Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

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Experiment 9

Aim:

Implement a rule based expert system using Protégé 5.5.

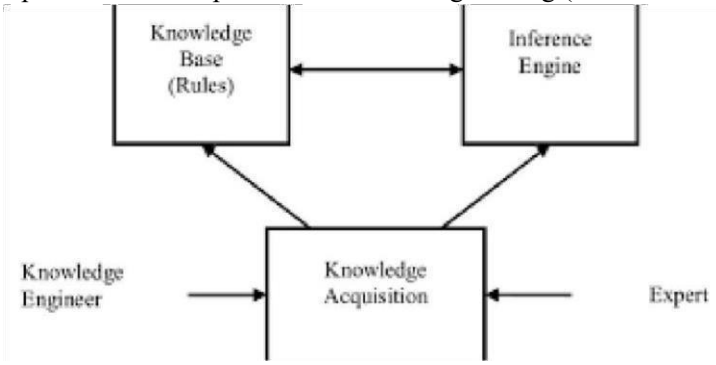
Theory:

The strength of an Expert System derives from its knowledge base - an organized collection of facts and heuristics about the system's domain. An ES is built in a process known as knowledge engineering, during which knowledge about the domain is acquired from human experts and other sources by knowledge engineers.

The accumulation of knowledge in knowledge bases, from which conclusions are to be drawn by the inference engine, is the hallmark of an expert system.

Knowledge Representation and the Knowledge Base

The knowledge base of an ES contains both factual and heuristic knowledge. Knowledge representation is the method used to organize the knowledge in the knowledge base.
Knowledge bases must represent notions as actions to be taken under circumstances, causality, time, dependencies, goals, and other higher-level concepts.



Several methods of knowledge representation can be drawn upon. Two of these methods include:

1. Frame-based systems - are employed for building very powerful ESs. A frame specifies the attributes of a complex object and frames for various object types have specified relationships.

2. Production rules - are the most common method of knowledge representation used in business.

Rule-based expert systems are expert systems in which the knowledge is represented by production rules.

A production rule, or simply a rule, consists of an IF part (a condition or premise) and a THEN part (an action or conclusion). IF condition THEN action (conclusion).

The explanation facility explains how the system arrived at the recommendation. Depending on the tool used to implement the expert system, the explanation may be either in a natural language or simply a listing of rule numbers.

Inference Engine

The inference engine:

1. Combines the facts of a specific case with the knowledge contained in the knowledge base to come up with a recommendation. In a rule-based expert system, the inference engine controls the order in which production rules are applied and resolves conflicts if more than

one rule is applicable at a given time. This is what A reasoning amounts to in rule-based systems.

2. Directs the user interface to query the user for any information it needs for further inferencing.

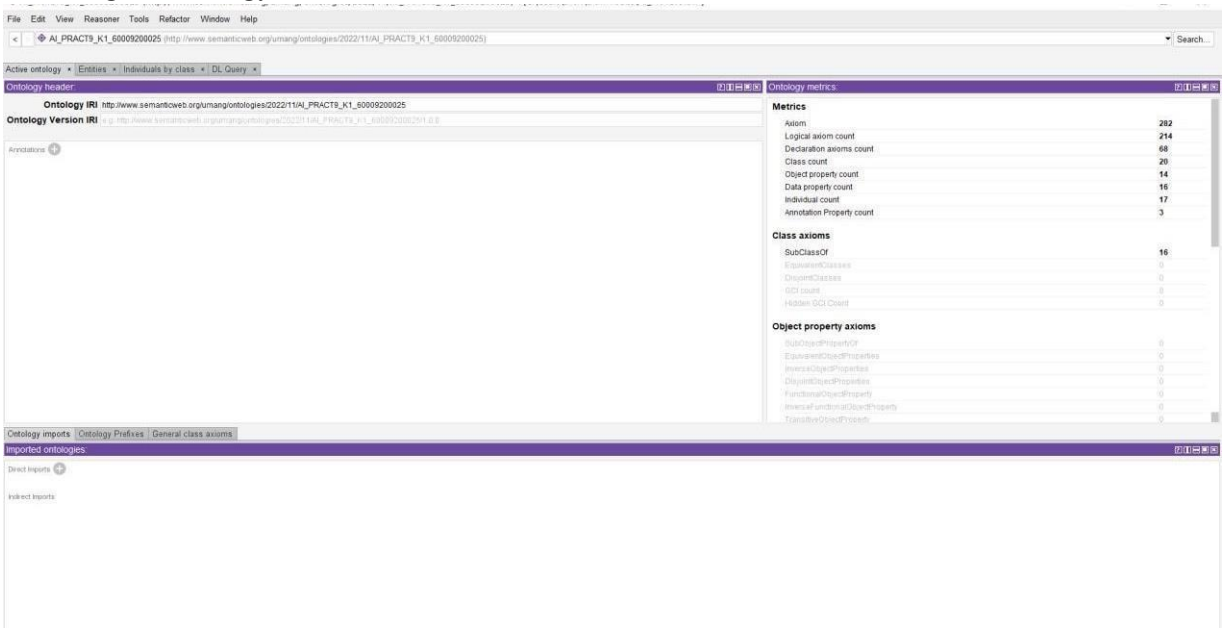
The facts of the given case are entered into the working memory, which acts as a blackboard, accumulating the knowledge about the case at hand. The inference engine repeatedly applies the rules to the working memory, adding new information (obtained from the rules conclusions) to it, until a goal state is produced or confirmed.

Lab Assignment to do:

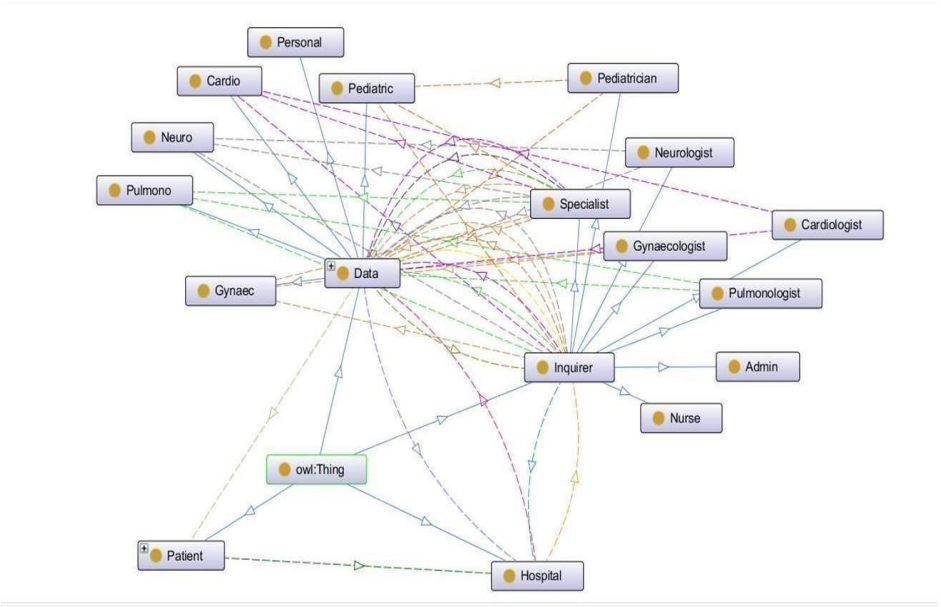
1. Implement access control use case with Inquirer, Data, Hospital and Patients as Main Classes.
2. Design appropriate Ontology and test it using Hermit Reasoner.
3. Execute Drool inference engine and observe the changes in Onto Graph.

Working:

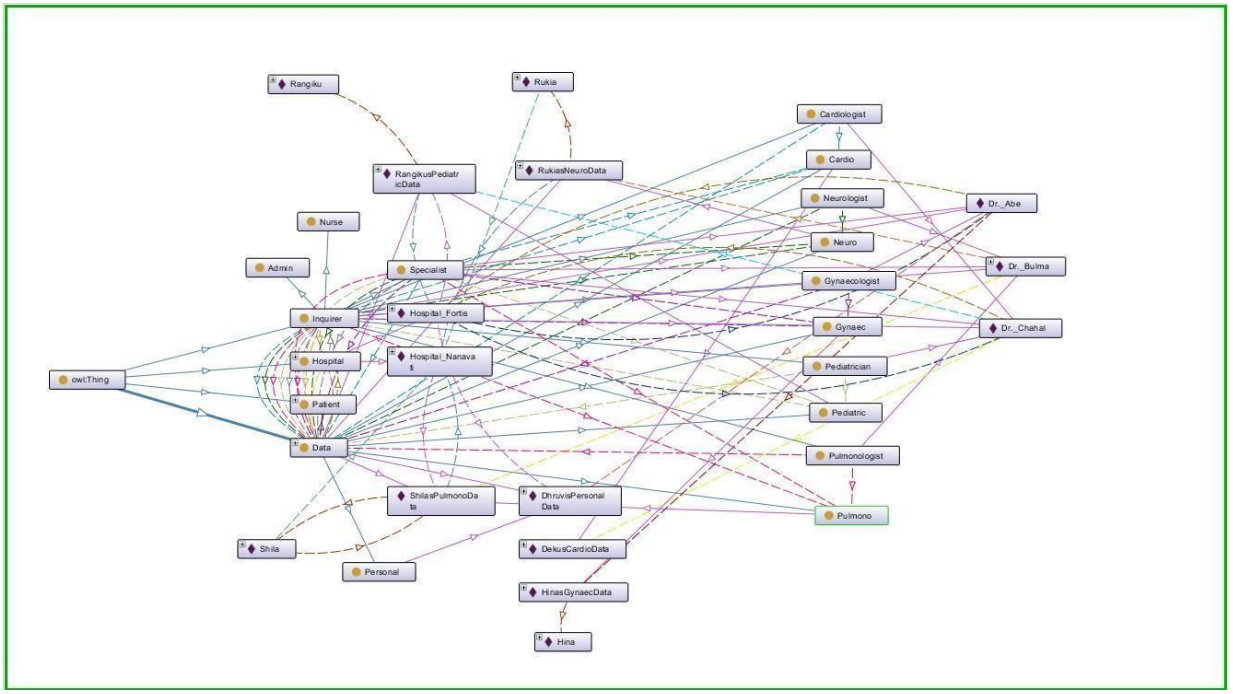
1. Creating an ontology



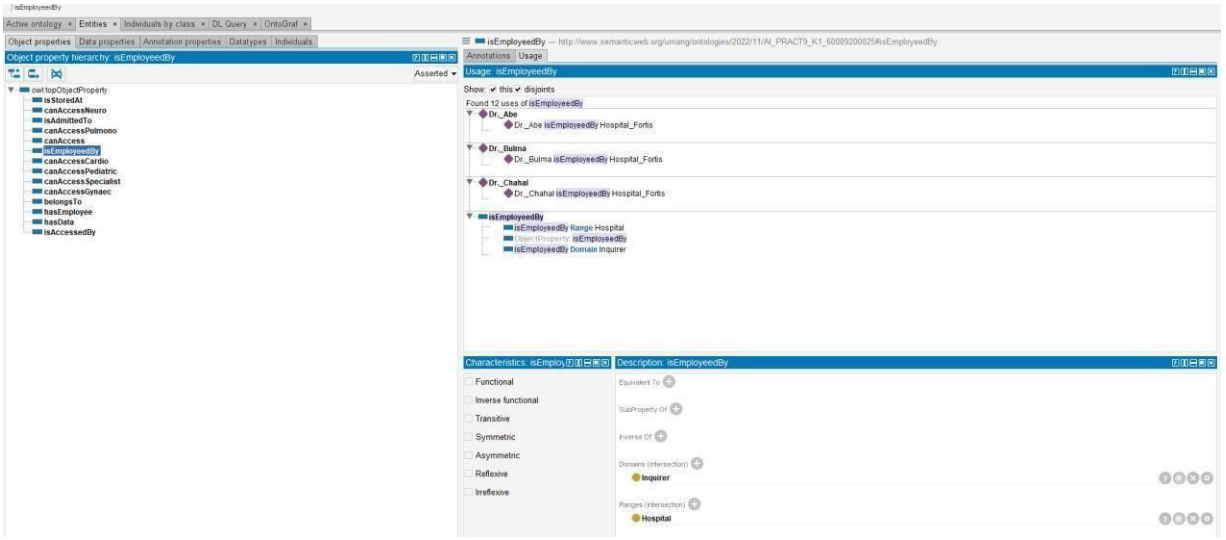
2. Under Entities, creating Classes for Data, Hospital, Inquirer, Patient



3. Creating an Onto Graph

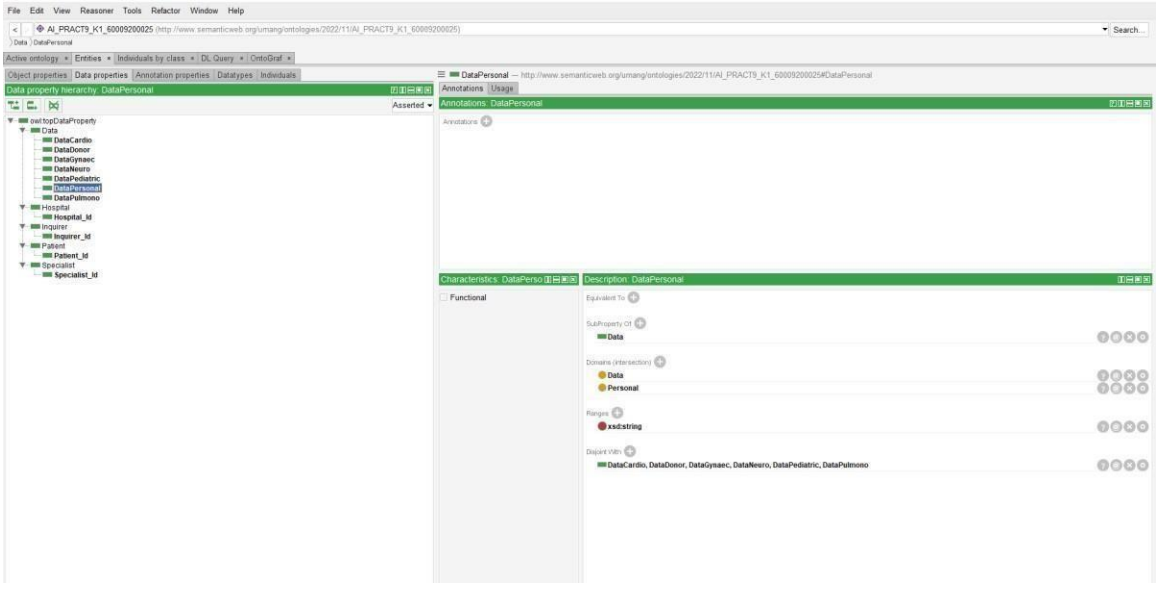


4. Defining object properties



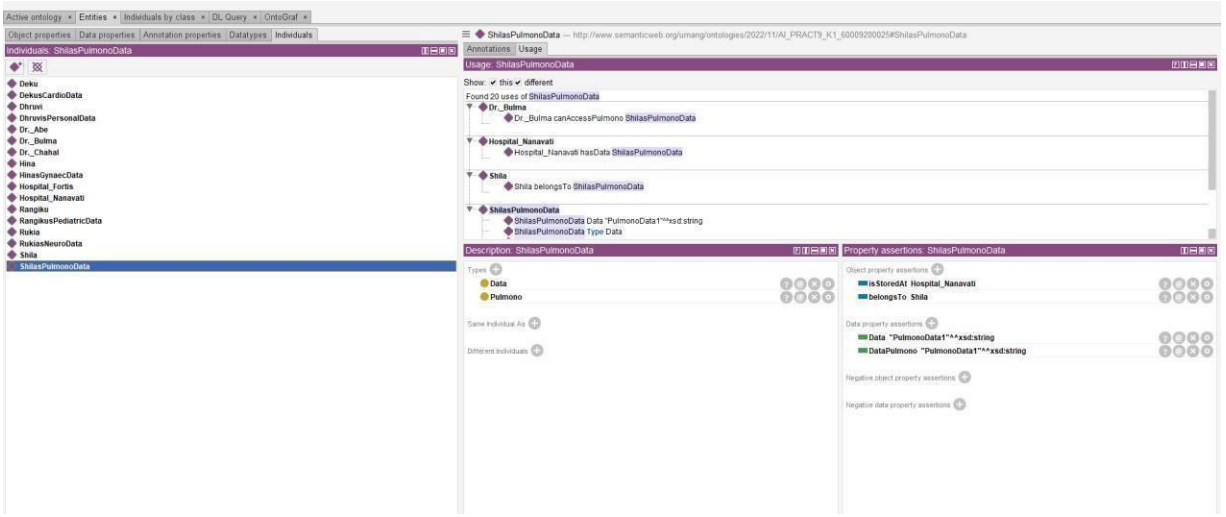
Different Object Properties are: belongsTo, canAccess, canAccess<Specific>, hasData, isAccessedBy, isAdmittedTo, isEmployeedBy, isStoredAt.

5. Defining different Data Properties

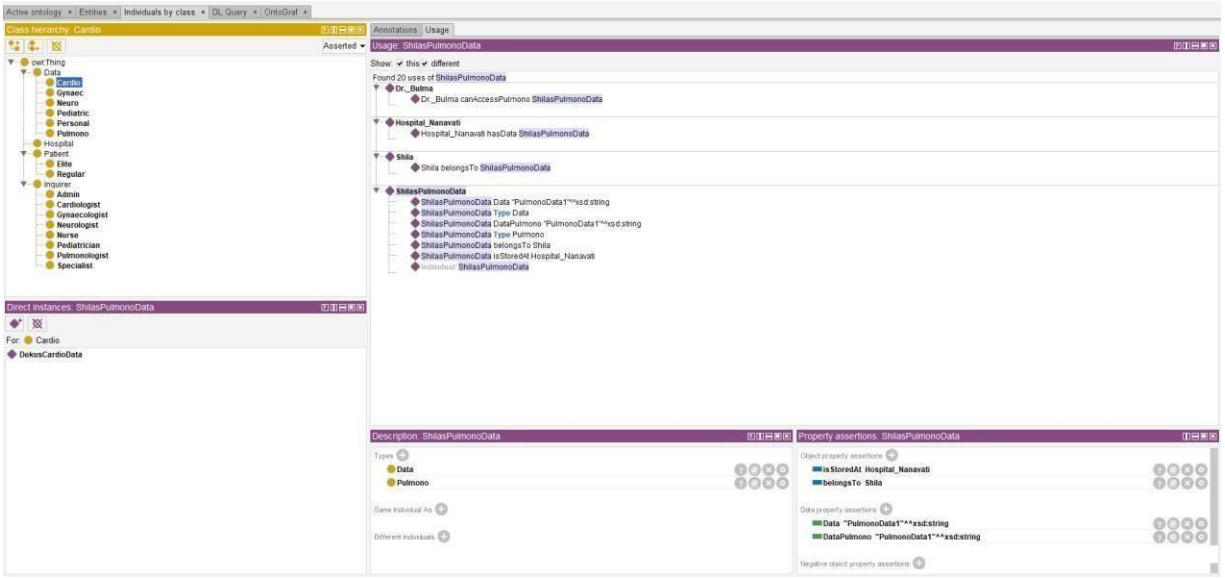


Different Data Properties are: Data, Data<Specific>, Hospital_Id, Inquirer_Id, Patient_Id, Specialist_Id.

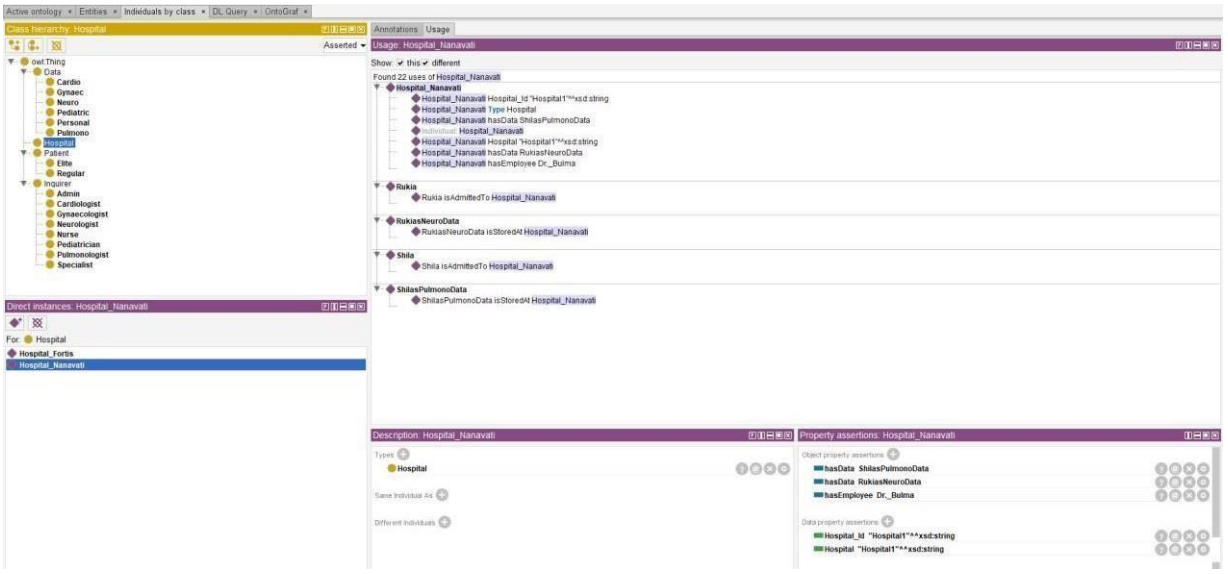
6. Defining Individuals



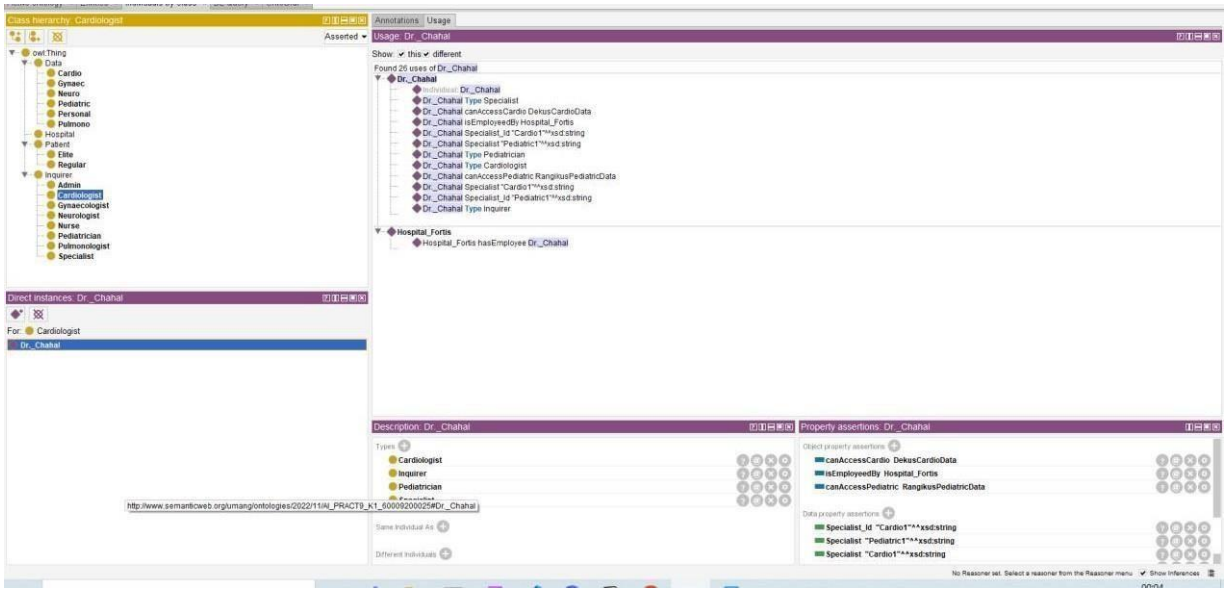
7. Summary – Individuals by Classes
    a. Individuals by Class: Data



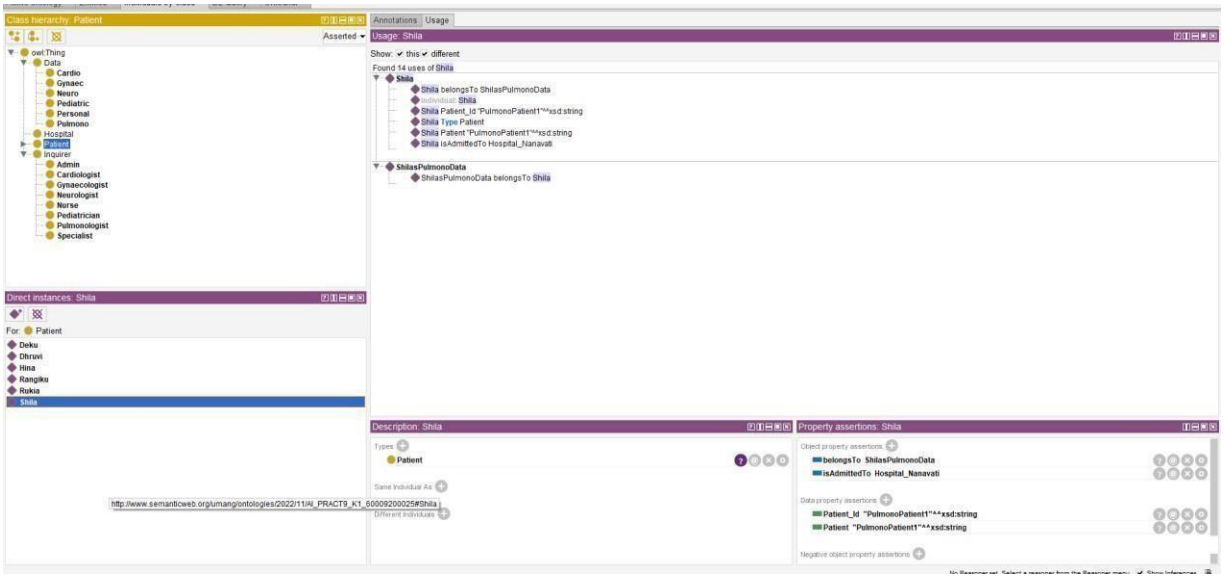
b. Individuals by Class:
Hospital



c. Individuals by Class
Inquirer

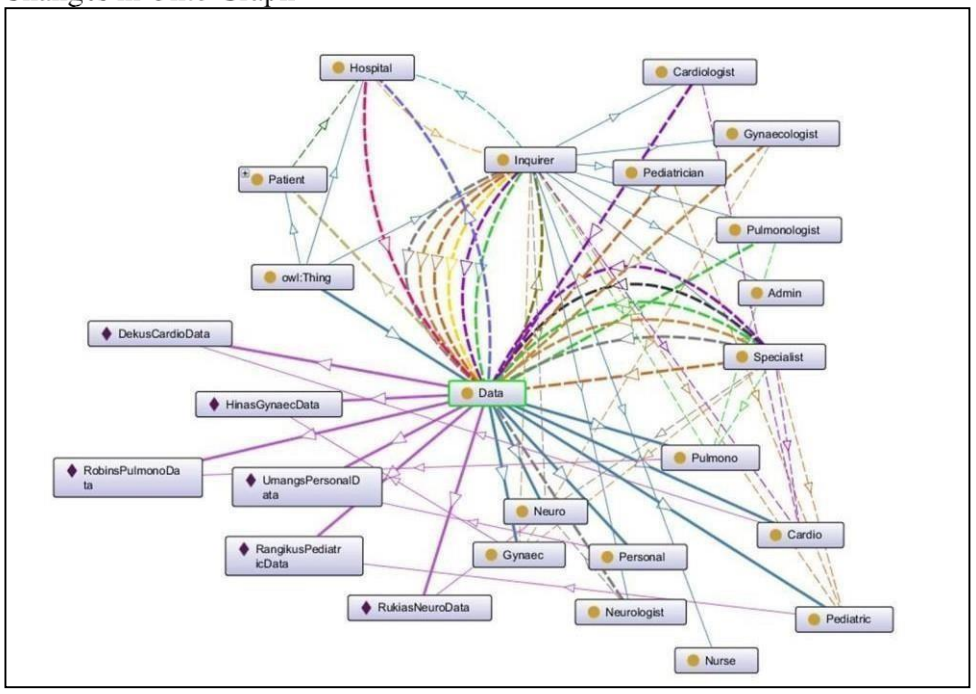


d. Individuals by Class Patient



8. Running Query

9. Changes in Onto Graph



Thus, we have successfully implemented a rule based expert system for a hospital using Protégé 5.5