



Applying Ontological Engineering Methodology in Medical Domain

Thesis submitted to the computer sciences department in partial fulfillment of
the requirements for the philosophy of doctorate degree in Computer
Sciences.

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ACKNOWLEDGMENT

To: My Parents,

To: The Embassy of Yemen in Egypt.

I would like to express my deepest gratitude to Prof. Dr. Ibrahim Fathy Moawad and Dr. Marco Alfonse. They were only through his meticulous supervision, support, and constructive advice, that this work has been completed. I would like to extend my gratitude to Prof. Dr. Mohamed Ismail Roushdy.

I am greatly indebted to them for their valuable input and continue support and direction.

This list of persons could be extended much further, therefore I would like to thank all those not mentioned above, and who have helped and supported me.

List of Publications:

1. Galal AL Marzoqi, Marco Alfonse, Ibrahim F. Moawad, Mohamed Roushdy.: ***"A survey on Applying Ontological Engineering Approach for Hepatobiliary System Diseases"***. Proceeding of CIT 2015 The 7th International Conference on Information Technology, PP: 370-375, Amman 2015.
2. Galal AL Marzoqi, Marco Alfonse, Ibrahim F. Moawad, Mohamed Roushdy.: ***"Ontology-based Approach for Hepatobiliary System Diseases"***. International Journal of e-Healthcare information Systems (Je-HIS). PP: 80-89. 2016.
3. Galal AL Marzoqi, Marco Alfonse, Ibrahim F. Moawad, Mohamed Roushdy.: ***"Exploiting Existed Medical Ontologies to Build Domain Ontology for Hepatobiliary System Diseases"***. Proceeding of the International Conference on Advanced Intelligent Systems and Informatics, PP: 804-814. Cairo 2016.
4. Galal AL Marzoqi, Marco Alfonse, Ibrahim F. Moawad, Mohamed Roushdy.: ***"Web Service-based System for Hepatobiliary System Diseases Prognosis and Treatment"***. The 13th International Conference on Computer Engineering and Systems (ICCES), IEEE, Accepted. Cairo 2018.

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List of Abbreviations

API	Application Programming Interface
ASP.NET	Active Server Pages technology
BFO	Basic Functional Ontology
BiOSS	Biomedical Ontology Selection System
DAML	Darpa Agent Markup Language
DAML+OIL	Darpa agent markup language Ontology Interface Language
DOC	Differential Ontology Editor
DOLCE	Descriptive Ontology for Linguistic and Cognitive Engineering
FMA	Foundational Model of Anatomy
HAV	Hepatitis A Virus
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HDV	Hepatitis D Virus
HSD	Hepatobiliary System Diseases
KM	Knowledge Management
LIO	Live Immunology Ontology
MESH	Medical Subject Headling
MVOM	Medius Visual Ontology Modeler
NCBO	National Center for Biomedical Ontology
NLM	National Library of Medicine
OBO	Open Biomedical Ontology
OBR	Ontology of Biomedical Reality
OCML	Options Configuration Modeling Language
OIL	Ontology Interface Language
OIL-S	Web Ontology Language for services
ORC	Ontology Reasoning Component
OUI	Ontology of Ultrasound Images
OWL	Web Ontology Language
RDF	Resource Description Framework
RDF(S)	Resource Description Framework Schema

SNOMED CT	Systematized Nomenclature of Medicine Clinical Terms
SWRL	Semantic Web Rule Language
UML	Unified Modeling Language
UMLS	Unified Modeling Language System
VHOSWS	Viral Hepatitis Ontology Sharing Web Service
WSO	Web Service Operation
WSHSD	Web Service Hepatobiliary System Diseases
XML	Extensible Markup Language

ABSTRACT

In this thesis, applying Ontological Engineering Methodology in Medical Domain to build a new Medical Ontology in pathology domain specific in Hepatobiliary System Diseases. The Hepatobiliary System is one of the important systems in the human body. It is responsible for many processes, which are necessary to keep body regulated and healthy. Conceptually, it is affected by many pathologic conditions, which affect other organs negatively. Also, it plays an important role in many body functions like protein production.

We exploited the existed Ontologies in the medical domain to build a new Hepatobiliary System Diseases (HSD) Ontology. The Ontology has been built using the BioPortal system to find the correct candidate Ontologies. This Ontology was developed in pathology domain and represented in the Web Ontology Language (OWL) that has recently become the standard language for the semantic web. The HSD Ontology development methodology includes five phases: HSD Query Extraction phase, Ontology Selection phase, Ontology Mapping and Partitioning phase, Knowledge Adding phase, and Ontology Merging and Validation phase. By developing the HSD Ontology in pathology domain, both intelligent systems and physicians can share, reason, and exploit this knowledge in different ways.

Additionally, a complete system for prognosing and treating the Hepatobiliary system diseases was introduced. The system utilizes the causal relations among diseases to predict the incoming diseases. Besides, it shares the Ontology knowledge by replying the inquiries of both physicians and medical students. As the proposed system is a web service-based, it can be integrated with intelligent systems to share Ontology knowledge and to prognose the patient diseases. To show how the system is very beneficial, some of case studies are presented for the HSD Ontology sharing, patient diagnosing and treatment, and expecting the patient progress. The system has been evaluated using a real dataset of 40 anonymous patients, and the diagnosis accuracy of the system is 92.5% .