KING KHALID UNIVERSITY

College of Computer Science

Dept. of Computer Science

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Subject Name: Expert System and Knowledge Engineering

Subject Code: 476CSM 3

Assignment 2

Semester 2, 1441-1442

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Question 1

Represent the following facts as a set of frames, using the notation described earlier:

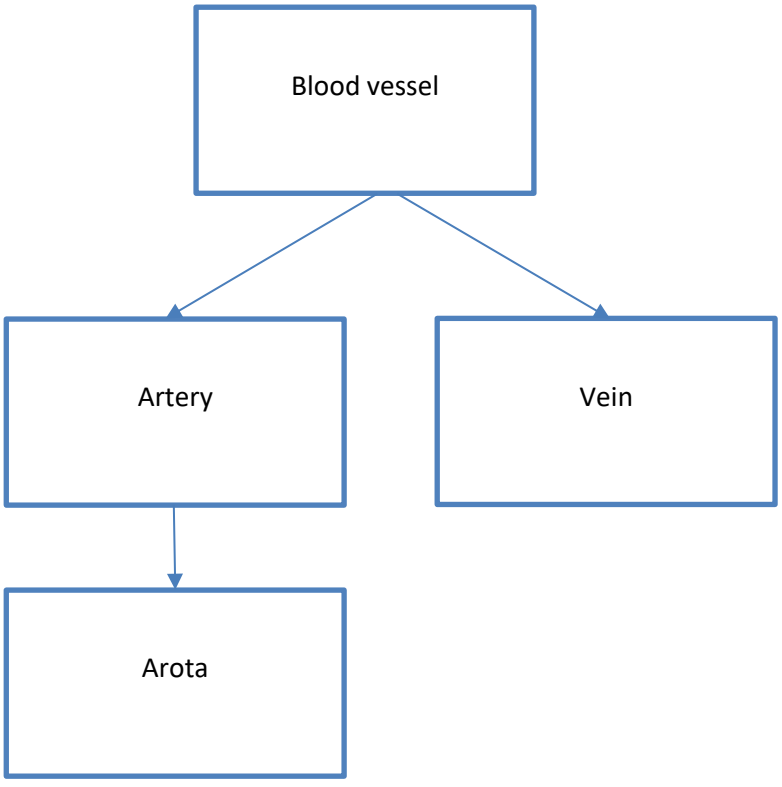
'The aorta is a particular kind of artery that has a diameter of 2.5 cm. An artery is a kind of blood vessel. An artery always has a muscular wall, and generally has a diameter of 0.4 cm. A vein is a kind of blood vessel, but has a fibrous wall. Blood vessels all have tubular form and contain blood'. (With thanks to Alison Cawsey [1998] for permission to use this question.)

Blood vessel Frame	
IS	Blood vessel
DIAMETER	2.5 cm
FORM	Tubular
CONTAINS_BLOOD	True

Artery Frame	
IS	Blood vessel
DIAMETER	0.4 cm
FORM	Tubular
WALL	Muscular

Vein Frame	
IS	Blood vessel
WALL	Fibrous

Arota Frame	
IS	Artery
DIAMETER	2.5 cm



Question 2: Explain the Blackboard ARCHITECTURES in details with example, Purpose, Applications with Advantages and Limitations of Blackboard Architectures. **Ref to text book**

solution:

A knowledge base is required to categorise pets and store details of appropriate foods, environmental needs, etc. The system will then diagnose medical problems and offer advice on the appropriate care. Which of the following three knowledge representation methods would you use for this problem and why?

- Rules
- Frames
- Semantic networks.

Semantic networks could be used for this problem but inference, i.e., the diagnosis, would be complex. Therefore, it may be better to restrict the use of semantic networks to the knowledge acquisition phase of the project, i.e., use them as a communication tool between the knowledge engineer and expert. After this stage the knowledge would be converted into another format. Frames are much simpler being restricted to is a style relationships. Frames would provide a good method of storing the data about the pets and it would be easy to categorise them into suitable hierarchies, e.g. small mammals, reptiles, etc. Similar pets could inherit data and characteristics from frames higher up in the hierarchy, thus simplifying the data stored (food etc.). Data on pet ailments could be stored as procedural code (demons) associated to particular slots, e.g. a cat frame could have a slot called eating disorders and another called infections. However, encoding this knowledge as procedural code could get messy so let us consider rules as an alternative to frames. With rules storing details of the pets could be complex and difficult to visualise however defining rules to describe pet problems and the associated symptoms would be quite easy. Thus, using rules storing details of the actual pets would be complex but invoking inference to diagnose problems would be easy.

Question 3

Use the Motor Vehicles frame (below) and the information specified to complete a three-wheeled Car frame.

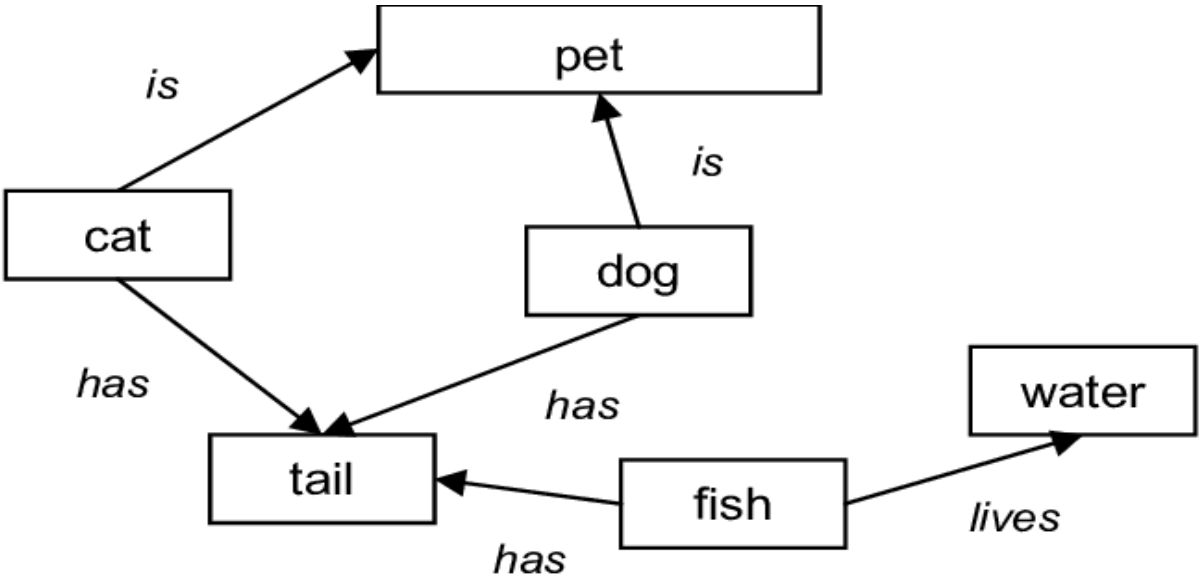
Three-wheeled cars are manufactured by 'Smith's'. They have 1.1 litres engines and have a maximum speed of 100 kilometres per hour.

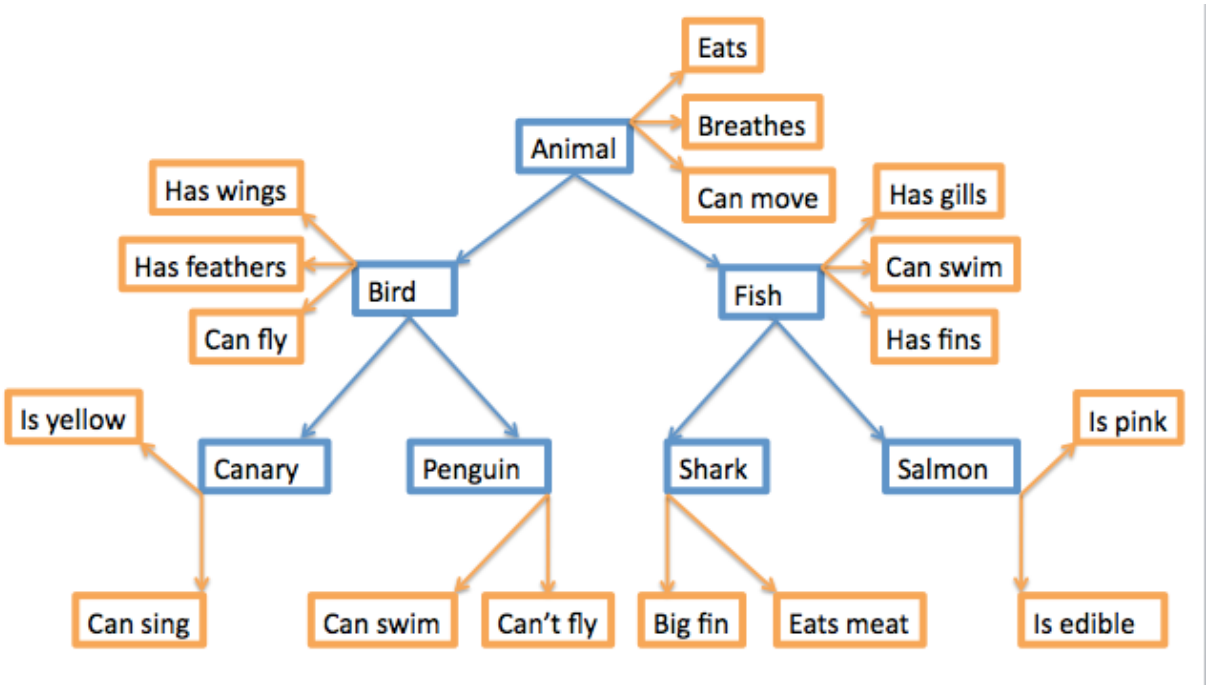
Motor Vehicle FRAME	
CAN_TRAVEL_ON_ROADS	True
NUMBER_OF-WHEELS	Default = 4

Three-wheeled Car FRAME	
IS A	Motor Vehicle
MANUFACTURER	Smith's
CAN TRAVEL ON ROADS	True (inherited from car frame)
NUMBER OF-WHEELS	3
ENGINE SIZE	1.1 litres
Maximum Speed	100 kilometres per hour

Remember that the NUMBER OF WHEELS slot does not take on the default value in this situation but is overwritten with the new value of 3.

***Question 4*: Explain the following semantic networks.**





Solution:
Let's understand the semantic network in the simple meaning of all the relations.

(1) Let's see the the semantic network which are represented in black color first,

The cat is a pet and Cat has a tail.
The dog is also a pet and Dog has a tail.
The fish has a tail and the fish lives in water.

(2) Let's see the semantic network which is written in colorful boxes,

Animal can eat
Animal can breath
The animal can move from one place to another.
Bird is an animal
Bird has wings
Bird has feathers
Bird can fly
Canary is a bird
Canary's colour is yellow
Canary can sing
Penguin is a bird
Penguin can swim
Penguin can't fly
Fish is also an animal
Fish has gills
Fish can swim
Fish has fins
Shark is one type of fish
Shark has a big fin
Shark eats meat
Salmon is one type of fish
Salmon's colour is Pink
Salmon is edible
In this way, we can interpret the semantic networks used to store more information in form of this representation so that we can easily understand what is the overall concept of any topic which is included in the semantic networks.

Question 5: Explain the six-stage life cycle and also Consider the limitations of the waterfall and prototyping life cycles and justify the need for a methodology when developing large-scale KBSs.

Solution:
Explanation of six-stage life cycle with limitations of the waterfall and prototyping life cycles:

six-stage life cycle It consists of six different stages all of which are important in itself and they follow a specific order except in certain circumstances.
there are six steps:
include planning.
Analysis.
Design.
Development & implementation.
Testing & deployment and maintenance.

in the planning step planning can also include feedback from stakeholders, stakeholders are anyone who stands to benefit from the application and try to get feedback from potential customers, developers, subject matter experts, and sales reps.

in the analysis step, it is a detailed analysis of the software is performed to identify overall requirements of client, this step is necessary to make adjustments and to ensure that software functions properly at the end, this involves the process of gathering and interpreting facts, diagnosing problems, and recommending improvements to the system.

the design step is a models the way a software application will work, here only the design will be there and not the code the outcome from this phase is high-level document and low-level document which works as an input to the next phase.

the development & implementation step is the stage where the engineering team actually codes the product. at this stage, the development team translates the high-level overview communicated in the roadmap into a tactical set of assignments, due dates, and day to day work schedules.

the testing & deployment step is entails the evaluation of the created software, the testing team evaluates the developed product in order to assess whether they meet the requirements specified in the planning phase.

the maintenance step the product is maintained, any bugs vulnerabilities are fixed, as necessary. Limitations of waterfall, the waterfall model assumes that the requirements of a system can be frozen before the design begins this is possible for systems designed to automate an existing manual system but for absolutely new system, determining the requirements is difficult, as the user himself does not know the requirements, this makes no allowances for prototyping.it is very difficult to go back and change something that was not well-documented upon in the concept stage. The limitations of the prototyping life cycles, It has poor documentation because of continuously changing customer requirements, and it is one of the software development life cycle models in which a prototype is built with minimal requirements. this prototype is then tested and modified based on the feedback received from the client until a final prototype with desired functionalities gets created.

there are three methods need to develop large-scale KBSs:

1.blackboard architectures:a method for structuring large-scale KBSs.

2. problem-solving methods : Problem-solving methods of which knowledge acquisition design system is an important example.

3. the hybrid methodology : it will designed to support the development of hybrid information systems, that is the integration of KBSs with traditional information systems.