Why use this data structure?

- It enables attribute values to be retrieved quickly
- Properties of relations are easy to describe .
- It allows ease of consideration as it embraces aspects of object oriented programming.

Weak slot-and-filler structure

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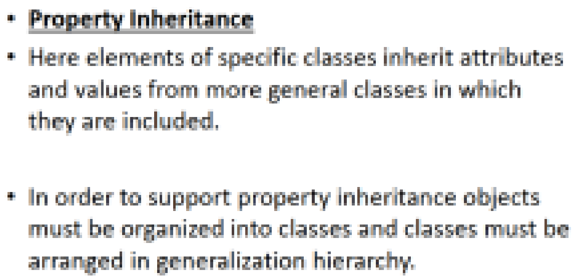
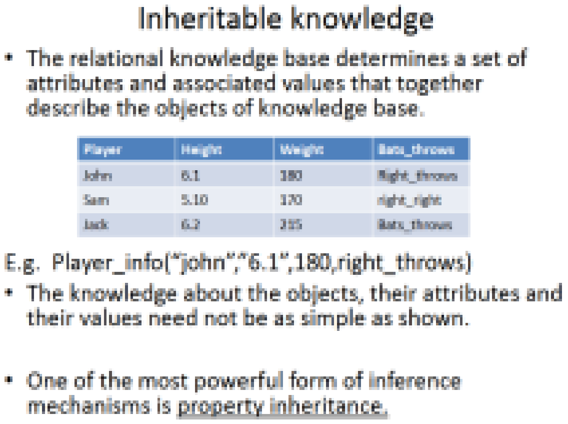


- **Property Inheritance**
- Here elements of specific classes inherit attributes and values from more general classes in which they are included.

- In order to support property inheritance objects must be organized into classes and classes must be arranged in generalization hierarchy.



Inheritable knowledge

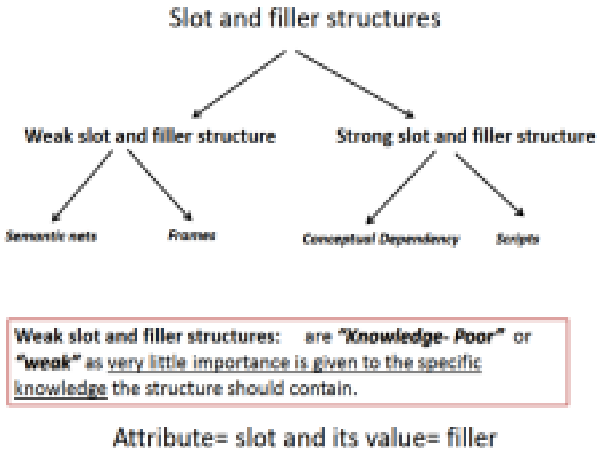
- The relational knowledge base determines a set of attributes and associated values that together describe the objects of knowledge base.

Player	Height	Weight	Bats_throws
John	6.1	180	Right_throws
Sam	5.10	170	right_right
Jack	6.2	215	Bats_throws

E.g. Player_info("john","6.1",180,right_throws)

- The knowledge about the objects, their attributes and their values need not be as simple as shown.

- One of the most powerful form of inference mechanisms is property inheritance.


Slot and filler structures
Weak slot and filler structure
Strong slot and filler structure
Semantic nets
Frames
Conceptual Dependency
Scripts

Weak slot and filler structures: are ***"Knowledge- Poor"*** or ***"weak"*** as very little importance is given to the specific knowledge the structure should contain.

Attribute= slot and its value= filler

Weak-slot-filler

- A slot is an attribute value pair in its simplest form.
- A filler is a value that a slot can take -- could be a numeric, string (or any data type) value or a pointer to another slot.
- A weak slot and filler structure does not consider the content of the representation.

Semantic Network Representation(Ross Quillian)

- Semantic networks are alternative of predicate logic for knowledge representation.
- In Semantic networks, we can represent our knowledge in the form of graphical networks.
- This network consists of nodes representing objects and arcs which describe the relationship between those objects.
- Semantic networks can categorize the object in different forms and can also link those objects. Semantic networks are easy to understand and can be easily extended.

This representation consist of mainly two types of relations:

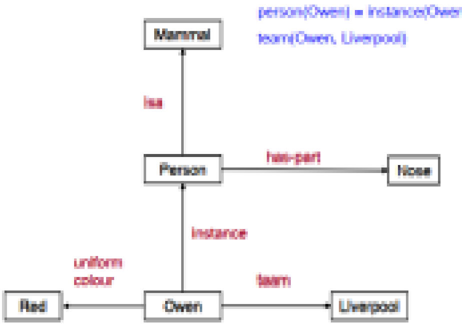
- IS-A relation (Inheritance)
- Kind-of-relation

The Major Idea

- The meaning of a concept comes from its relationship to other concepts, and that,
- The information is stored by interconnecting nodes with labeled arcs.
- Semantic nets initially we used to represent labeled connections between nodes.

Here,

Lines ==attributes and boxed nodes== object/values of attributes of an object.

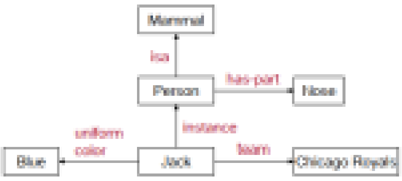


person(Owen) = instance(Owen, Person)

team(Owen, Liverpool)

This structure is also called as **slot and filler structure.** These structures are the devices to support property inheritance along isa and instance links.

- In semantic nets information is represented as:
  - set of nodes connected to each other by a set of labelled arcs.
- **Nodes represent**: various objects / values of the attributes of object .
- **Arcs represent:** relationships among nodes.



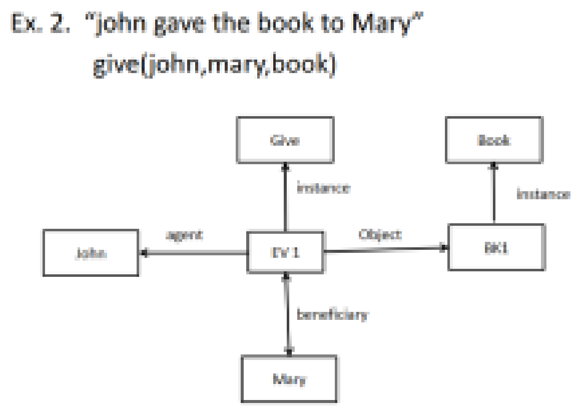
- Advantage of slot and filler structures:

1. monotonic reasoning can be performed more effectively than with pure logic and non monotonic reasoning is easily supported.

2. Makes it easy to describe properties of relations.

   e.g. "does Owen has-part called nose?"

3. Form of object oriented programming and has advantages such as modularity and ease of viewing by people.



Ex. 2. "john gave the book to Mary"
give(john,mary,book)

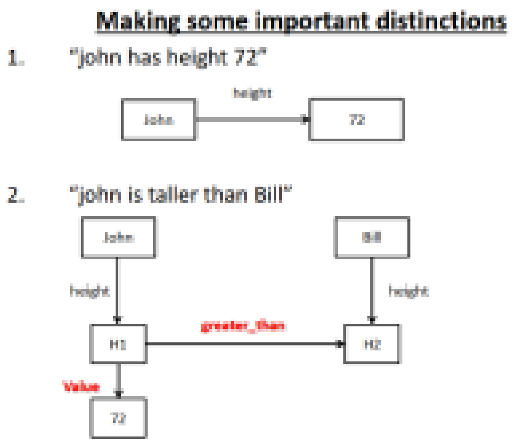
Advantages of Semantic Networks

• Easy to visualize and understand. • The knowledge engineer can arbitrarily defined the relationships.

• Related knowledge is easily categorised. • Efficient in space requirements. • Node objects represented only once. • Standard definitions of semantic networks have been developed.

Limitations of Semantic Networks

• Binary relations are usually easy to represent, but some times is difficult. • E.g.



Making some important distinctions

1. "john has height 72"
2. "john is taller than Bill"

try to represent the sentence: – "John caused trouble to the party".

who where
John cause party what

trouble

Limitation

• Other problematic statements. . . –
negation "John does not go fishing";
– **disjunction** "John eats pizza or fish and chips"; –
…

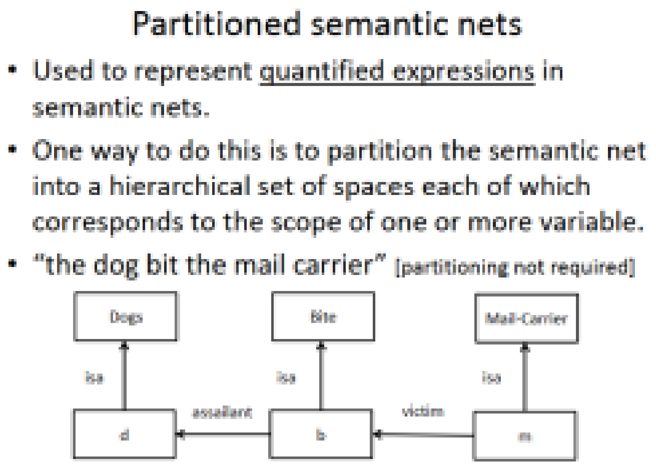
• Quantified statements are very hard for semantic nets. E.g.:
– "Every dog has bitten a postman"
– "Every dog has bitten every postman" –
Solution: **Partitioned semantic networks** can represent quantified statements.

Partitioned Semantic Net

- The central idea of partitioning is to allow groups, nodes and arcs to be bundled together into units called **spaces** – fundamental entities in partitioned networks, on the same level as nodes and arcs (Hendrix 1979:59).
- Every node and every arc of a network belongs to (or lies in/on) one or more spaces.
- Some spaces are used to encode 'background information' or generic relations; others are used to deal with specifics called 'scratch' space.

Partitioned Semantic Network

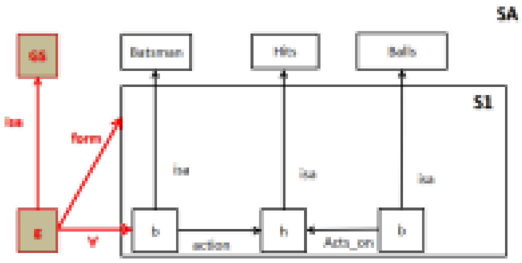
- Hendrix (1976 : 21-49, 1979 : 51-91) developed the so-called **partitioned semantic network** to represent the difference between the description of an individual object or process and the description of a set of objects. The set description involves **quantification**.
- Hendrix partitioned a semantic network whereby a semantic network, loosely speaking, can be **divided** into one or more networks for the description of an individual.



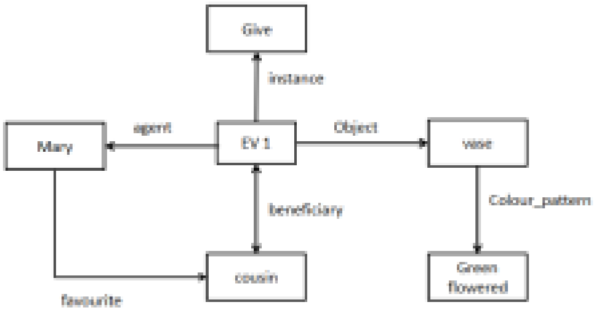
Partitioned semantic nets

- Used to represent quantified expressions in semantic nets.
- One way to do this is to partition the semantic net into a hierarchical set of spaces each of which corresponds to the scope of one or more variable.
- "the dog bit the mail carrier" [partitioning not required]

- “every batsman hits a ball”



- More examples of sementic nets:
- “ Mary gave the green flowered vase to her favourite cousin”



Exercise

- Every parent love their child.
- Every students loves to party.