



SNS COLLEGE OF TECHNOLOGY



Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF INFORMATION TECHNOLOGY

19CSE303 – ARTIFICIAL INTELLIGENCE

III YEAR IV SEM

UNIT IV – UNCERTAIN KNOWLEDGE AND REASONING

TOPIC – Semantic Network

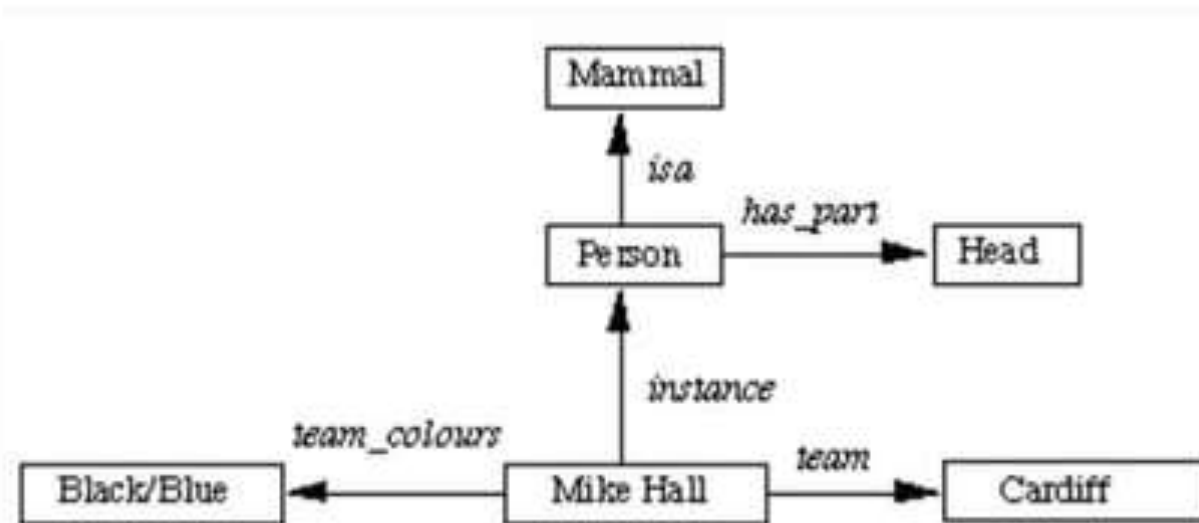


Semantic Net

- Form of knowledge representation
- Predicate logic alternative
- Labelled directed graph
- Components:
 - Nodes – object or concept
 - Links – relation between nodes.



Semantic Nets



- `isa(person, mammal)`
- `instance(Mike Hall, person)`
- `team(Mike Hall, Cardiff)`



Kinds of Semantic Nets

Definitional Networks

- Emphasize the *subtype* or *is-a* relation between a concept type and a newly defined subtype.

Supreme genus:

Differentiae:

Subordinate genera:

Differentiae:

Subordinate genera:

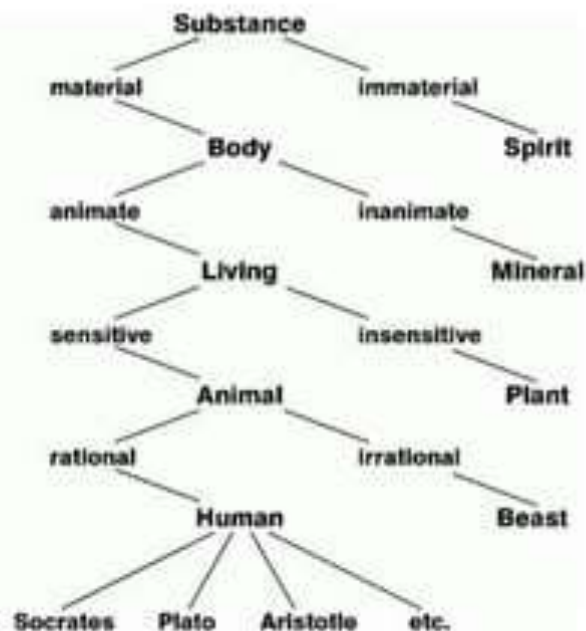
Differentiae:

Proximate genera:

Differentiae:

Species:

Individuals:

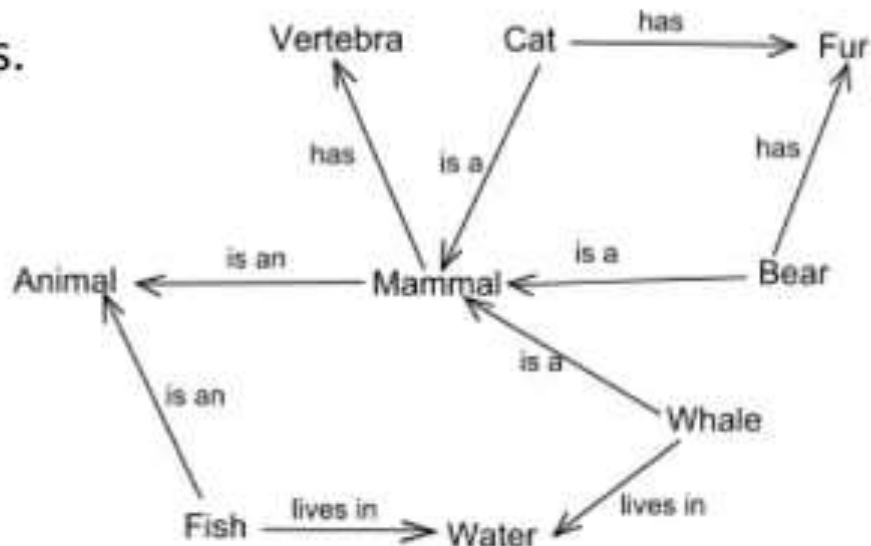




Kinds of Semantic Nets

Assertional Networks

- Designed to assert propositions.

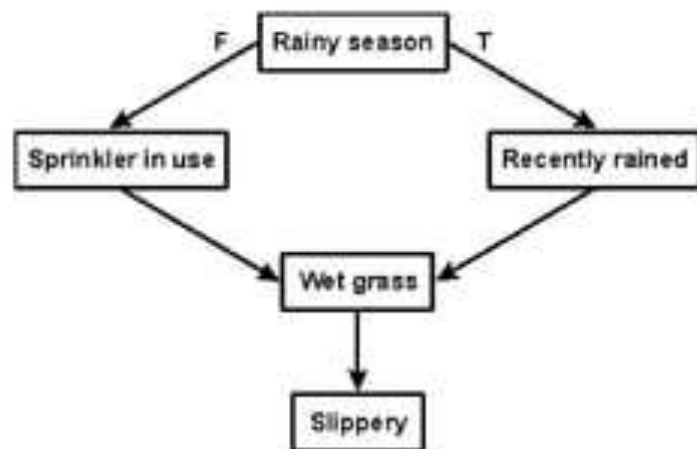




Kinds of Semantic Nets

Implicational Networks

- Uses implication as the primary relation for connecting nodes.

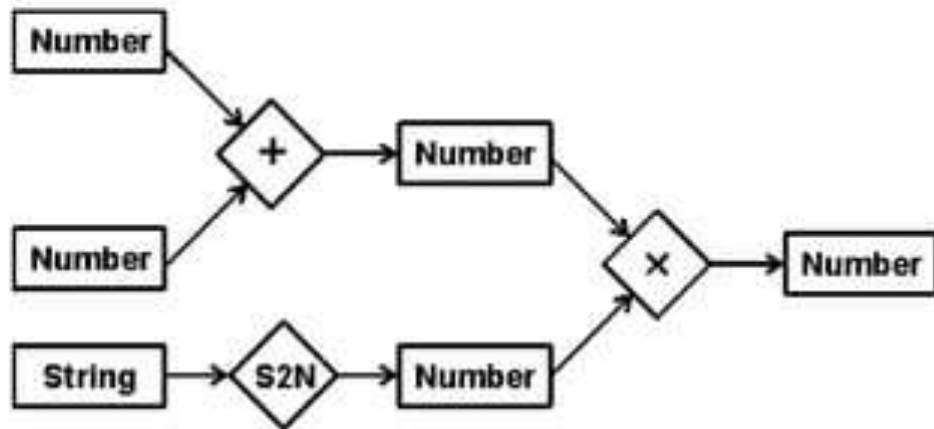




Kinds of Semantic Nets

Executable Networks

- Contain mechanisms that can cause some change to the network itself.

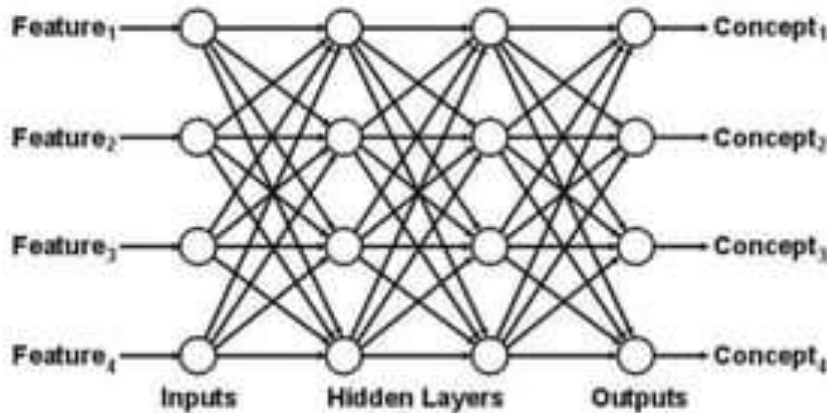




Kinds of Semantic Nets

Learning Networks

- Networks that build or extend their representations by acquiring knowledge from examples.

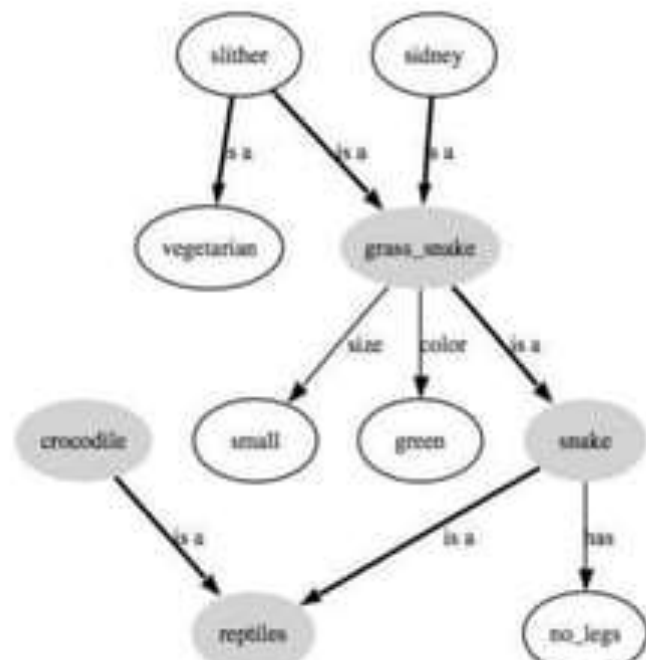




Kinds of Semantic Nets

Hybrid Networks

- Networks that combine two or more of the previous techniques, either in a single network or in separate, but closely interacting networks.





Semantic Relations

- Antonymy - A is the opposite of B (Cold is the opposite of warm)
- Holonymy - B has A as a part of itself (Bedroom has bed)
- Homonymy - A and B, are expressed by the same symbol. (Both a financial institution and a edge of a river are expressed by the word bank)
- Hypernymy - A is the superordinate of B. A is the general kind of B (Animal is a hypernym of dog)
- Hyponymy or troponymy - A is a subordinate of B. A is a specific kind or instance of B (Dog is a hyponym of animal)
- Meronymy - A is part of B (Engine is part of car)
- Synonymy - A denotes the same as B (Happy is synonym of blissful)



Common Semantic Relations

- There is no standard set of relations for semantic networks, but the following relations are very common:
- **INSTANCE:** X is an INSTANCE of Y if X is a specific example of the general concept Y.
 - Example: Elvis is an INSTANCE of Human
- **ISA:** X ISA Y if X is a subset of the more general concept Y.
 - Example: sparrow ISA bird
- **HASPART:** X HASPART Y if the concept Y is a part of the concept X. (Or this can be any other property)
 - Example: sparrow HASPART tail



Inheritance

- A key concept in semantic networks and can be represented naturally by following ISA links.
- In general, if concept X has property P, then all concepts that are a subset of X should also have property P.



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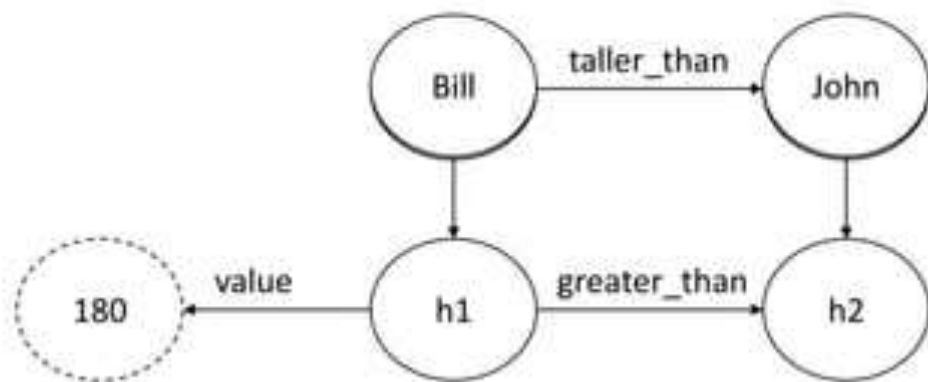


Converting to Semantic Net



Example

- Bill is taller than John.



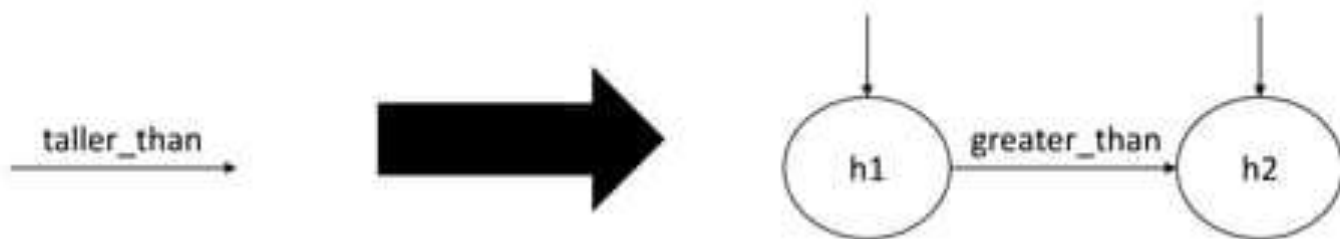


nodes represent object, and arcs represent relationships between those objects



Steps

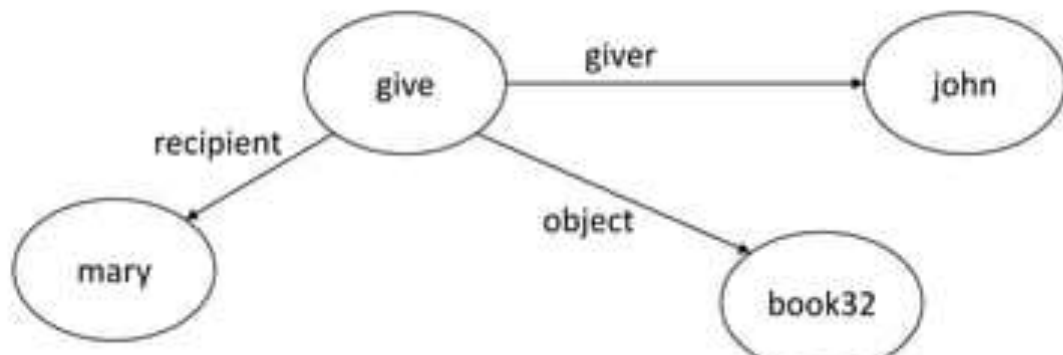
- Draw Relations on the basic of primitives
- Represent Complicated Relations with this primitives.





Reification

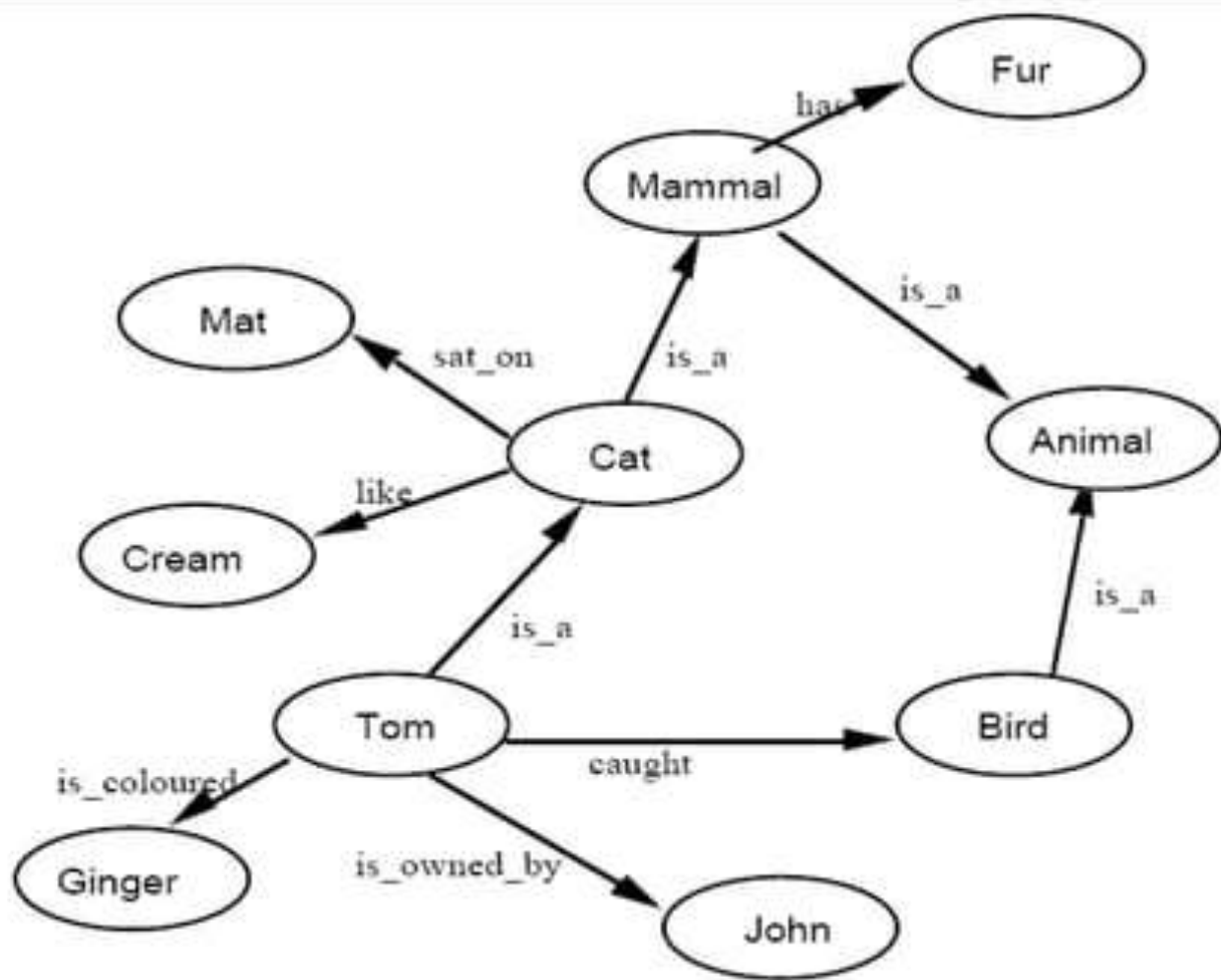
- reify v : consider an abstract concept to be real
- Non-binary relationships can be represented by “turning the relationship into an object”
- Example: a giver, a recipient and an object, `give(john,mary,book32)`

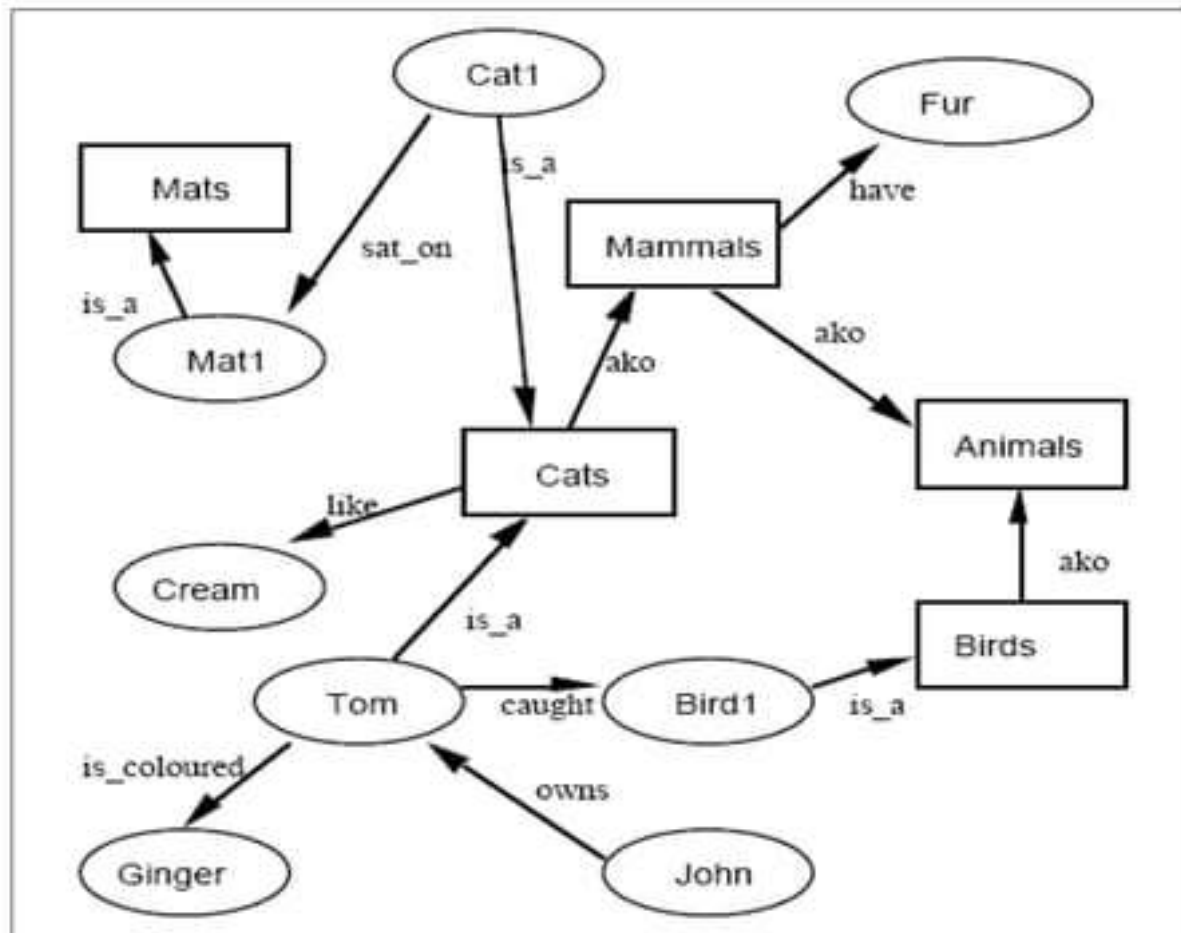




EXAMPLE

- Tom is a cat.
- Tom caught a bird.
- Tom is owned by John.
- Tom is ginger in colour.
- Cats like cream.
- The cat sat on the mat.
- A cat is a mammal.
- A bird is an animal.
- All mammals are animals.
- Mammals have fur.







Disadvantages of using Semantic Nets



Disadvantages

- There is no standard definition of link names
- Semantic Nets are not intelligent, dependent on creator
- Links are not all alike in function or form, confusion in links that asserts relationships and structural links.
- Undistinguished nodes that represent classes and that represent individual objects.
- Links on objects represent only binary relations.
- Negation, disjunction and general non-taxonomic knowledge are not easily expressed.



Advantages of using Semantic Nets



Advantages

- Natural
- Modular
- Efficient
- Convey meaning in a transparent manner
- Simple
- Understandable
- Translatable to PROLOG w/o difficulty



THANK YOU