Project Report on

Ontology Based Knowledge Healthcare System

By

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In partial fulfilment of requirements for the award of degree in
Bachelor of Technology in Computer Science and Engineering
(2020)

Under the Project Guidance of

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Project Completion Certificate

This is to certify that the below mentioned students of Sikkim Manipal Institute of Technology have worked under my supervision and guidance from **10 Jan 2020 to 6 Jun 2020** and have successfully completed the project entitled **" Ontology based Knowledge Healthcare System "** in partial fulfilment of the requirements for the award of Bachelor of Technology in Computer Science and Engineering.

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Project Review Certificate

This is to certify that the work recorded in this project report entitled **“Ontology based Knowledge Healthcare System ”** has been carried out by **Mr. Basit Halim (Reg 201600112) and Mr. Asifur Rahman (Reg 201600660)** of Computer Science & Engineering Department of Sikkim Manipal Institute of Technology in partial fulfilment of the requirements for the award of Bachelor of Technology in Computer Science and Engineering. This report has been duly reviewed by the undersigned and recommended for final submission for Major Project Viva Examination.

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Certificate of Acceptance

This is to certify that the below mentioned students of Computer Science & Engineering Department of Sikkim Manipal Institute of Technology (SMIT) have worked under the supervision of **Dr. Md. Tanwir Uddin Haider, Associate Professor,** of **National Institute of Technology Patna** from 10 Jan 2020 to 06 Jun 2020 on the project entitled **"Ontology based Knowledge Healthcare System ".**

The project is hereby accepted by the Department of Computer Science & Engineering, SMIT in partial fulfilment of the requirements for the award of Bachelor of Technology in Computer Science and Engineering

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Declaration

We the undersigned, hereby declare that the work recorded in this project report entitled **"Ontology based Knowledge Healthcare System"** in partial fulfilment for the requirements of award of B.Tech in Computer Science & Engineering from Sikkim Manipal Institute of Technology (A constituent college of Sikkim Manipal University) is a faithful and bonafide project work carried out at National Institute of Technology Patna under the supervision and guidance of Dr. Md. Tanwir Uddin Haider, Associate Professor, CSE Department.

The results of this investigation reported in this project have so far not been reported for any other Degree / Diploma or any other Technical forum.

The assistance and help received during the course of the investigation have been duly acknowledged.

Basit Halim (Reg 201600112) …………………………..

Asifur Rahman (Reg 201600660)………………………..

Acknowledgement

Foremost, I would like to express my sincere gratitude to the external guide, Mr. Dhruba Ningombam for her constant support and engagement throughout this project. I would also like to thank my internal reviewer Dr. Md. Tanwir Uddin Haider for his motivation, knowledge and insightful advice which led to the fruition of this project. Besides the reviewers, I would also like to thank Dr.Kalpana Sharma, Head of Department – Computer Science and Engineering and the project coordinators of the Department of Computer Science for their engagement and patience. And finally, I would like to thank the Department of Computer Science, Sikkim Manipal Institute Of Technology for the immense support and dearth of opportunities provided to us.

Basit Halim(201600112) …………Signature

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DOCUMENT CONTROL SHEET

1	Report No	CSE/Major Project/B.Tech/External/87/2020
2	Title of the Report	“Ontology based Knowledge Healthcare System”
3	Type of Report	Technical
4	Author(s)	Mr Basit Halim(Reg 201600112) Mr Asifur Rahman(Reg 201600660)
5	Organizing Unit	National Institute of Technology Patna, India
6	Language of the Document	English
7	Abstract	Abstract of project
8	Security Classification	General
9	Distribution Statement	General

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ABSTRACT

The project ‘Ontology based Knowledge Healthcare System’ is developed in order to construct a decision making for healthcare. This decision making capability is what differentiates our model from other healthcare models. Once the rules are fed into the system, it takes decisions on its own rather than just being an input output system. In the Healthcare sector, one of the most valuable challenges is the one connected with the information extraction from raw data that implies the automatic detection of significant facts in unstructured texts and their transformation into structured documents, which are indexable and queryable exactly like databases. It incorporates automation and ease to the process of disease detection and treatment suggestion. Also, it takes into consideration the many factors that are associated with each disease and its types. During the course, an ample sized data was studied, analyzed and interpreted in order to carve out the general rules that would be implied with certain features. The SWRL rules are the interpretation of these rules into the software. Further, a class hierarchy is created wherein parent and child classes are defined in order to incorporate inheritance amongst them. Apart from this, data properties such as hasAge and hasPatientId are added. They enable us to add different data properties into our system. The Object properties on the other hand define the relationships between individuals. Individuals are like instances of a class. In OWL an individual can be an instance of more than one class and can have polymerous objects as well as data properties. The Ontology graph on the other hand is a rather precious addition to the software. It holds great importance as it has the ability to act as the connecting link between the developer and a layman. The pictorial representation of flow diagrams of the ontology is quite useful for even the developer to understand the model. This graph represents the individual classes, Individuals and their relationship between each other.

This project includes the work of a knowledge engineer who is vested with the responsibility first of acquiring knowledge of the field on which the project is based upon and secondly of incorporating this gained knowledge in making the project. The rules hold utmost importance and any misrepresentation or inconsistency may lead to inaccuracy. It takes into account four diseases, namely: Diabetes, Cancer, Heart Disease and Tuberculosis. These are further sub classified into their types. Also a patient is allotted a Patient’s Id, weight, age, gender amongst other factors. It is done in order to rationalise the symptoms as some of them may rely on these given factors as well. This project that had started with a mere idea for a project is in-fact a must needed evolution that can be achieved by large sets of recorded data points from the patient's recorded history. This is nothing but a step towards that path

CHAPTER 1

INTRODUCTION

1.1 ONTOLOGY

Ontologies formalise the semantics of the domain explicitly by describing their elements; and hus, they consist of concepts that describe the internal features of the concepts, and the properties that describe the relationships between these concepts. Ontologies are based on a shared and consensual domain knowledge agreed by a community.

1.2 Benefits of ontologies:

1. The integration of heterogeneous data sources can benefit from the use of domain ontology to overcome semantic heterogeneities (Lacroix and Critchlow, 2003).

2. Ontology enables explicit and consensual knowledge to be shared and reused between human and software agents (Uschold and Jasper, 1999).

3. An ontology can be used to build knowledge bases - a knowledge base being an ontology with a set of instances (Noy and McGuinness, 2001). Also, ontologies can be used in deriving aspects of information systems at development or run time (Guarino, 1998). For example, ontology-based retrieval systems can assist users to browse and understand domain concepts, and therefore, formulate better specialised queries (Baker et. al, 1999).

In Healthcare sector, one of the most valuable challenges is the one connected with the information extraction from raw data that implies the automatic detection of significant facts in unstructured texts and their transformation into structured documents, which are indexable and queryable exactly like databases. It incorporates the automation and ease to the process of disease detection and treatment suggestion

(I) The automation and ease to the process of disease detection and treatment suggestion. Also, it takes into consideration the many factors that are associated with each disease and its types. During the course, an ample sized data was studied, analyzed and interpreted in order to carve out the general rules that would be implied with certain features

(II) The Object properties on the other hand define the relationships between individuals. Individuals are like instances of a class. In OWL an individual can be instance of more than one class and can have polymerous object as well as data properties

(III) The rules hold utmost importance and any misrepresentation or inconsistency may lead to inaccuracy. It takes into account four diseases, namely: Diabetes, Cancer, Heart Disease and Tuberculosis

(IV) These are further sub classified into their types. Also a patient is allotted a Patient's Id, weight, age, gender amongst other factors. It is done in order to rationalize the symptoms as some of them may rely on these given factors as well

1.3 Methods and methodologies for developing ontologies

(1) Building ontology from scratch
(2) Building ontologies from existing ontologies or from different data sources

The first activity in Grüninger and Fox methodology identifies the main scenarios that describe the purpose of the ontology with respect to the intended applications. Then, a set of competency questions are used to identify the scope of the ontology, thereby extracting the main concepts, properties, axioms of the underlying scope. After that, the elements of the ontology are expressed in first order logic
The Uschold and King's method proposes the following activities:
(1) Identify the purpose of the ontology,
(2) Build the ontology by capturing knowledge and identifying key concepts and properties in the domain, coding knowledge, and reusing other ontologies inside the current one,
(3) Evaluate the ontology, and
(4) Document the ontology.

The approach starts with a rough first pass at the ontology. This is followed by revising and refining the evolving ontology and filling in the details. Since building ontologies from scratchis not a simple task and is a time-consuming process, next we introduce the research work related to the second perspective, which studies the approaches for developing ontologies either from reusing existing ontologies or from reusing different data sources. For example, the developed ontology at Kactus (Bernaras et al, 1996) is built on the basis of an application knowledge base. In other words, the approach starts by building a knowledge base for an application. After that, when another knowledge base in a similar domain is needed, the first knowledge base can be generalised into an ontology. The output of repeating this process can lead to the development of an ontology that represents the consensual knowledge needed in all applications (Corcho et al,2003). Furthermore, Maedche & Staab (2001) distinguished different approaches for developing ontologies from existing data sources based on the type of input. The input can be one of the following:
(1) text where the ontology development is carried out by applying natural language analysis techniques to texts;
(2) Dictionary where the relevant concepts and relations of an ontology is extracted from a machine readable dictionary;
(3) Knowledge base; is used an existing source for building an ontology;
(4) Semi-structured data is used for eliciting an ontology from sources which have any predefined structure;
(5) Relational schema aims to extract relevant concepts, properties, relations from databases schema or relations.

CHAPTER 2

LITERATURE SURVEY

S.No.	Author	Paper & publication details	Research Gap	Findings.
1.	Flora Amato	Building Ontology from knowledge base Systems	· A new approach to develop certain domain ontology. · The proposed approach has integrated different data mining techniques to assist in developing a set of representative consensual.	The basics of ontological application and approach are learned through this p a p e r. Wo r k i n g o n protege, its tools and techniques were learned through this paper.
2	Robert J. Rovetto and Riichiro Mizoguchi	Casuality and ontology of disease	. Takes only causation into Account. . No model purpose Just general Discussion of Casual chains vis-A-vis disease ontology	A general discussion of casual chains vis a vis disease ontology. It tells of how the home remedies can be suggested and causation be taken into account. Remedy suggestion ways were learnt from and incorporated in suggesting tests in our

3.	Flora Amato, Giovanni Cozzolino, Alessandro Maisto, Antonino Mazzeo, Vincenzo Moscato, Serena Pelosi, Antonio Picariello, Sara Romano, Carlo Sansone	A knowledge Based Collaborative framework for e-health And Dipartimento di Ingegneria Elettrica e delle Tecnologie dell'Informazione.	· A knowledge Based Collaborative framework that consists in a doublefaced system aiming to support clinical processes in a more effective way (diagnostics and therapy)	The basic outlook of how a knowledge based health care system were learned from this paper. Also the rough idea of the classes and properties to be used were extracted.
4	Dr.Sunita Abburu & Suresh Babu Golla	Ontology Driven Knowledge Based Healthcare System	· Ontology centric approach provides an innovative ,effective and efficient means of capturing and organizing knowledge to represent the medical health care domain area for health care management system	Advocates the use of ontologies in the project and not any other technique as ontology centric approach proves to be the most efficient
5	Nureize Arbaiy[1], Shafiza Eliza Sulaiman[1], Norlida Hassan[1] and Zehan Afizah Afip	Integrated knowled-ge based expert system for disease diagnosis system	. Does not implement owl ontologies . Only related to pneumonia,thallassemia and arthrimitis . Inference engine thus Inference rule . SPARQL query not run	Integrated knowledge based expert system for disease diagnosis system It is a theoretical approach to ontology for disease diagnosis. It describes the probable path and connections amongst class.

6.	Dendani Nadjette [1] Allouani Rayene [1] 1 Badji Mokhtar-Annaba University	Rule based decision system support syst -em and domain Ontology for diabet -es diagnosis	formulation of rules for the system were learnt. Although they were inference and not knowledge rules . Also, how a rule is made was learnt	.Uses AI(Rule based -soning . Inference rule and engine . It aims at helping th doctor diagnosis diabetes type and Propose treatment
7.	Farman Ali , Pervez Khan , Daehan Kwak , S.M. Riazul Islam , Niamat Ullah , Sang-jo Yoo , K.S. Kwak	Fuzzy Ontology -Aided recommend -ation system for io -based healthcare s -ystem	it was a research using a different approach to the problem. Instead of ontology, fuzzy logic was used. Also Iot was added and no queries were run in practical. The advantages and disadvantages of ontology over other means were realized. Keeping humans in the	. Uses fuzzy logic . Iot based .No sparql query exe -ion
8	G. Suresh Babu A. Sunitha	Ontology driven knowledge based healthcare system and emerging area -challenges and opportunities	it is a theoretical approach to the challenges and opportunities that a knowledge engineer would face if they were to make a ontology based healthcare system.	. Describe approach in establishing firm linkage between different ontologies related to disease,places and environments in our integrated platforms .implented using java ,java API,oracle semantic store .RDF triples are associated with domain ontology

Table 1.1 Literature Survey

CHAPTER 3

PROBLEM DEFINITION

It has long been a desire in the field of research to develop a system which is able to map/predict the repercussions of the diagnosis available. Doctors very commonly have expressed an urge to be provided with such systems which eases the process of diagnosing the patient's reports and mapping it with treatment. Systems currently available are mostly inaccurate and do not map the test data to diseases. They mainly focus upon treatment. There are many instances where patients did not have complete information and knowledge about their health condition. The dependency upon domain experts and doctors is high.

- Multiple diseases have similar symptoms resulting in overlapping of classes.
- The process of data acquisition (see framework fig 1.1) involves collecting patient information data such as Age, Gender, Symptoms etc (object as well as data properties) are mostly unstructured and are thus very difficult to collect and visualize.
- This field is such, that every case may have certain hidden components/Symptoms (Individuals, data properties, object properties) that may be the driving factor for that certain case. This causes inconsistency in the data analysis and thus resulting in inconsistent Semantic web rule language Rules (SWRL Rules).
- They Semantic web rule language Rules (SWRL Rules) are very complex to put into exercise.
- Any slight misrepresentation in Semantic web rule language Rules (SWRL Rules) leads to inaccurate results.
- Often the patients data property HasAge (Age) is incorrect on the prescription which may be used for data acquisition.

3.1 SOLUTION STRATEGY

- The project requires the work of a knowledge engineer. A knowledge engineer interacts with the field experts, collects data and learns aptly regarding the domain of the project (in this case regarding Diseases namely Diabetes, Cancer, Tb and Heart disease). Further, the knowledge engineer using the domain data acquired creates ontology and Semantic web rule language Rules (SWRL Rules).

- Firstly, Data Acquisition phase is carried out. Data is acquired through various sources such as medical diagnostic centres, Medical clinics.

- Afterwards in the Data Validation phase, the earlier acquired data is then manually validated through data acquired through websites such as . This confirms the accuracy, consistency and reliability of the dataset.

- Then, Object properties and Data properties are extracted from the available data.

- Data properties such as HasAge and HasGender are included in the ontology. These are the data properties that effect result of the ontology.

- A primary key HasPatientId is included in the data property.

- Object properties such as issufferingfrom and hassymptom are then added to the ontology. These may include symptoms, diseases as well as tests.

CHAPTER 4

DESIGN

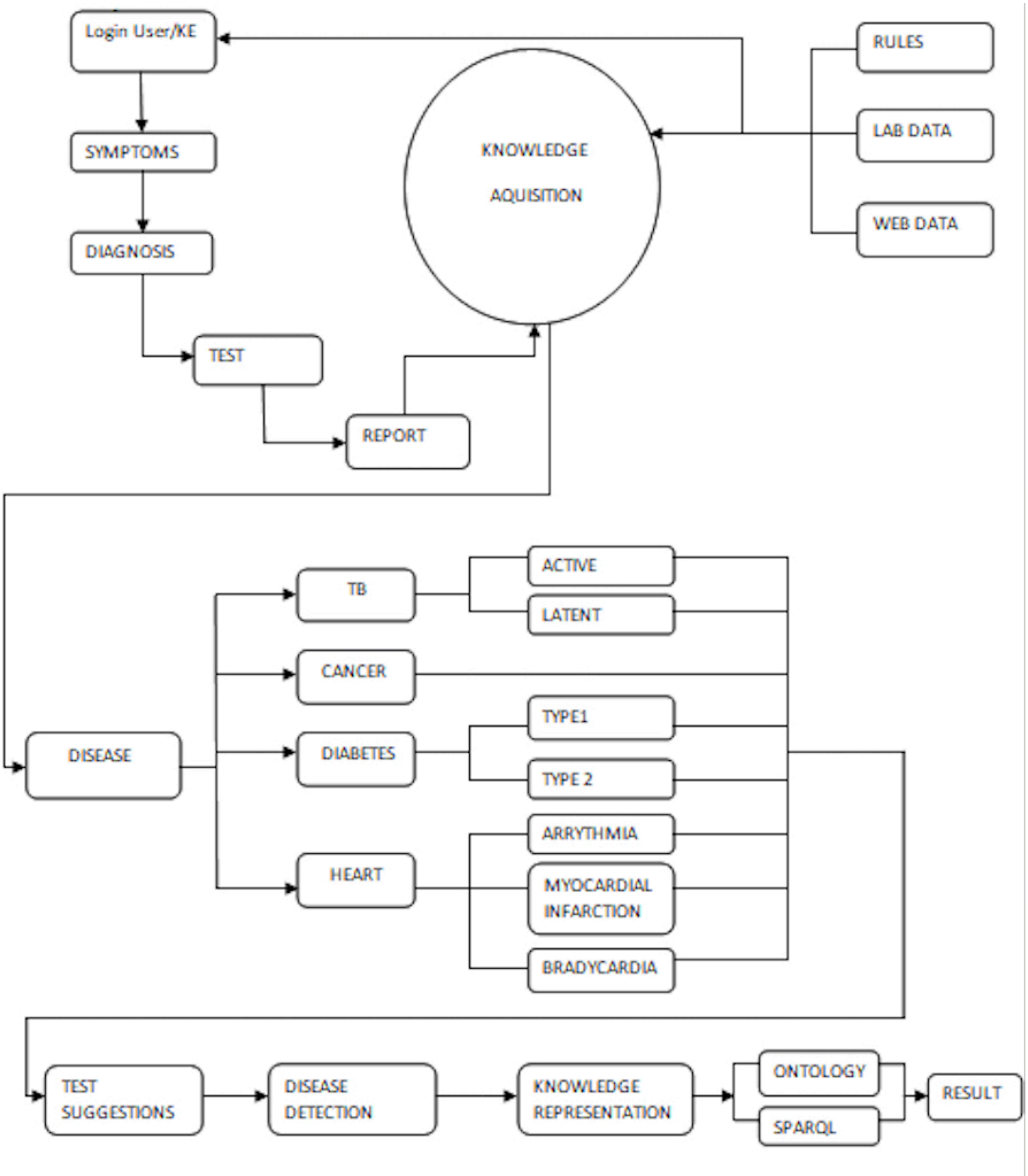


FIG 2.1- PROPOSED FRAMEWORK

4.2 Module Definition

1. Login User - The Login Module is a module that allows users to type a user name and password to log in. you can add this module on any module tab to allow users to log in to the system
2. Symptoms - The Symptoms module allow user to feed their symptoms into the system
3. Diagnosis - The diagnosis module compile the symptoms and collate with rules
4. Test - The test module extracts information from diagnosis module and suggest corresponding test for the user
5. Report - The test results are feed into the module by the user
6. Knowledge Representation - It's the core module of the ontology which compile rules and relationship between individual properties and show the disease and set of instruction to follow for the user in future .
    6.1. Rules - The module contain set of rules , production rules and first order logic.
    6.2 Lab data - The module contains processed data from the labs
    6.3 Web Data - The module contain process data from various govt website

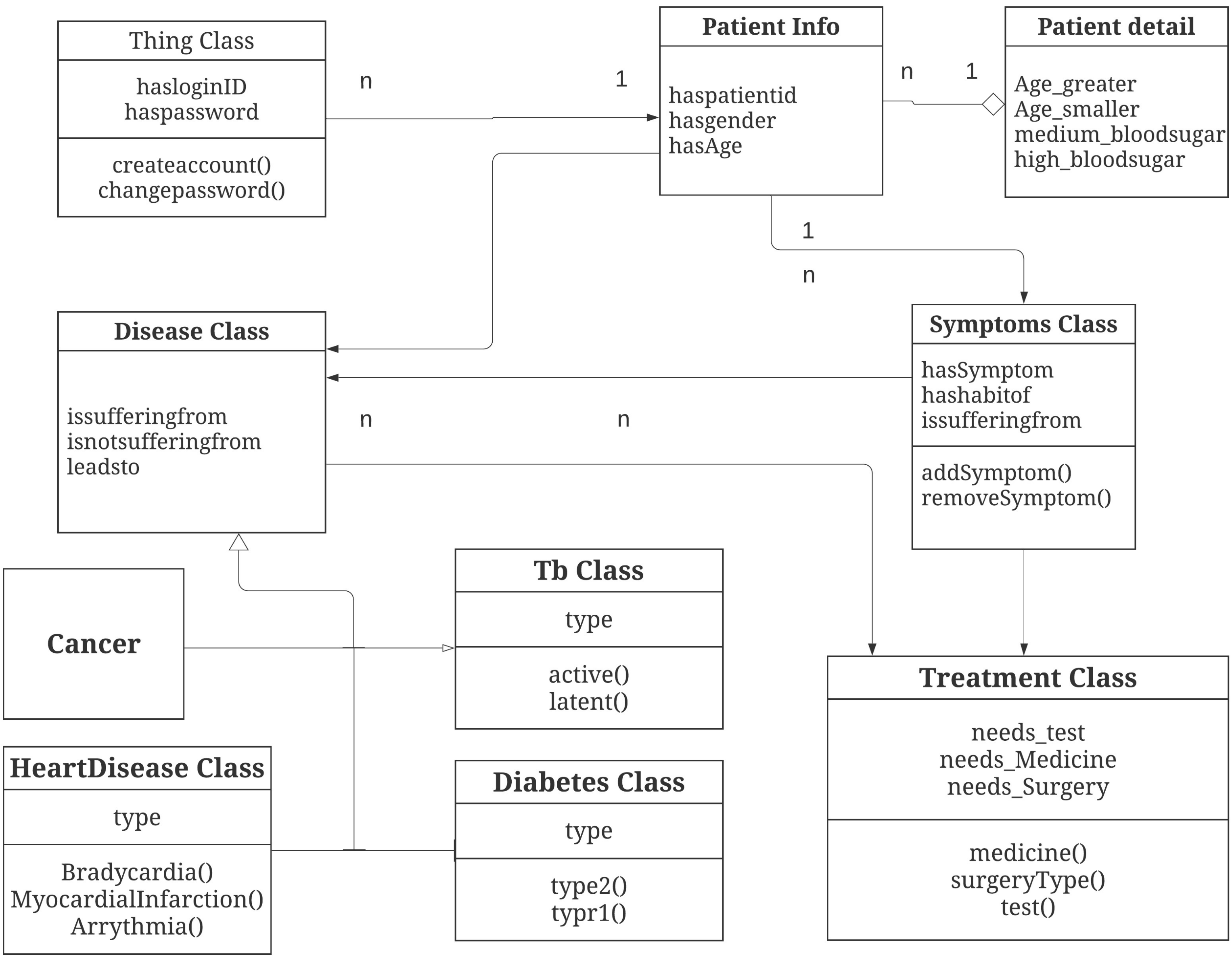
7. Disease - The module display the particular disease user suffering from and its consist of mainly four disease (i)Tuberculosis (ii)Heart Malfunction (iii) Diabetes (iv) Cancer.
    7.1 Tuberculosis - The module identify whether its Latent or Active
        7.1.1. Latent - In this condition, you have a TB infection, but the bacteria remain in your body in an inactive state and cause no symptoms. Latent TB, also called inactive TB.
        7.1.2. Active - It can occur in the first few weeks after infection with the TB bacteria, or it might occur years later.
    7.2 Heart Malfunction - The module identify whether its Arrhythmia or Myocardial infraction
        7.2.1. Myocardial infraction - Acute myocardial infarction is the medical name for a heart attack.
        7.2.2. Arrhythmia - Arrhythmias occur when the electrical signals to the heart that coordinate heartbeats are not working properly.
    7.3 Diabetes - The module identify whether its Type 1 or Type 2.
        7.3.1. Type 1 - Insulin is the main treatment for type 1 diabetes. It replaces the hormone your body isn't able to produce.
        7.3.2. Type 2 - A chronic condition that affects the way the body processes blood sugar
    7.4 Cancer - The module identify whether it's Stage 1&2 or Stage 3&4
        7.4.1. Stage 1&2 - stage I means the cancer is small and only in one area. This is also called early-stage cancer. Stage II mean the cancer is larger and has grown into nearby tissues or lymph nodes.
        7.4.2. Stage 3&4 -Stage 3 usually means the cancer is larger. It may have started to spread into surrounding tissues and there are cancer cells in the lymph nodes in the area. 4 mean the cancer has spread from where it started to another body organ. This is also called secondary or metastatic **cancer**.

8. Treatment - The module process the data and analyse then suggest between Medications or Surgery .
    8.1 Medication - It contains list of medication for the disease identified by the system.
    8.2 Surgery - It contains list of surgey for the disease identified by the system.

9.Knowledge Representation - The module generates the knowledge graph and represent it by Ontology and SPARQL

10. GUI - The Graphical User interface of the system.

4.3 CLASS DIAGRAM



4.3 Class Hierarchy

The class hierarchy view displays the asserted and inferred class hierarchies. The asserted class hierarchy is visible by default.The asserted class hierarchy view is one of the primary navigation devices in Protégé. It is presented as a tree where nodes in the tree represent classes. A child-parent relationship in the tree represents a sub/super class relationship in the class hierarchy

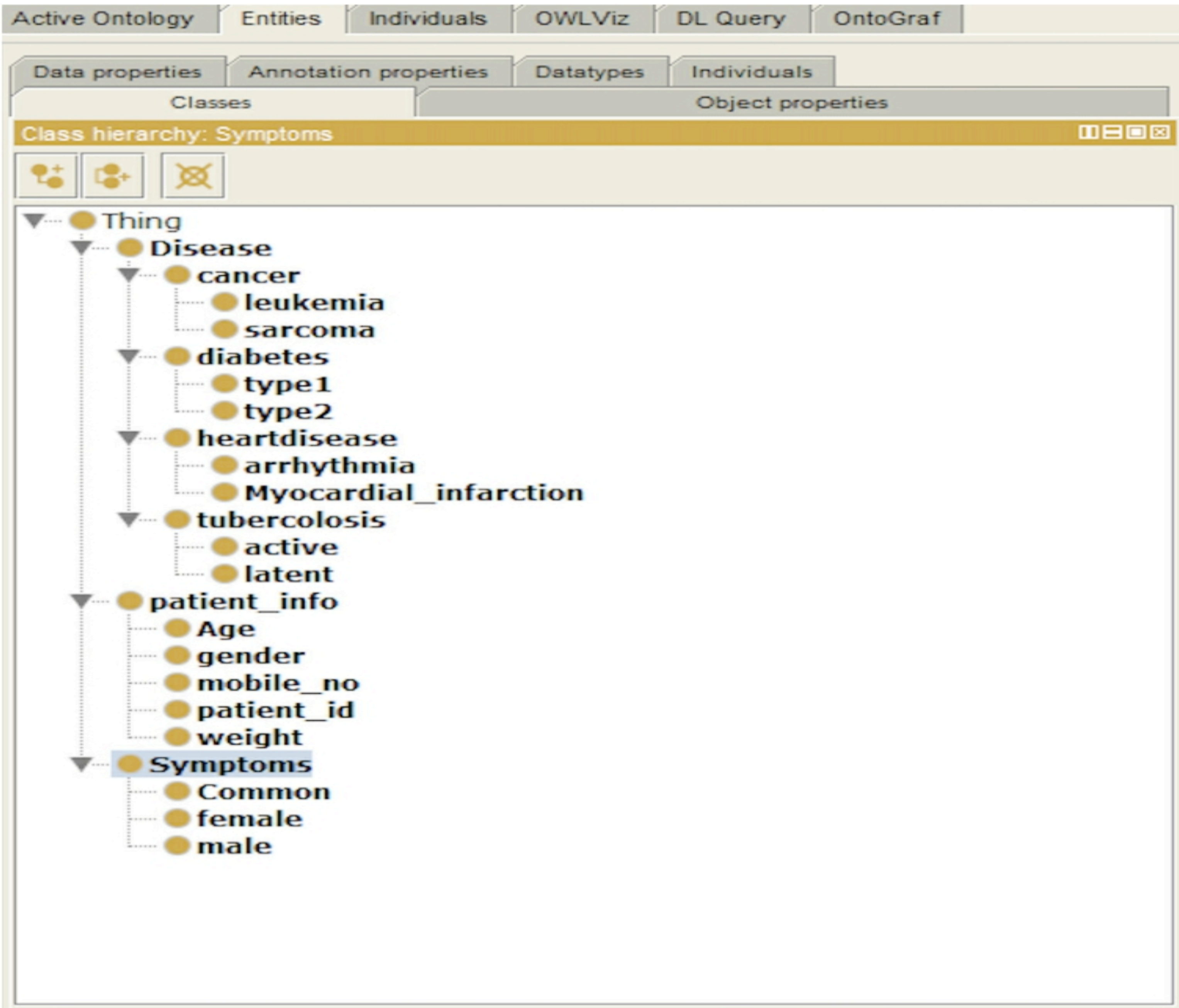


FIG 2 - CLASS HIERARCHY

4.4 Individual Properties

Individuals (instances) are the basic, "ground level" components of an ontology. The individuals in an ontology may include concrete objects such as people, animals, tables, automobiles, molecules, and planets, as well as abstract individuals such as numbers and words (although there are differences of opinion as to whether numbers and words are classes or individuals). Strictly speaking, an ontology need not include any individuals, but one of the general purposes of an ontology is to provide a means of classifying individuals, even if those individuals are not explicitly part of the ontology.

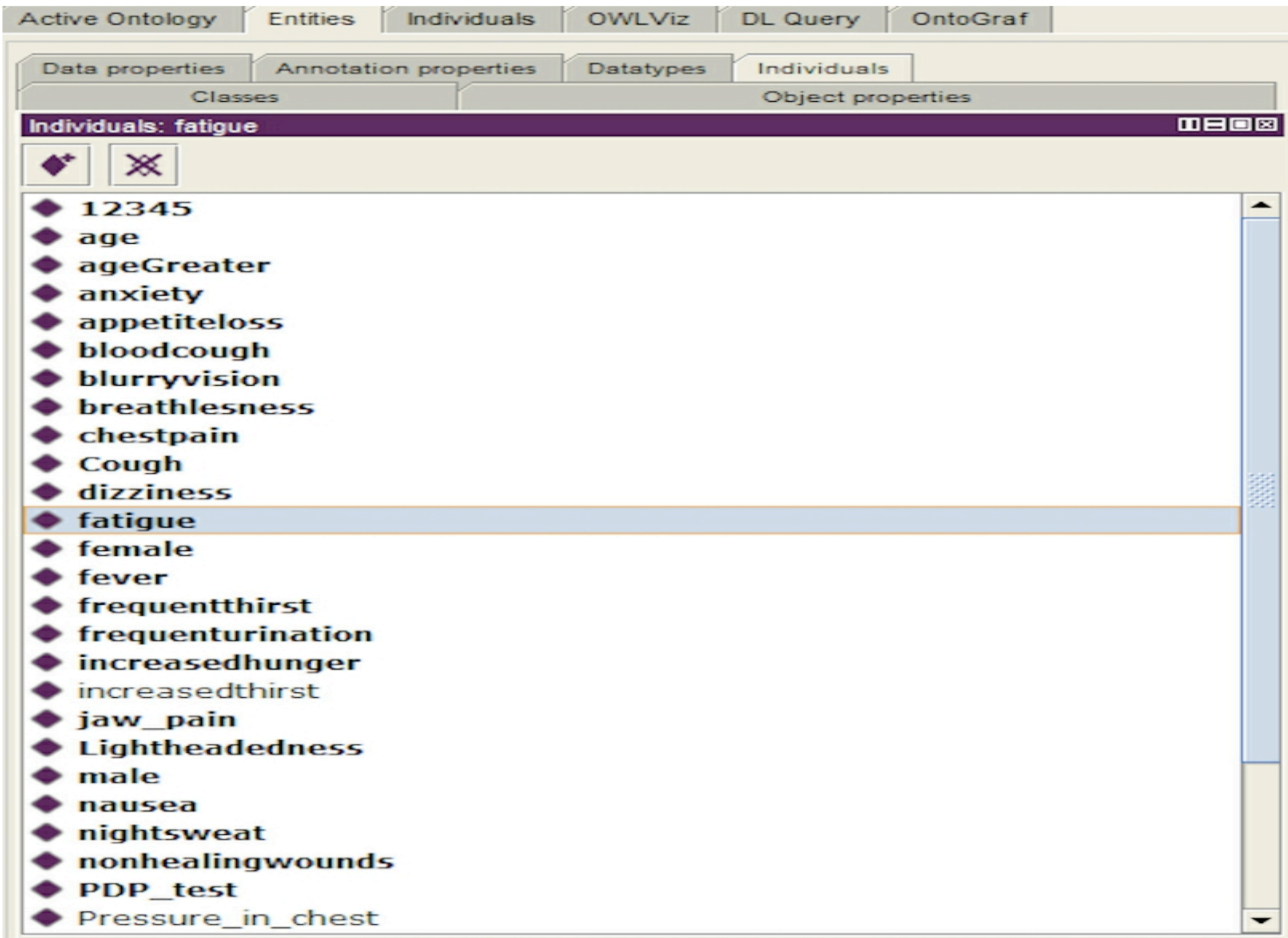


FIG 3 - INDIVIDUAL PROPERTIES

CHAPTER 5

IMPLEMENTATION

- IF patient is male And if there is chest pain AND IF there is pain in upper part of the body AND If it last more than 5 mins And if sweating occur And if he feel nausea then he is suffering from myocardial infraction.
- IF patient is female And If she having features of ‘RULE 1’ And if there is shortness of breath And IF vomiting occurs Then she is suffering from myocardial infraction.
- IF Patient has feature of RULE 1 And IF patient has features of Rule 2’ THEN Recommend “Stress Test“ And Then Recommend ‘Angiogram’ And Then Recommend ‘Echocardiogram’.
- IF patient has slow heart beat AND IF patient feels palpitations AND IF patient experiencing syncope THEN he is suffering from “BARDYCARDIA-Arrhythmias”.
- IF patient has fast heartbeat AND IF patient feels palpitations AND IF patient experiencing syncope THEN he is suffering from “TACHYCARDIA-Arrhythmias”.
- IF patient has Arrhythmias THEN recommend Blood Test Then recommend EKG the.Recommend chest-Xray THEN recommend heart catheterisation Then recommend echocardiogram THEN recommend electrophysiologic test.
- IF patient has myocardial infarction THEN consult doctor.
- vIF patient has bradycardia-Arrhythmias THEN suggest pacemaker.
- v IF patient has tachycardia_Arrhythmia THEN perform Vagal manoeuvres.
- IF patient doesn’t show positive signs from Rule 9 THEN suggest surgery THEN consult.

5.1 First Order Predicate Logic

- U->(PATIENT(M)^ ~PATIENT(F)) v (~PATIENT(M)^ PATIENT(F))
- For All(X,Y) U ^ PERSISTENT_COUGH^ BLOOD_COUGH ^ BREATHING _PAIN ^WEIGHT_LOSS=> TB
- For All(X,Y) U ^ PDP_POSITIVE ^ BCG=> FALSE POSITIVE
- For All(X,Y) U ^ PDP_NEGATIVE ^ AIDS => FALSE NEGATIVE
- For All(X,Y) U ^ PDP_POSITIVE ^ BLOODTEST_POSITIVE ^ SPUTUM_NEGATIVE => Latent TB
- For All(X,Y) U ^ PDP_NEGATIVE ^ BLOODTEST_NEGATIVE ^ SPUTUM_POSITIVE => ACTIVE TB
- For All(X,Y) U ^ LATENT TB => IMAGING TEST
- For All(X,Y) U ^ LATENT TB => (U ^ ~ ACTIVE TB)
- For All(X,Y) U ^ PATIENT(M) ^ HUNGER ^ DECREASED_SEX_TIME ^ POOR_MUSCLE_STRENGTH => DIABETES
- For All(X,Y) U ^ PATIENT(F) ^ HUNGER ^ FREQUENT_URINATION ^ UNIARY_TRACT_INFECTION => DIABETES
- For All(X,Y) U ^ (PATIENT(M) ^ ~PATIENT(F) ^ DIABETES ^ AGE <=20 => TYPE 1 v (~PATIENT(M) ^ PATIENT(F))
- For All(X,Y) U ^ (PATIENT(M) ^ ~PATIENT(F) ^ DIABETES ^ AGE > 20 => TYPE 2 v (~PATIENT(M) ^ PATIENT(F))
- For All(X,Y) U ^ ((PATIENT(M) ^ ~PATIENT(F) ^ TYPE 1 => (~PATIENT(M) ^ PATIENT(F)

5.2 Explanation

- This rule states that a patient who is male and his symptoms hunger , decreased sex drive and poor,muscle concludes that the patient is suffering from diabetes.
- This rule states that a a patient who is female and has symptoms hunger ,frequent urination and UTI concludes that the patient is suffering from diabetes.
- The rules state that a patient who is either male or female and has diabetes and is of age less that or equal to 20 is suffering from Type 1.
- The rules state that a patient who is either male or female and has diabetes and is of age is greater than to 20 is suffering from Type 2.
- The rules state that a patient who is either male or female and has type 1 can’t have Type 2 and vice versa.
- The rules state that a patient who is either male or female and has heriditary diabetes of Type 1 has a risk of having Type 1 diabetes.
- The rule states that a patient who is either male o female and has fasting blood sugar less than or equal to 100 is of normal range .
- The rule states that a patient who is either male o female and has fasting blood sugar greater than 100 and less than equal to 125 is of range pre-diabetes.
- The rule states that a patient who is either male o female and has fasting blood sugar greater than 125 is of range diabetes .

5.3 SWRL RULES

The Semantic Web Rule Language (SWRL) is an expressive OWL-based rule language. SWRL allows users to write rules that can be expressed in terms of OWL concepts to provide more powerful deductive reasoning capabilities than OWL alone. Semantically, SWRL is built on the same description logic foundation as OWL and provides similar strong formal guarantees when performing inference

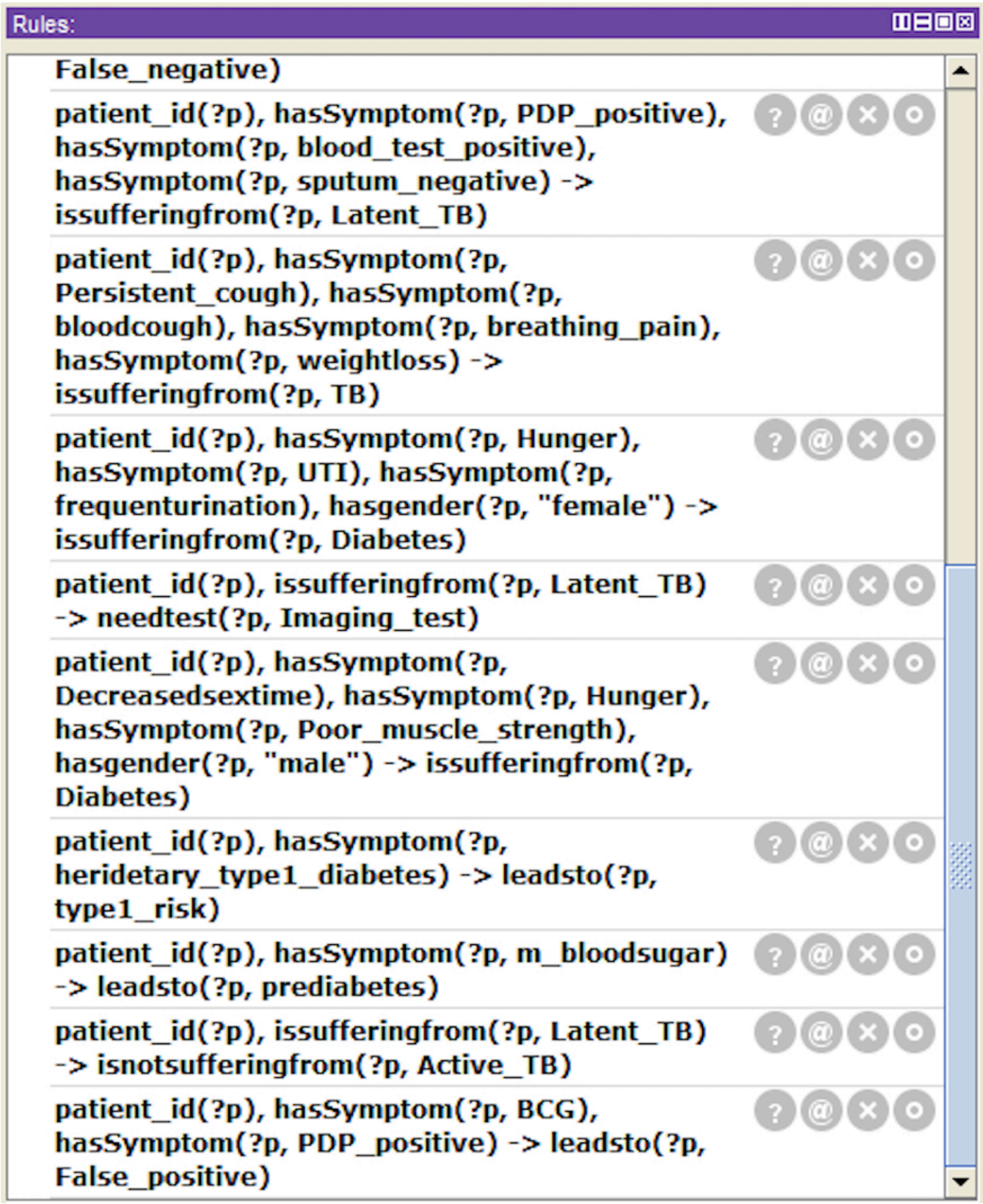


Fig 4.1 - SWRl Rules Created By Converting knowledge based rule

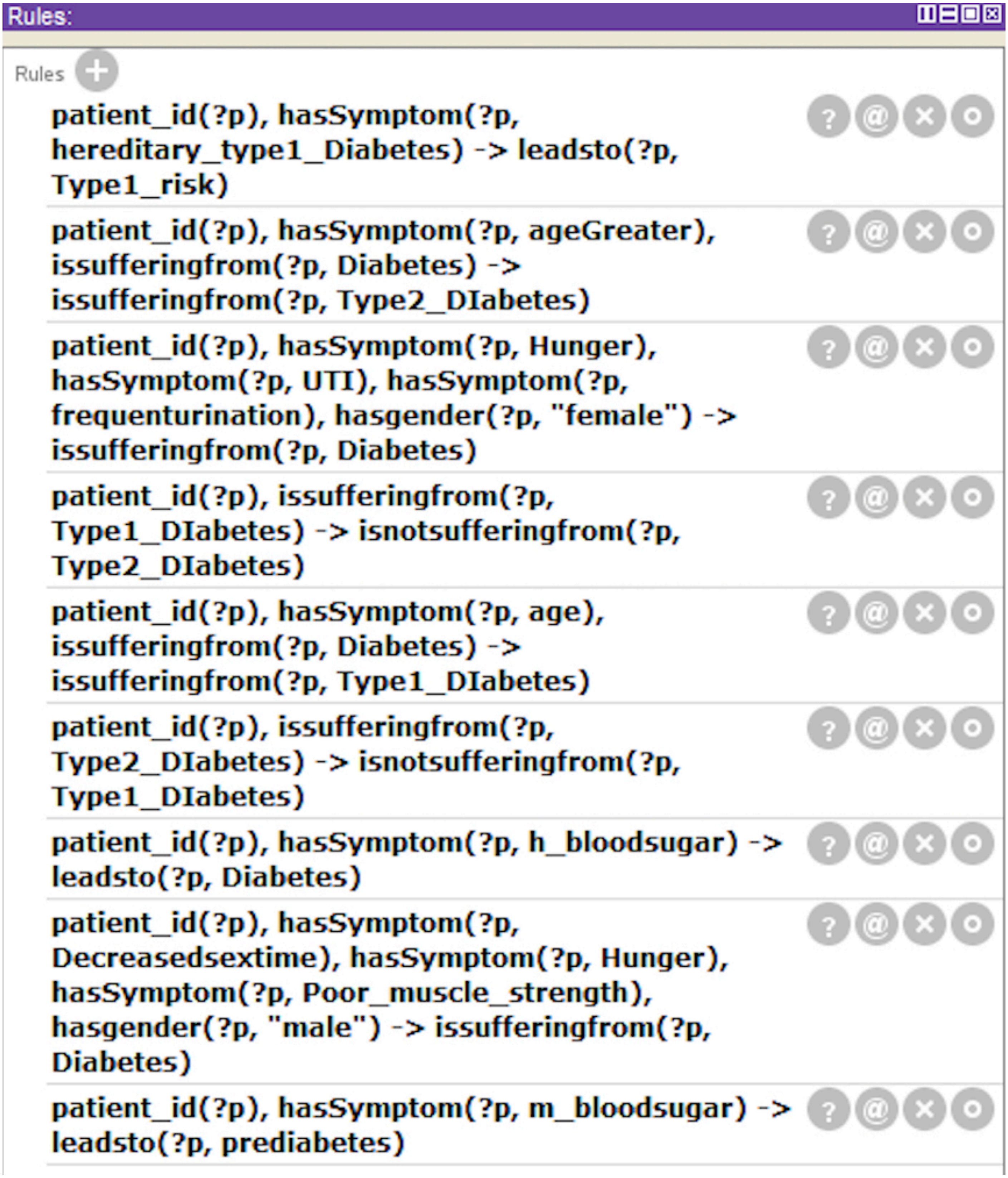


Fig 4.2 - SWRl Rules Created By Converting knowledge based rule

5.4 Knowledge Graph

A collection of entities, where the types and the relationships between them are expressed by nodes and edges between these nodes, By describing the structure of the knowledge in a domain, the ontology sets the stage for the knowledge graph to capture the data in it.
there are, of course, other methods that use formal specifications for knowledge representation such as vocabularies, taxonomies, thesauri, topic maps and logical models. However, unlike taxonomies or relational database schemas, for example, ontologies express relationships and enable users to link multiple concepts to other concepts in a variety of ways.

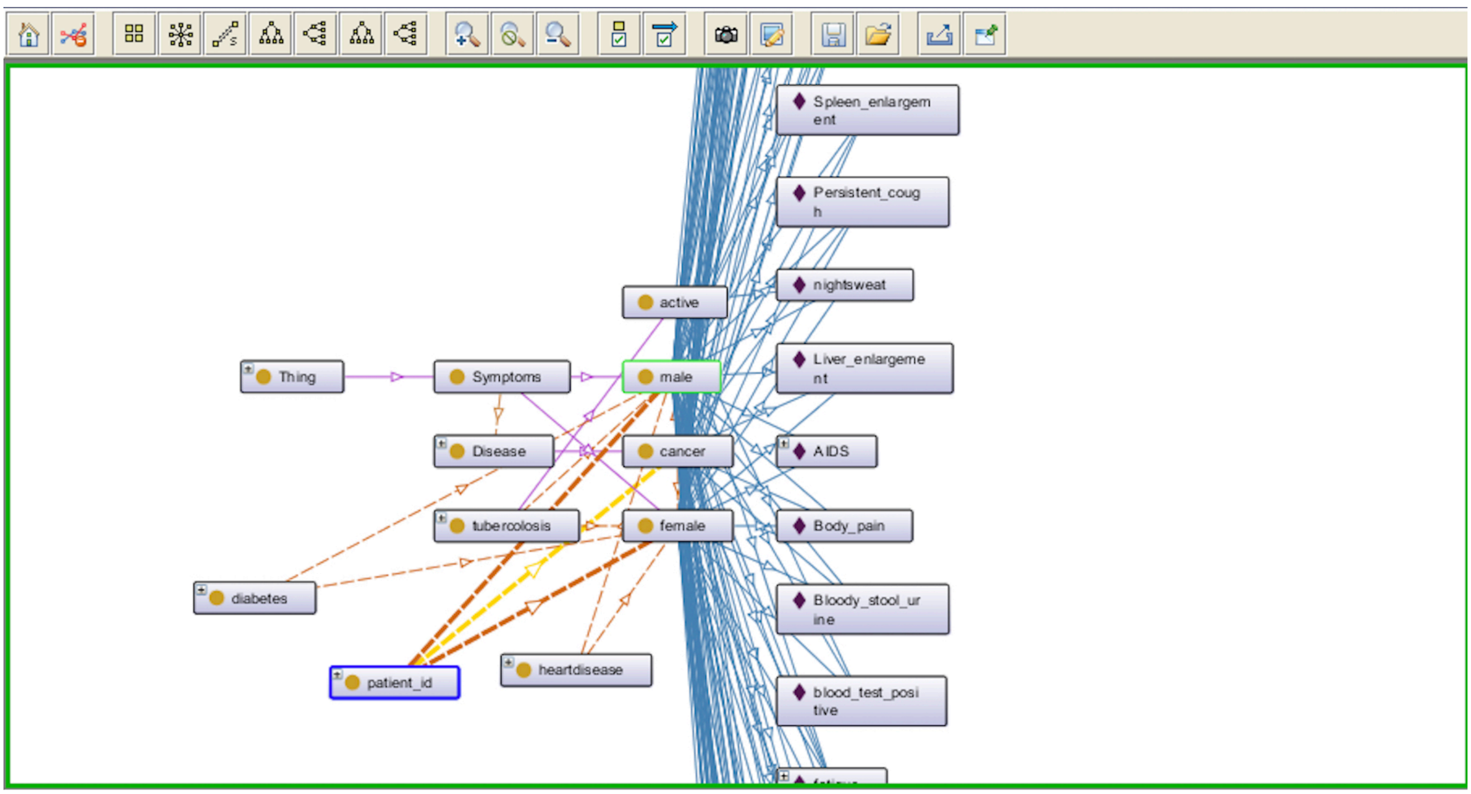


Fig 5 - Ontology Graph depicting the relationships between class and individual through properties

CHAPTER 6

CONCLUSION AND FUTURE WORK

This project has in fact woven great results inspite of being just a prototype and with limited data availability. Several examples of patients were taken and have been successfully tested.Especially in such times of pandemic this project becomes even more useful as it minimises the interaction between the patient and doctor to a bare minimum. Also the grave shortage of doctors will be compensated in some way or the other. Issue of misdiagnosis will as well-be solved and human error is reduced to a bare minimum. Such complex systems are relatively simple to make and it can be utilised in almost every field. Projects like these can be made by various techniques. Machine learning, natural language processing and convolution network can make the take easier without human intervention in SWRL rule formation. The best part yet about this approach is in fact this very approach. As every patient and every case is different from the other, this approach enables the doctor himself to add rules specific to a patient pertaining to their case and can also add new rules for new cases in medical profession.

Also, this project brings to an end a very dangerous millennial habit of surfing Google for symptoms and diseases the results of which have often been found highly volatile and inaccurate. Accuracy of the data on websites are highly inconsistent and thus the results.This approach also enables a layman to understand to some extent the backend of the project through Ontology graph apart from it being a boon for the developer themselves. It is only but a gateway to evolution for the future. It helps reduce human error to a minimum while keeping them in the loop. This approach enables generic as well as individual interaction and rules formulation making it so much effective.

In the near future a conversion feature may be added to the project for a first. It will allow now technical people such as doctors to write and incorporate their own rules easily into the symptoms. Afterwards this project may be developed into a whole system of its own which may include pulse oximeter, vitals checker and maintainer amongst others. It will correctly detect all the relevant symptoms from the subject’s body and will further eliminate the possibility of human error and improve accuracy of the result to maximum. Also we hope to build in future such low cost sensors which maybe attached into smartphones so that every one may be aware of their health at all this. This is expected to increase the mortality rate and age around the globe.

Fig 6 - Future Proposed Health care System[

6.0 GANTT CHART

ACTIVITY	TIME FRAME (Year 2020)				
	Jan.(13-01-2020)	February (13-02-2020)	March (16-03-2020)	April (6-04-2020)	May (30-05-2020)
Literature Survey					
Problem Identification					
Design					
Implementation					
Documentation					

Proposed Activity

Completed Activity

REFERENCES

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[2] G. Suresh Babu et al ,*Ontology driven knowledge based healthcare system and emerging area -challenges and opportunities*,ISPRS Technical Commission VIII Symposium, 09 – 12 December 2014.

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