

DEDICATIONS

This Thesis is dedicated to my father, who taught me that the best kind of knowledge to have is the one which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

ACKNOWLEDGEMENTS

Thanks God first and foremost to complete this research . Then I would like to express my gratitude to my Supervisor Dr. **Amir Mohmead Talib** has been the ideal thesis supervisor. Her sage advice, insightful criticisms, and patient encouragement aided the writing of this thesis in innumerable ways. I am also grateful to my family, and the Researcher **Eiman Alsiddig Altayeb** for help me and they always ask Almighty Allah to guide me.

ABSTRACT

Ontologies have become core components of many large applications. One of the more common goals in developing the ontologies is to Share common understanding of the structure of information among people or software agents. This research addresses the issues of why one would build an ontology and presents a methodology for creating ontologies. The idea is to design an ontology for Diabetes Domain and use it to add information that it becomes possible for computer systems to process information in meaningful and useful way.

This research listed the steps of ontology development process, and addressed the complex issues of defining class hierarchies, enumerated the terms that can possibly found in the domain, and then organized them in a hierarchy depending on which class subsumes another. And then defined properties for each class and the relationships linked these classes. Final step in designing the ontology was defining some instances to be able to make queries.

After The Ontology has been designed, it sent to the Reasoner to check classes consistency and to compute subsumption relationships.

An important result of this research is designing an ontology for Diabetes Domain, explicit representations and full definitions for Diabetes type, properties and their relationships. Also can make any query to retrieve information about Diabetes. Furthermore, the designed ontology can be shared and reused in applications related to diabetes.

المستخلص

أصبحت الانطولوجيا مكوناً أساسياً ومهماً في العديد من المجالات المختلفة والتطبيقات الكبيرة. حيث نجد أن أحد أهم أهداف الانطولوجيا هو تبادل الفهم المشترك لبنية المعلومات سواء بين الناس أو وكلاء البرمجيات. الهدف الرئيس من هذا البحث هو بناء انطولوجيا لتوصيف مرض السكري بحيث تكون متاحة لكافة أنظمة المعلومات .

ذكرت في هذا البحث الخطوات المتبعة في بناء الانطولوجيا كما تم توضيح التصنيف الهرمي لفئات النظام موضوع الدراسة ابتداءً من تحديد المجال ورصد كافة المفاهيم والخصائص والعلاقات, ثم بعد ذلك ترتيب المفاهيم (الفصائل) في شكل هرمي يوضح الفئات والفئات الفرعية بناء على علاقة تضمين هذه الفئات. ومن ثم تم تعريف خصائص الفئات والعلاقات التي تربط بينها وأخيراً تم ذكر أمثلة لمرضي السكري ببياناتهم حتى يتسنى إجراء الاستعلامات المرغوب فيها. وبعد الانتهاء من تصميم الانطولوجيا، استخدم المفكر (Reasoner) المضمن في أداة الدراسة لاختبار مدى انسجام فئات السكري، ولحساب علاقة تضمين هذه الفئات.

وتتمثل أهم نتائج هذا البحث في تصميم انطولوجيا لمرض السكري والحصول على تمثيل واضح لأنواع المرض وخصائصه والعلاقات بينها؛ كما يمكن أيضاً من خلالها إجراء الاستعلامات لاسترجاع أية معلومات عن مرض السكري . بالإضافة إلى أنه يمكن مشاركة هذه الانطولوجيا وإعادة استخدامها في التطبيقات ذات العلاقة بمرض السكري.

Table of Contents

DEDICATIONS	I
ACKNOWLEDGMENT	II
ABSTRACT	III
المستخلص	IV
TABLE OF CONTENTS	V
LIST OF FIGURES	VII

Chapter One : Introduction

1.1 Background	1
1.2 Problem Statement	3
1.3 Research Objectives.....	4
1.4 Significance of the Study.....	4
1.5 Research Methodology.....	4
1.6 Research Tools.....	6
1.7 Research Organization	7

Chapter Two: Literature Review

2.1 Ontology's	8
2.1.1 Definitions of ontology.....	8
2.1.2 An ontology of Ontologies	9
2.2 Ontology languages....	12
2.2.1 XML – ad hoc ontologies	12
2.2.2 Ontolingua	13
2.2.3 Resource Description Framework schema (RDFS).....	14
2.2.4 Ontology Web Language	14
2.3 Ontology components	16
2.4 Uses of Ontologies	17

2.4.1 Communication	18
2.4.2 Inter Operability.....	20
2.4.3 Ontologies as Inter-Lingua.....	20
2.4.4 Dimensions of Inter-Operability.....	21
2.4.5 Systems Engineering.....	22
2.5 Ontology Engineering.....	25
2.6 Previous Studies.....	28

Chapter Three: Ontology Tools 35

3.1 Protégé	35
3.2 OWL Ontologies	36
3.3 Components of OWL Ontologies.....	37

Chapter Four: Ontology Building 40

4.1 Proposed Ontology	40
4.2 Developing Diabetes Ontology	42
4.2.1 Determine the domain and scope of the ontology	42
4.2.2 Consider reusing existing ontologies	42
4.2.3 Enumerate important terms in the ontology	43
4.2.4 Define the Classes and the Class Hierarchy	43
4.2.5 Define the properties of classes	46
4.2.6 Define properties of properties	46
4.2.7 create instances.....	47
4.3 Invoke the Reasoner.....	48

Chapter Five: Results 50

5.1 Results	50
5.2 Conclusion	50
5.3 Future Work	51

Appendices I

AppendixI

List of Figures

Figure 1.1 Research Methodology Framework	4
Figure 2.1 The Ontology spectrum from informal up to formal.....	10
Figure 2.2 the ontology hierarchy: from (reusable) at the bottom, (not very reusable) at the top	11
Figure 2.3 xml code example	13
Figure 2.4 Ontology Development	27
Figure 2.5 Correspondence of blood pressure concepts in the ontologies of SNOMED CT (above dashed line) and Portavita (below dashed line).....	29
Figure 2.6 Ontology of Glucose Metabolism Disorder (OGMD)....	30
Figure 2.7: Related Work Summary.....	34
Figure 3.1 Representation Of Individuals	37
Figure 3.2 Representation Of Properties.....	38
Figure 3.3 Representation Of Classes (Containing Individuals)	39
Figure 4.1 Class Thing	43
Figure 4.2 Type1 Classes.....	44
Figure 4.3 Diabetes Classes Hierarchy.....	45
Figure 4.4: Inconsistent Classes and Ontology Explanation.....	48
Figure 4.5 Inferred Class Hierarchy before Invoking the Reasoner..	49
Figure 4.6 Inferred Class Hierarchy After Invoking the Reasoner...	49
Figure 4.7 a query using SPARQL	49