relations. Efficient visualization graph views provide ontologies with browsing facility and of any size.

For huge amount of information in web, ontology-based analysis has evolved as new technique. In this paper, a significant attempt has been made to standardize the demonstration and exchange of information in medical information. There is lack of defined standards in intensive health care information system and the designed platform provides ontology-driven semantics illustration and lucidity of extended markup language. Our analysis indicate that semantics network based ontology can be efficiently used in medical domain to improve the quality and speed of information retrieval.

Medical recommender systems: A medical recommender system that is used for making recommendations generally has three phases as shown in figure 3, Initialization phase, that contains the medical history of patients from which feature is extracted, learning Phase during which a model is built and prediction phase during which recommendations are given.

Based on the information obtained from information retrieval, a medical recommender system has been developed as shown in figure 4 which has soft computing algorithms and hybrid filtering techniques. The quality of recommendations is dependent on collected indications and symptoms given to intelligent algorithms. The intelligent algorithms are utilized to extract and filter the medical recommendations from the data, which are according to the physical examination of diagnosed patient. All filtering methods like collaborative filtering, content-based filtering and knowledge-based filtering are used based on the requirement. The doctors can have access to an online system and use it anywhere. The recommender system provides its suggestions to doctors which they utilize for the treatment of patients.

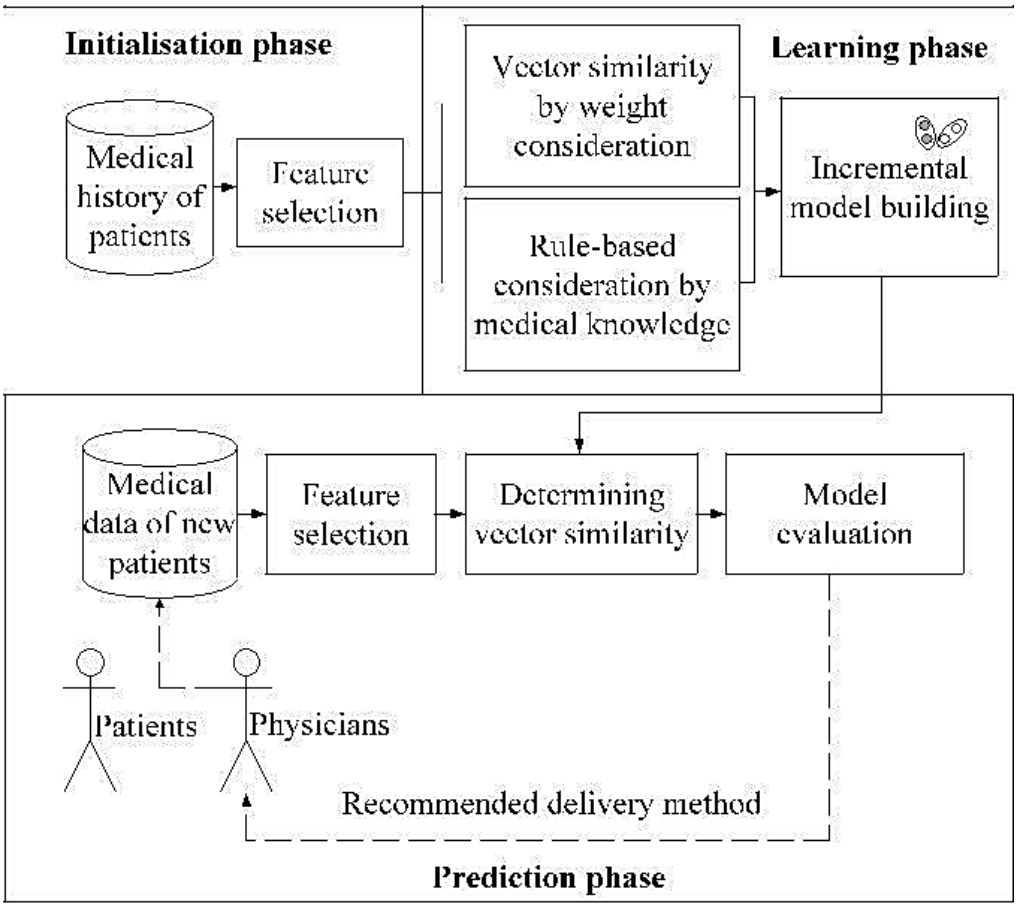

Figure.3.Medical Recommender system

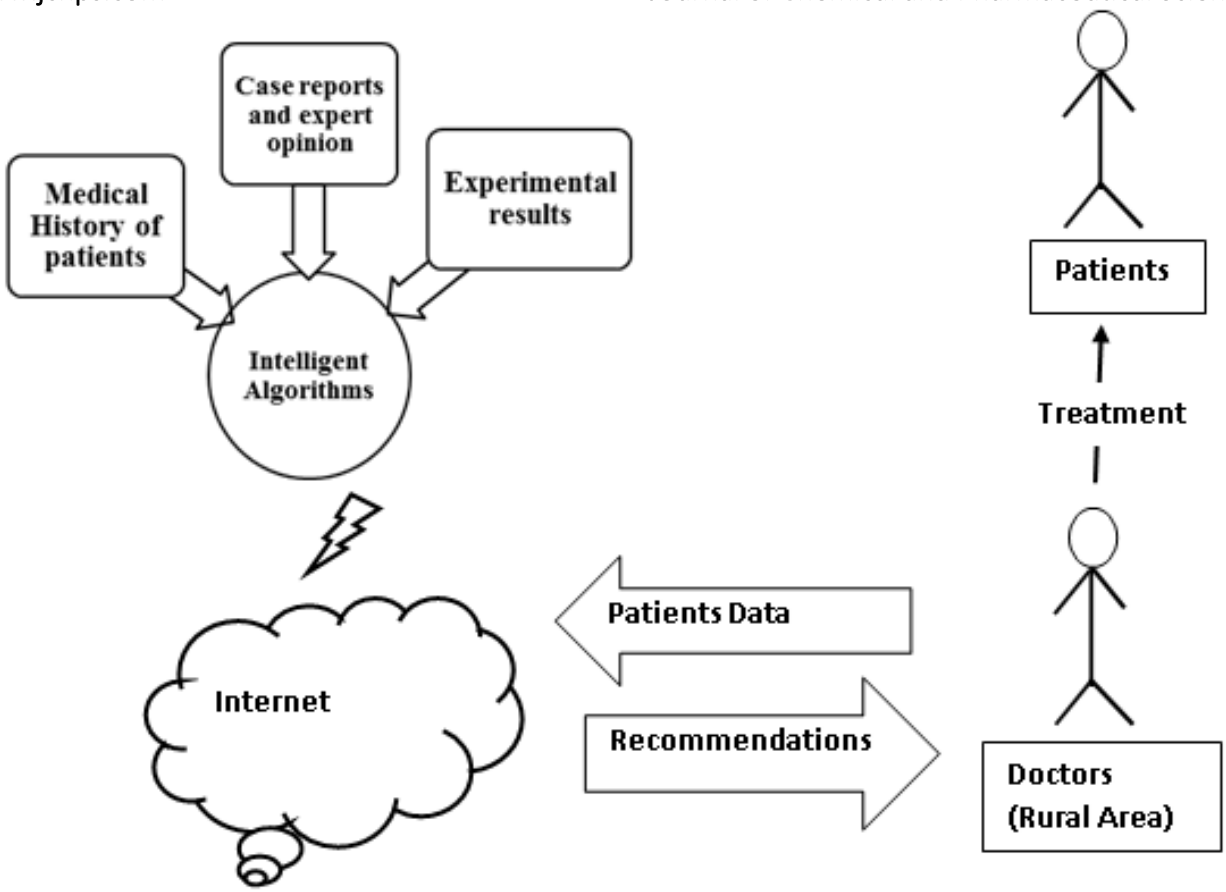

Figure.4.Proposed Recommender system

2. CONCLUSION

The framework proposed in this paper structures documents automatically and indexes it with ontology. Using this medical domain information, query mechanism provide better semantics based acquisition of information. In addition the proposed framework provides a way to exchange medical information which depends on the following two factors.

Scalability of the established framework for medical information interchange and expansion of the ontology model for setting the rules and constraints for representation of semantics over a wide domains for effective information retrieval.

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