Onto-CDS: Medical Decision Support with Timely Updated Knowledge

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I. INTRODUCTION

In medical domain DSSs are known as Clinical Decision Support System (CDSS) [1]. It is defined as software that helps in clinical decision-making. It matches the computerized clinical knowledge base with the individual patient's symptoms or the medical test results. After that the specific assessment or recommendations are then presented to the medical doctor for the decision. However, construction, maintenance and timely updating of such CDS have become challenges due to many reasons. Among others reasons, since body of knowledge in medicine is constantly updated, computer programmers are unable to timely update a CDS. Thus it is undisputed that automated solution for maintenance and updating of CDS solutions is of paramount importance. In this context, the concept of Ontology has gone beyond traditional data modelling approaches such as Entity-Relationship (ER) and the Object Oriented Modelling. More importantly, Ontology can automatically extract the up to date knowledge from the Internet and update the knowledge base of CDS.

II. DESIGN AND IMPLEMENTATION OF ONTO-CDS

A. System Domain and the requirement analysis

Our research has targeted Bacteria and Antibiotics domain, to come up with an ontology-based CDS, known as Onto-CDS that can be used by the laboratory technician to generate the reports after analysing the urine sample. The report generated by Onto-CDS is expected to be reviewed by a medical doctor to select appropriate drugs for the patient.

B. Knowledge base of the system

In our ontology-based solution, the knowledge base of the decision support system is designed to be automatically updated with the current knowledge of drugs and related information coming from ARDB-Antibiotic Resistance Genes Database [2] identified by medical experts. Depending on the experts' instructions other reputed sources of knowledge can also be linked up to the CDS through our ontology.

C. Client application

The client side of the solution is very much lightweight, and includes only the Inference engine, and some modules for integrating with the Ontology. The system architecture is shown in Figure 1.

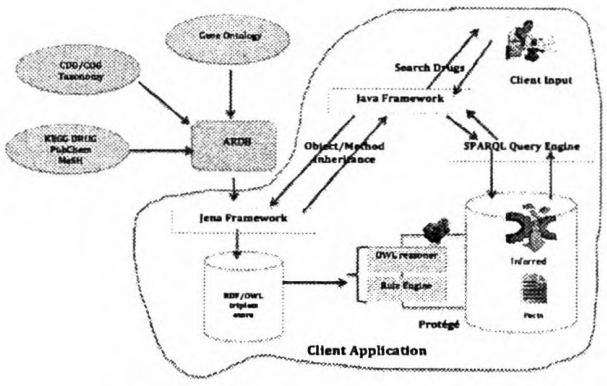

Figure 1: System architecture

III. EVALUATION OF ONTO-CDS

Onto-CDS has been evaluated with the results from few senior technicians and medical doctors by considering some known cases. Since the access to medical doctors were limited, authors had collected several urine reports and prescriptions from known cases and entered to the Onto-CDS and examined how far the prescriptions match with the solution coming from knowledge sources from the Internet. Such results were compatible with the decisions by the doctors when there were no recent updates of the knowledge sources on the Internet.

IV. CONCLUSIONS

This paper has reported on our ontology-based CDS solution for the domain of urine infections and antibiotic prescriptions. More importantly, the experiments reveled that Onto-CDS has brought some pertinent information about drugs, equivalent drugs, side effects and restricted usage, which may not be necessarily remembered or known by medical doctors in general. Thus Onto-CDS essentially consider as a decision support system. As the further work, it is intended to extend Onto-CDS to enable the medical doctor to view the report, which was generated by the data entered by a technician in the laboratory. This enables patients to meet the doctors without require to take his/her report by hand.

REFERENCES

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