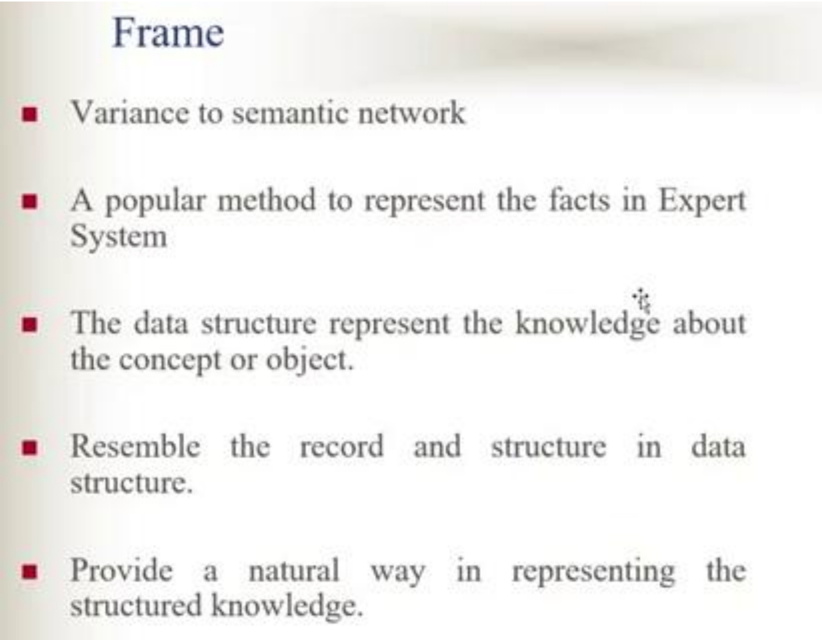
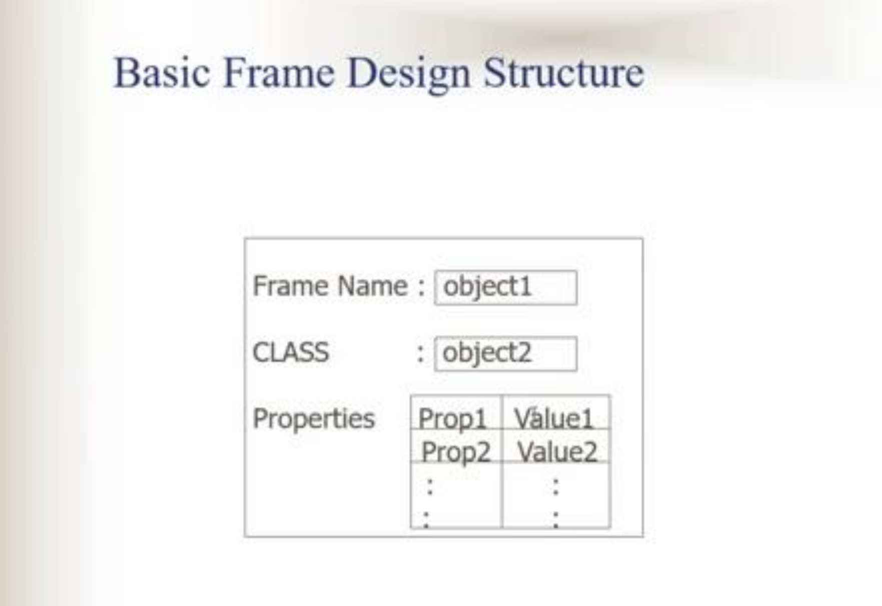


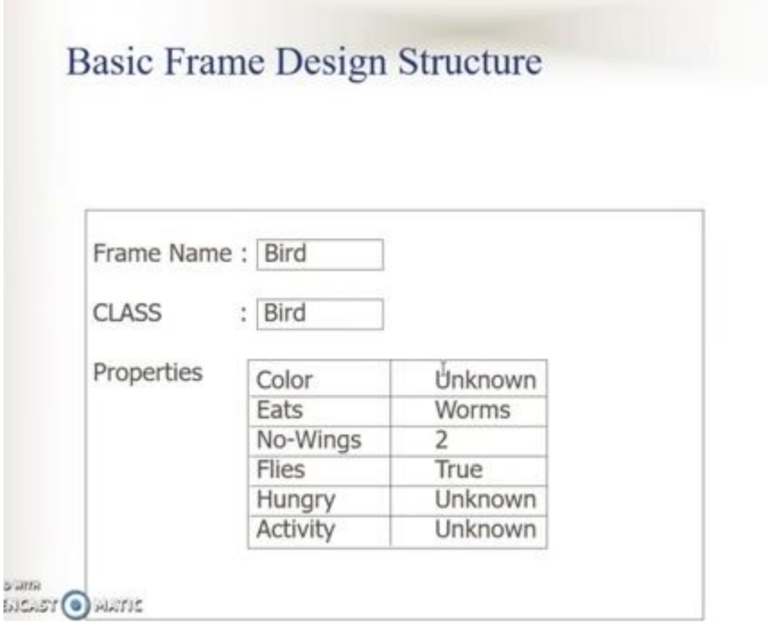
Frame

- Variance to semantic network
- A popular method to represent the facts in Expert System
- The data structure represent the knowledge about the concept or object.
- Resemble the record and structure in data structure.
- Provide a natural way in representing the structured knowledge.



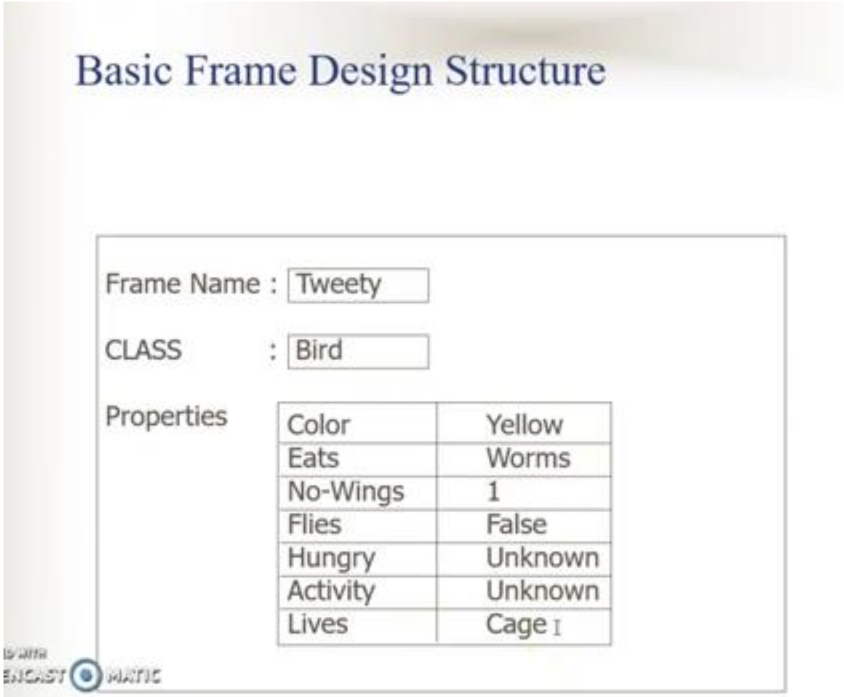
Basic Frame Design Structure

Frame Name :	object1	
CLASS :	object2	
Properties	Prop1	Value1
	Prop2	Value2
	:	:
	:	:



Basic Frame Design Structure

Frame Name :	Bird	
CLASS :	Bird	
Properties	Color	Unknown
	Eats	Worms
	No-Wings	2
	Flies	True
	Hungry	Unknown
	Activity	Unknown

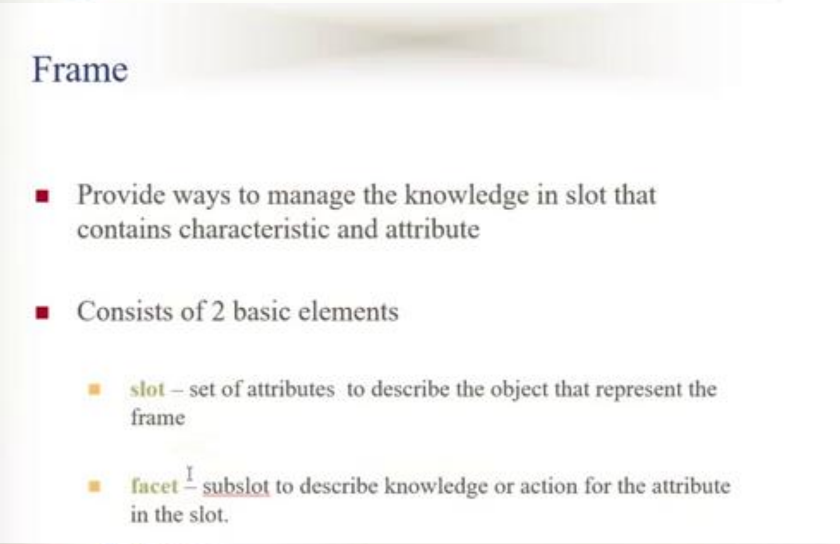


Basic Frame Design Structure

Frame Name :	Tweety
CLASS :	Bird

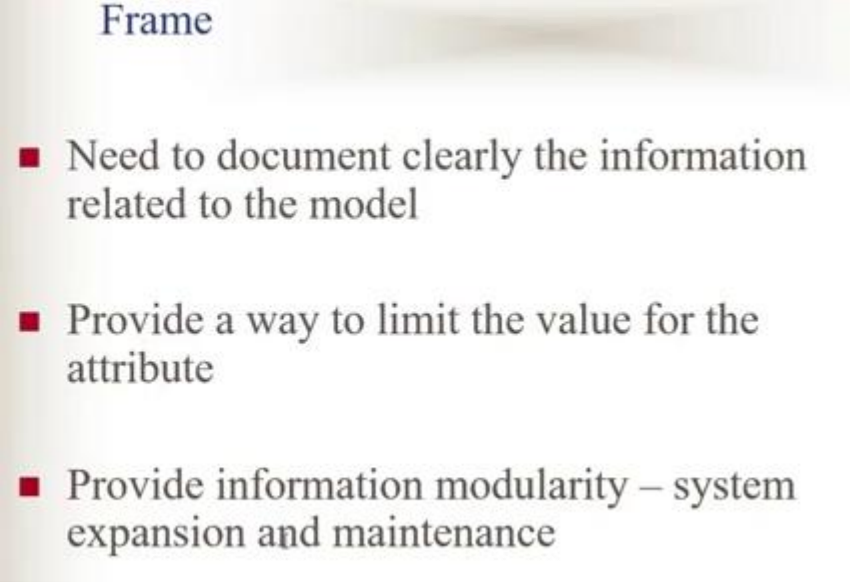
Properties

Color	Yellow
Eats	Worms
No-Wings	1
Flies	False
Hungry	Unknown
Activity	Unknown
Lives	Cage



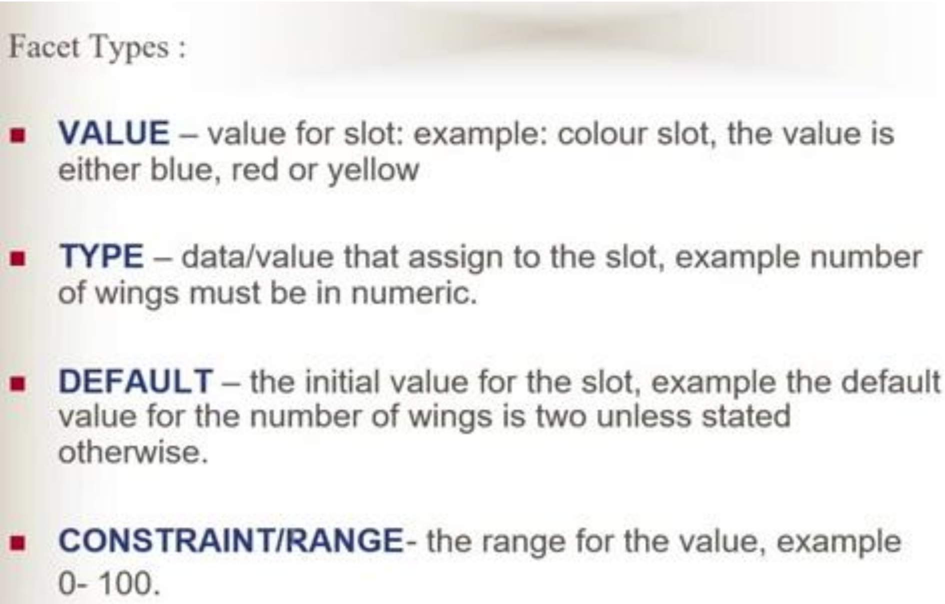
Frame

- Provide ways to manage the knowledge in slot that contains characteristic and attribute
- Consists of 2 basic elements
  - slot – set of attributes to describe the object that represent the frame
  - facet – subslot to describe knowledge or action for the attribute in the slot.



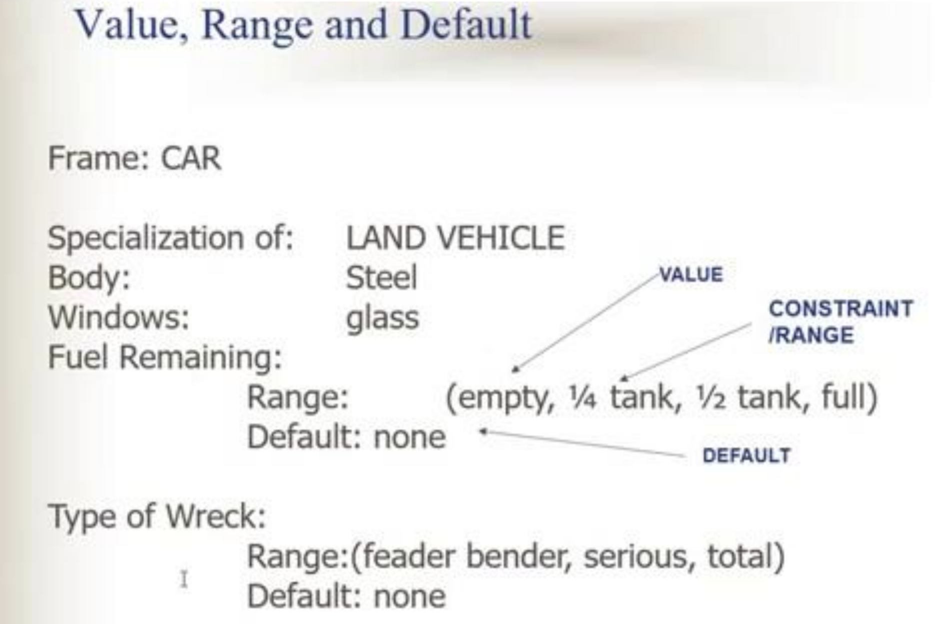
Frame

- Need to document clearly the information related to the model
- Provide a way to limit the value for the attribute
- Provide information modularity – system expansion and maintenance



Facet Types :

- **VALUE** – value for slot: example: colour slot, the value is either blue, red or yellow
- **TYPE** – data/value that assign to the slot, example number of wings must be in numeric.
- **DEFAULT** – the initial value for the slot, example the default value for the number of wings is two unless stated otherwise.
- **CONSTRAINT/RANGE**- the range for the value, example 0- 100.



Value, Range and Default

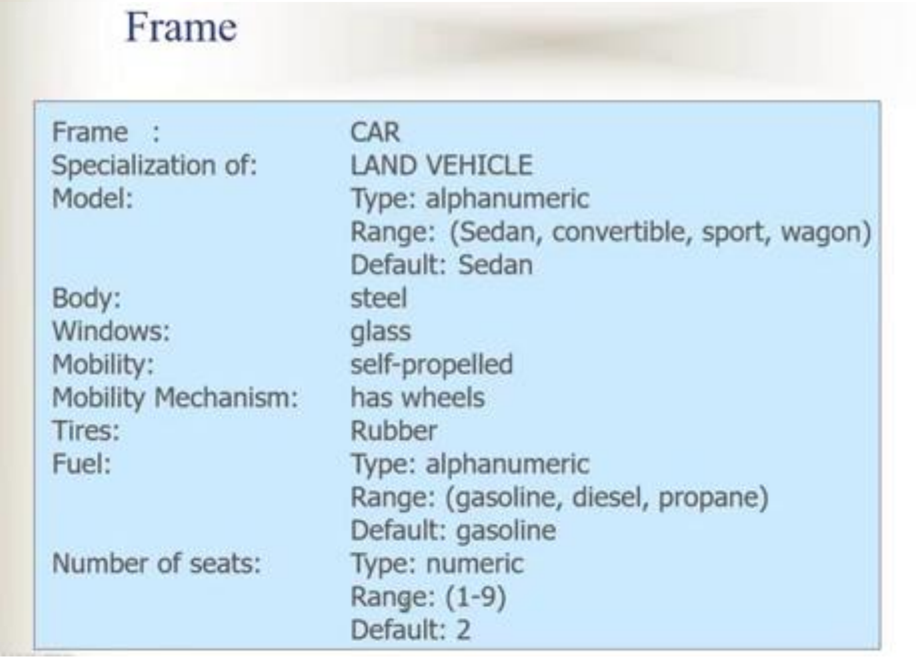
Frame: CAR

Specialization of:	LAND VEHICLE
Body:	Steel
Windows:	glass
Fuel Remaining:	
Range:	(empty, ¼ tank, ½ tank, full)
Default: none	

Type of Wreck:

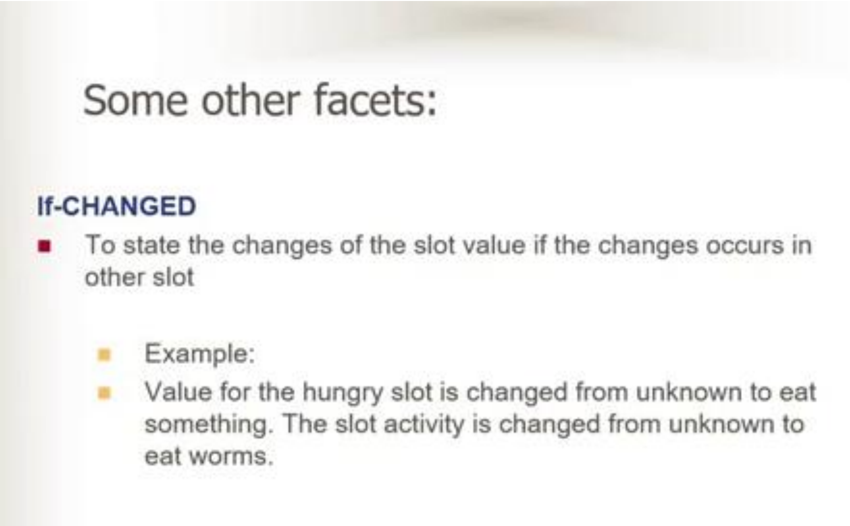
Range:(feader bender, serious, total)
Default: none

VALUE
CONSTRAINT /RANGE
DEFAULT



Frame

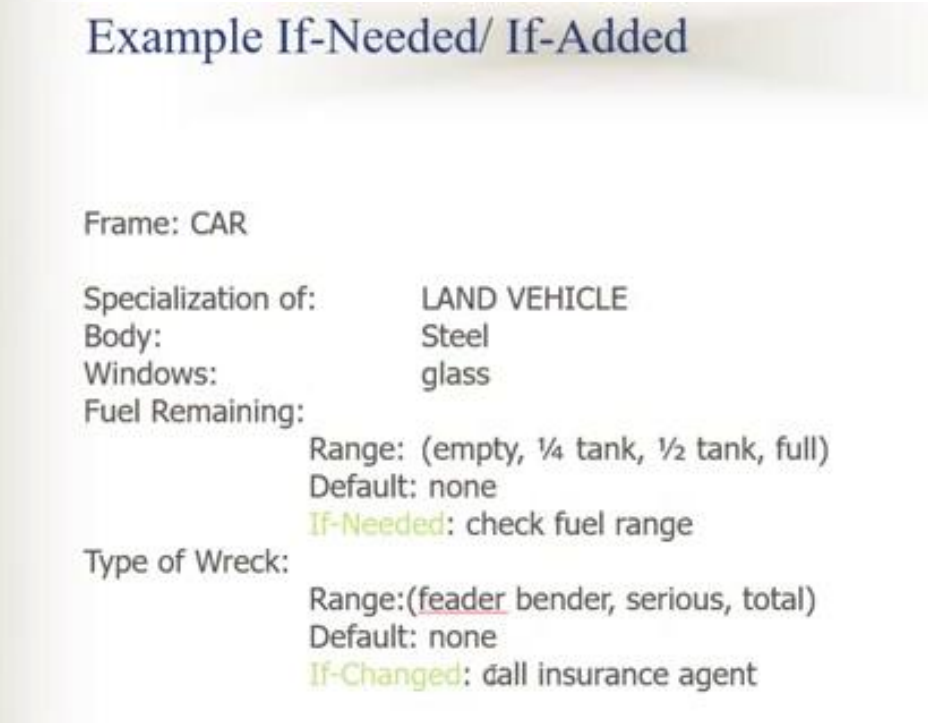
Frame :	CAR
Specialization of:	LAND VEHICLE
Model:	Type: alphanumeric Range: (Sedan, convertible, sport, wagon) Default: Sedan
Body:	steel
Windows:	glass
Mobility:	self-propelled
Mobility Mechanism:	has wheels
Tires:	Rubber
Fuel:	Type: alphanumeric Range: (gasoline, diesel, propane) Default: gasoline
Number of seats:	Type: numeric Range: (1-9) Default: 2



Some other facets:

If-CHANGED

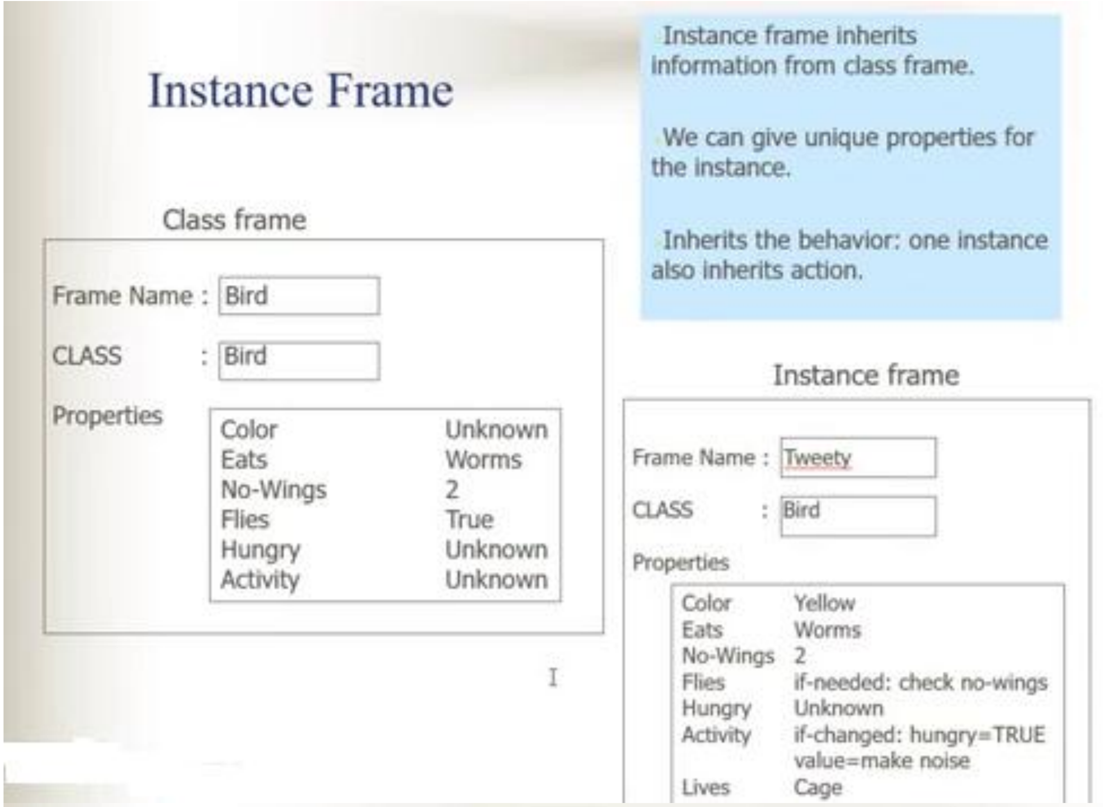
- To state the changes of the slot value if the changes occurs in other slot
  - Example:
  - Value for the hungry slot is changed from unknown to eat something. The slot activity is changed from unknown to eat worms.



Example If-Needed/ If-Added

Frame: CAR

Specialization of: LAND VEHICLE
Body: Steel
Windows: glass
Fuel Remaining:
Range: (empty, ¼ tank, ½ tank, full)
Default: none
If-Needed: check fuel range
Type of Wreck:
Range:(feader bender, serious, total)
Default: none
If-Changed: call insurance agent



Instance Frame

Instance frame inherits information from class frame.

We can give unique properties for the instance.

Inherits the behavior: one instance also inherits action.

Class frame

Frame Name : Bird

CLASS : Bird

Properties

Color	Unknown
Eats	Worms
No-Wings	2
Flies	True
Hungry	Unknown
Activity	Unknown

Instance frame

Frame Name : Tweety

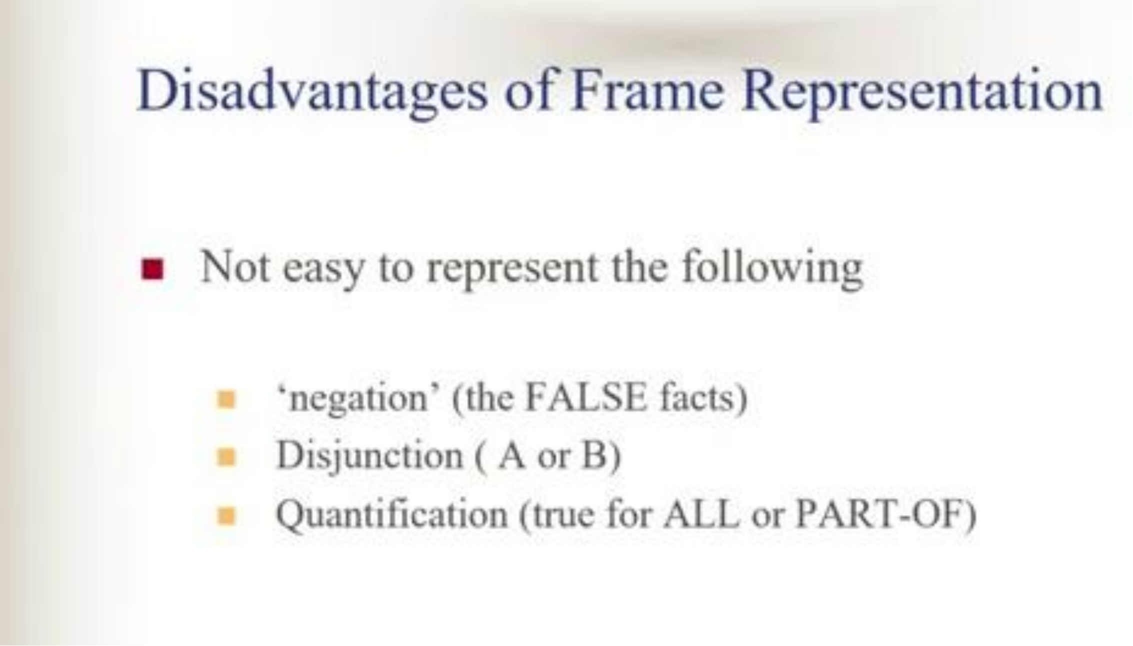
CLASS : Bird

Properties

Color	Yellow
Eats	Worms
No-Wings	2
Flies	if-needed: check no-wings
Hungry	Unknown

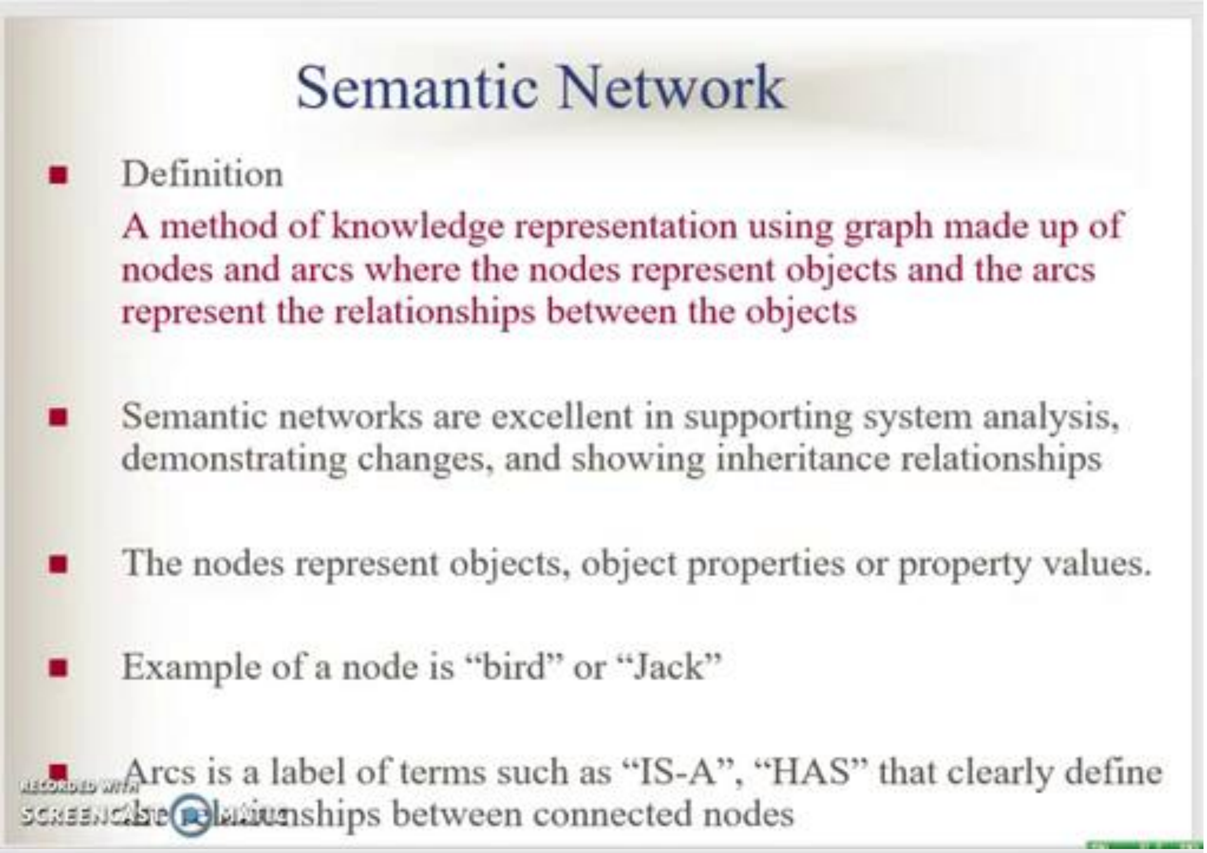
Activity	if-changed: hungry=TRUE
	value=make noise

Lives	Cage



Disadvantages of Frame Representation

- Not easy to represent the following
  - ‘negation’ (the FALSE facts)
  - Disjunction (A or B)
  - Quantification (true for ALL or PART-OF)



Semantic Network

- Definition

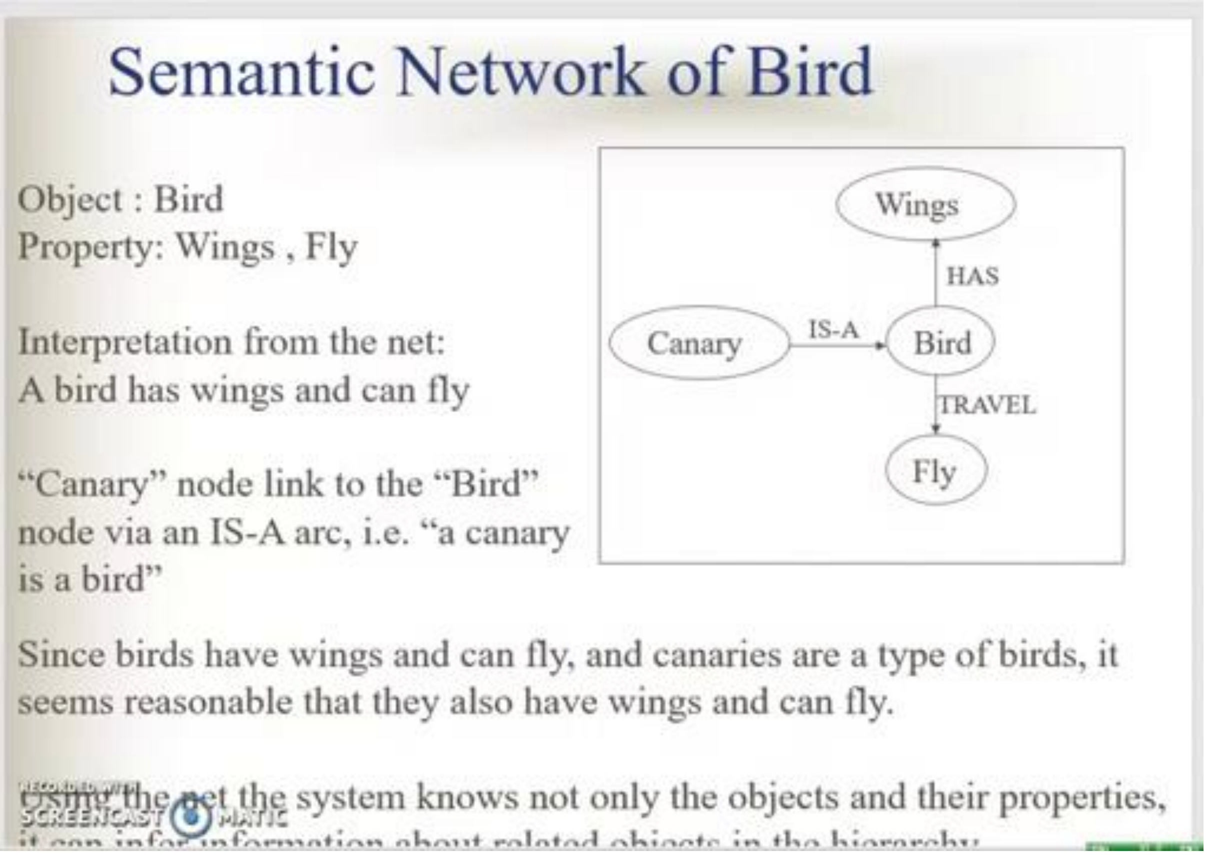
  A method of knowledge representation using graph made up of nodes and arcs where the nodes represent objects and the arcs represent the relationships between the objects

- Semantic networks are excellent in supporting system analysis, demonstrating changes, and showing inheritance relationships

- The nodes represent objects, object properties or property values.

- Example of a node is "bird" or "Jack"

- Arcs is a label of terms such as "IS-A", "HAS" that clearly define the relationships between connected nodes



Semantic Network of Bird

Object : Bird
Property: Wings , Fly

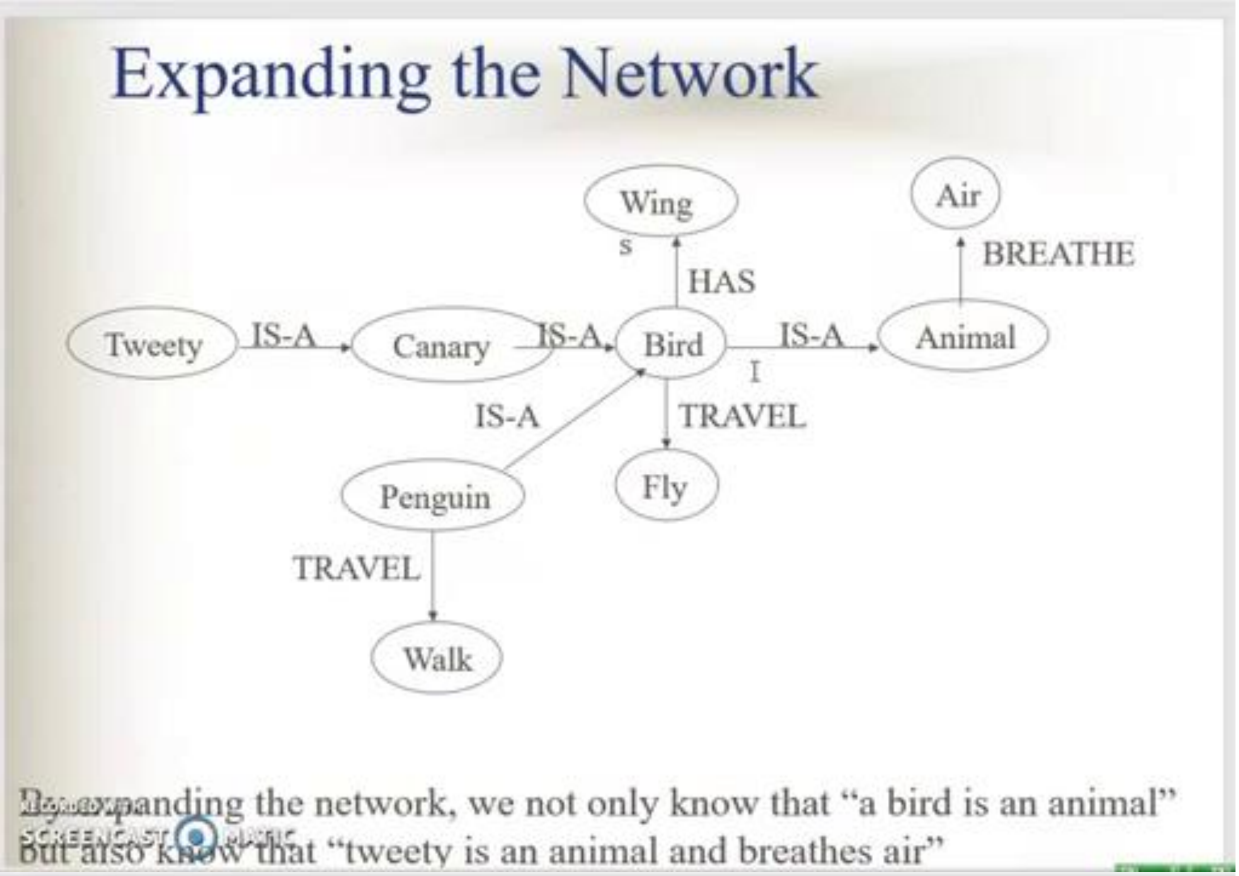
Interpretation from the net:
A bird has wings and can fly

"Canary" node link to the "Bird" node via an IS-A arc, i.e. "a canary is a bird"

Wings
HAS
Canary
IS-A
Bird
TRAVEL
Fly

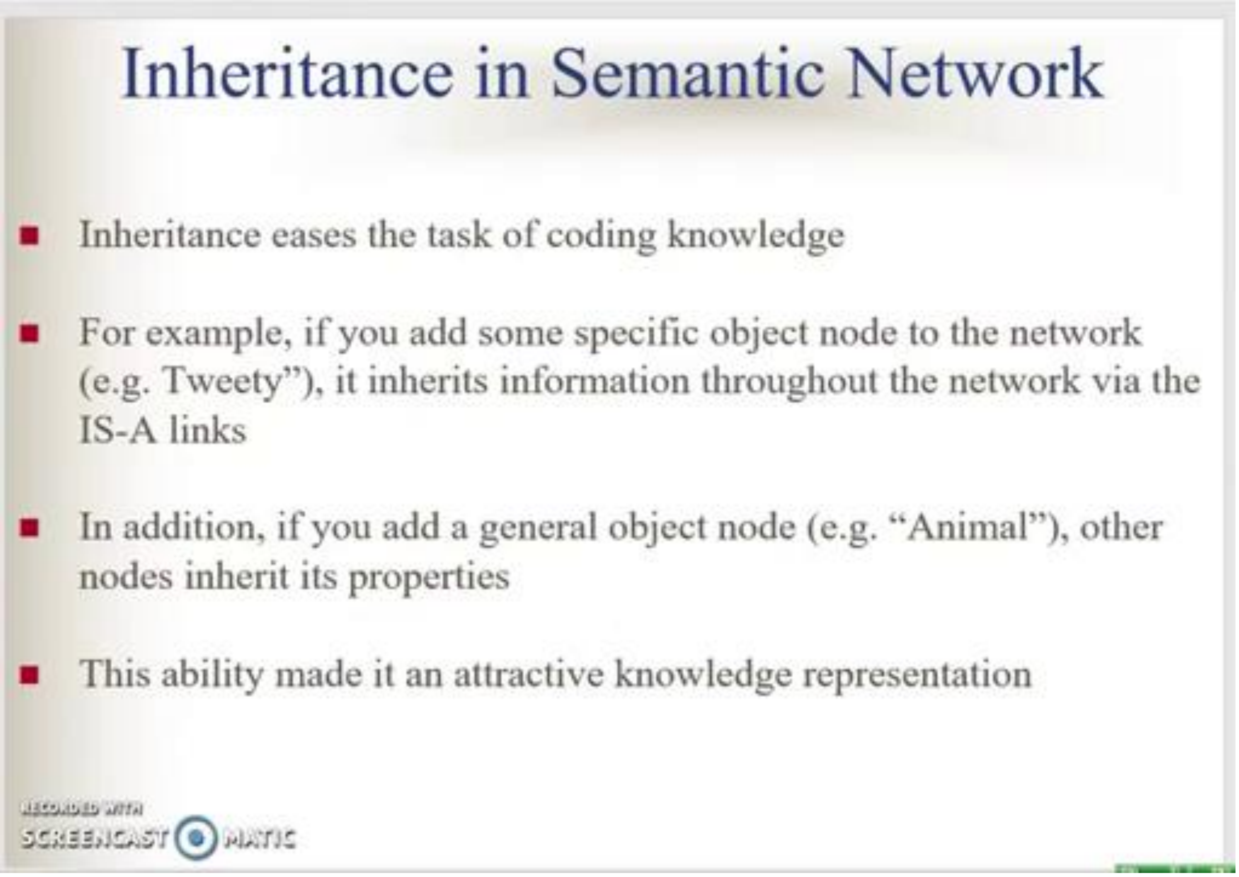
Since birds have wings and can fly, and canaries are a type of birds, it seems reasonable that they also have wings and can fly.

Using the net the system knows not only the objects and their properties, it can infer information about related objects in the hierarchy



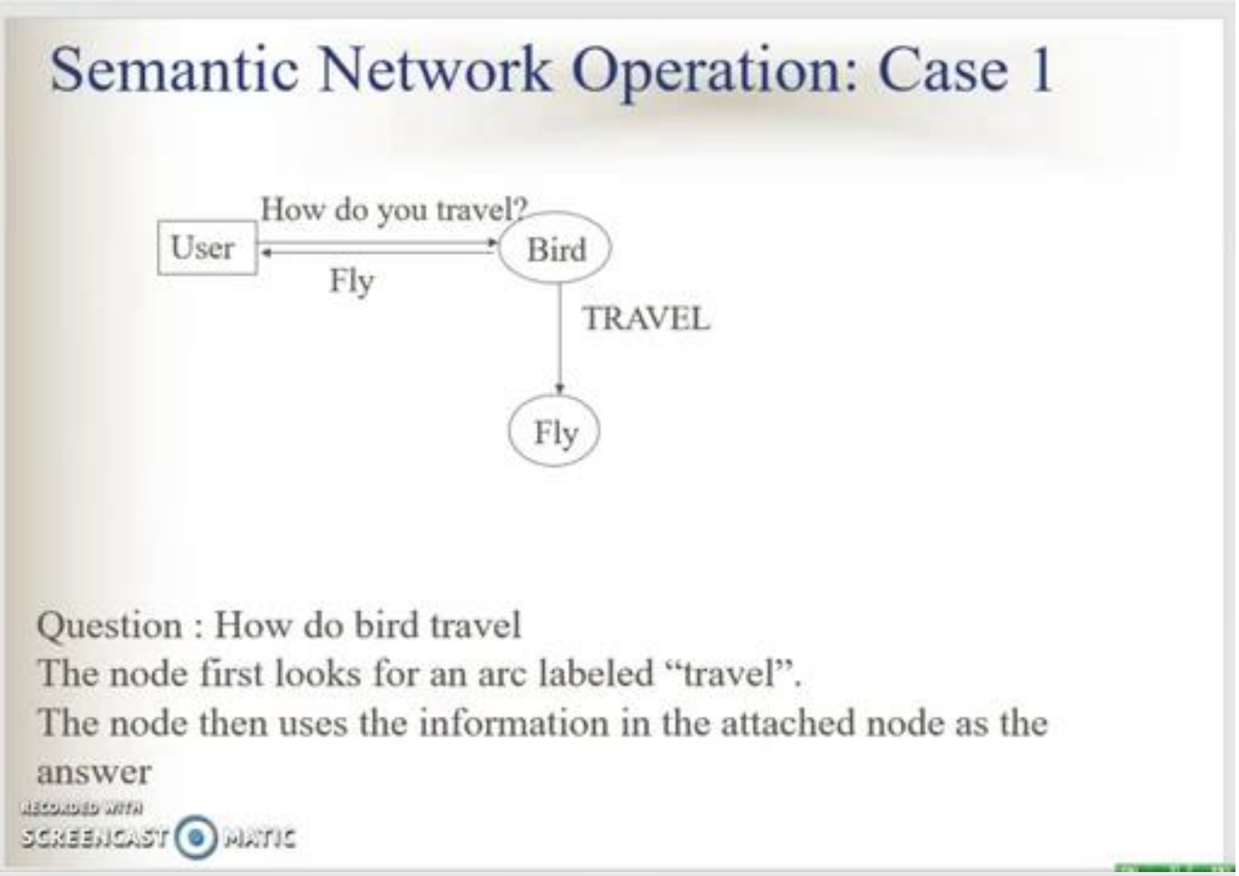
Expanding the Network

By expanding the network, we not only know that "a bird is an animal" but also know that "tweety is an animal and breathes air"



Inheritance in Semantic Network

- Inheritance eases the task of coding knowledge
- For example, if you add some specific object node to the network (e.g. Tweety"), it inherits information throughout the network via the IS-A links
- In addition, if you add a general object node (e.g. "Animal"), other nodes inherit its properties
- This ability made it an attractive knowledge representation

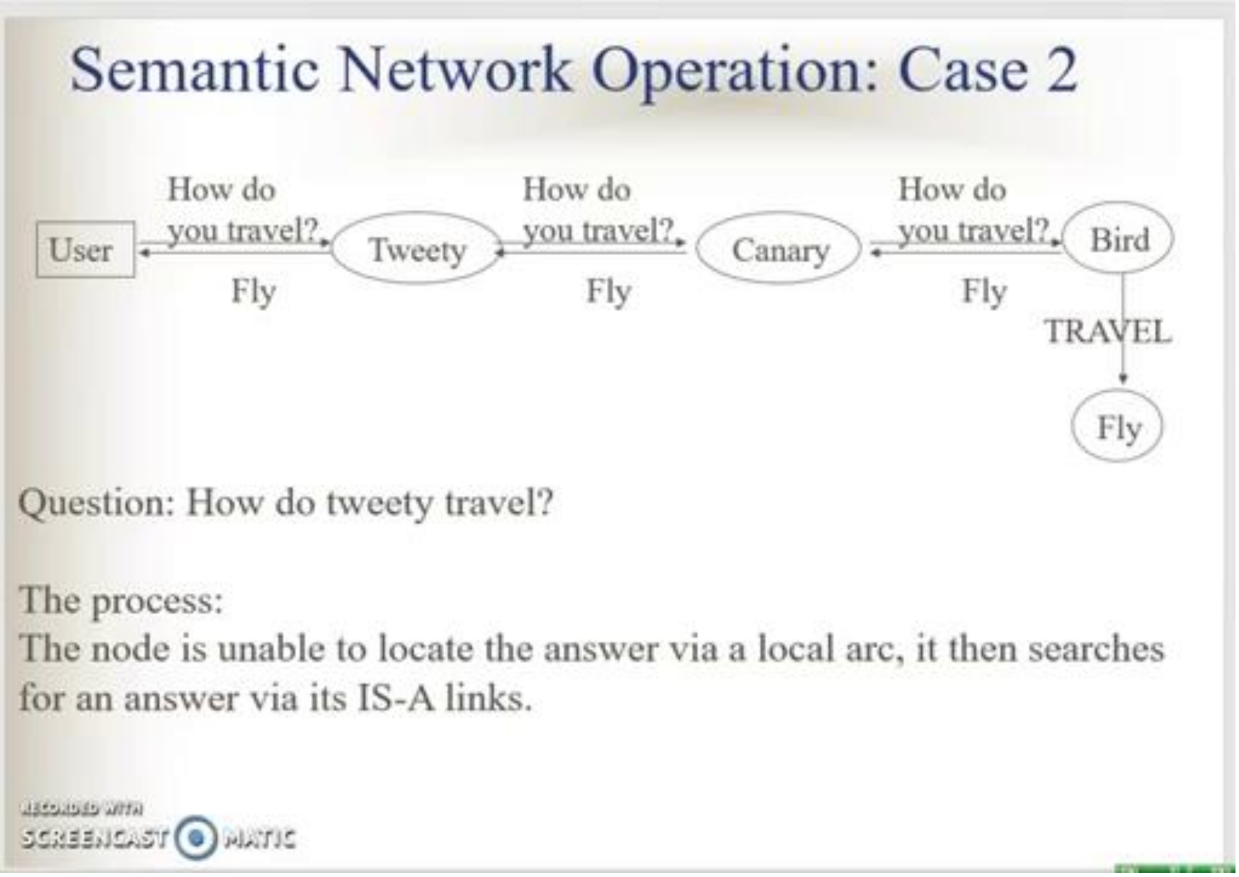


Semantic Network Operation: Case 1

Question : How do bird travel

The node first looks for an arc labeled “travel”.

The node then uses the information in the attached node as the answer

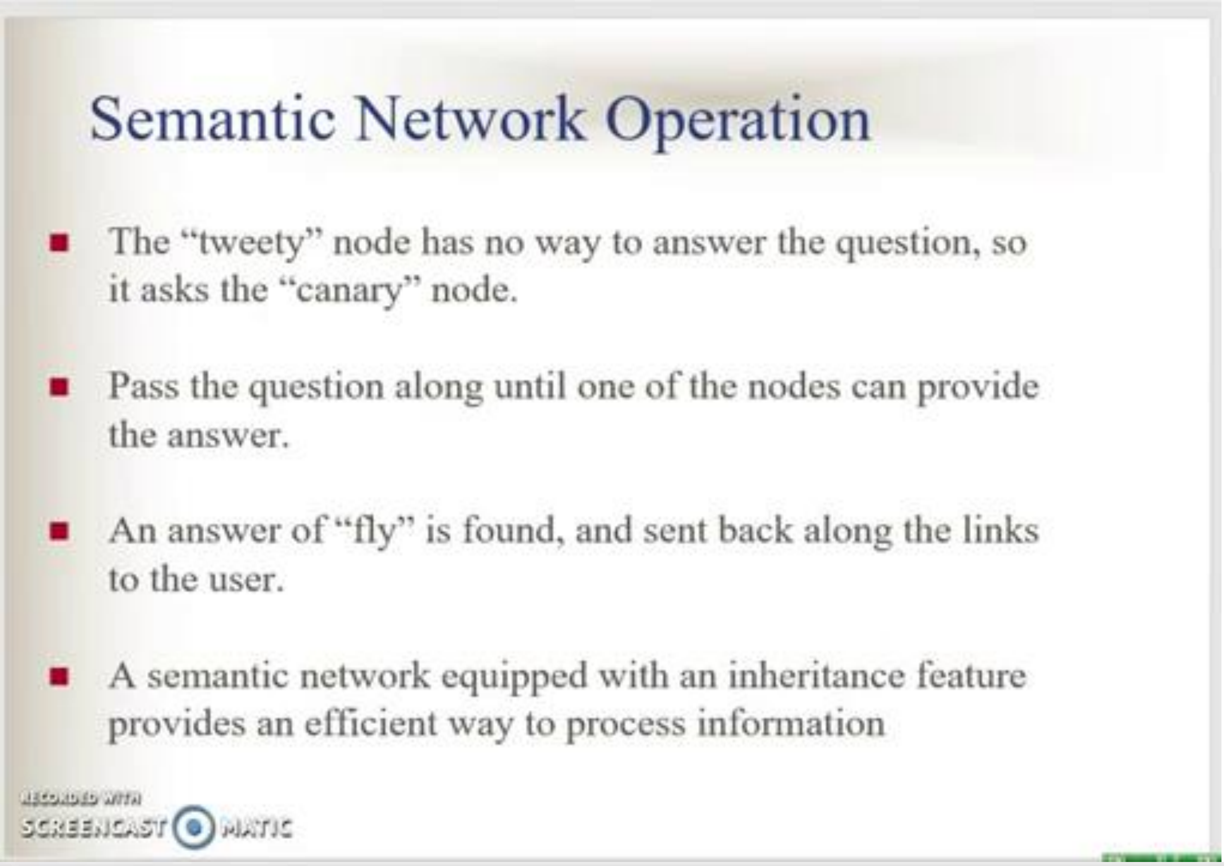


Semantic Network Operation: Case 2

Question: How do tweety travel?

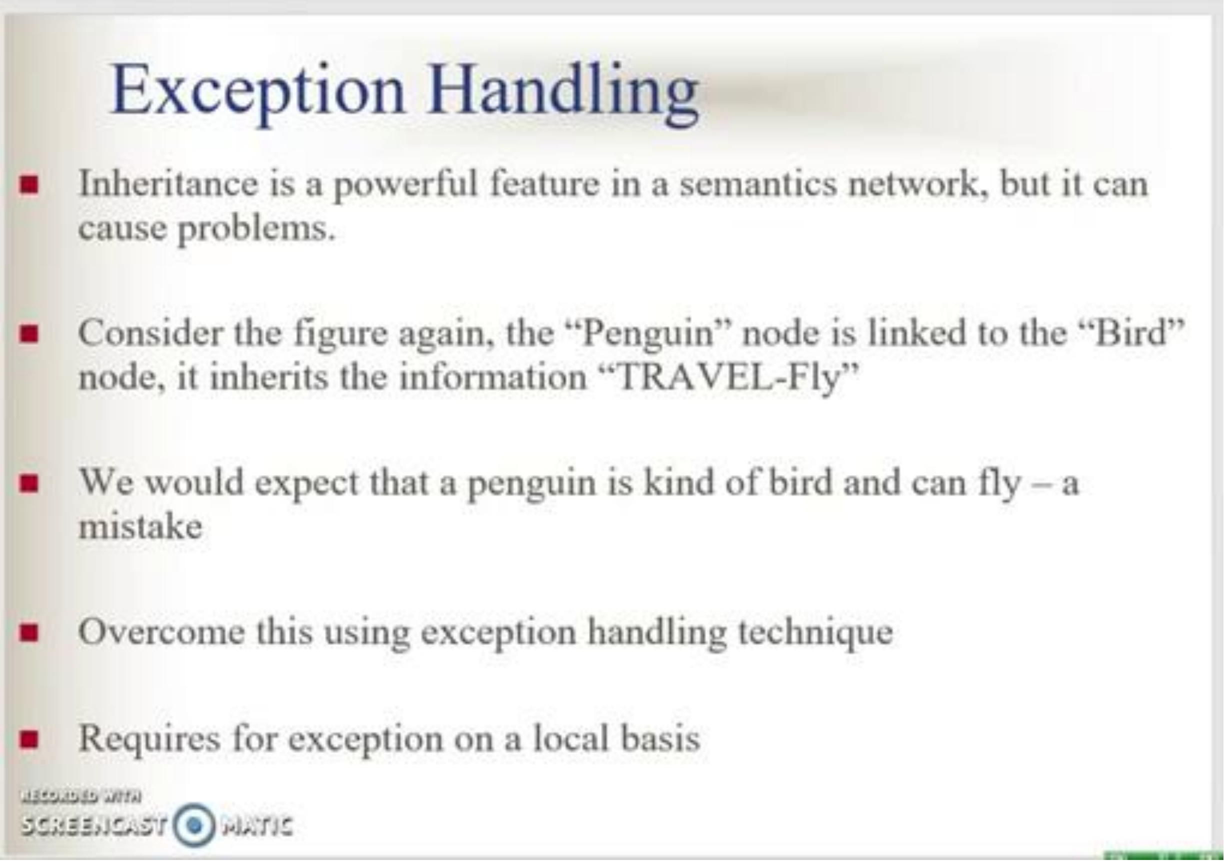
The process:

The node is unable to locate the answer via a local arc, it then searches for an answer via its IS-A links.



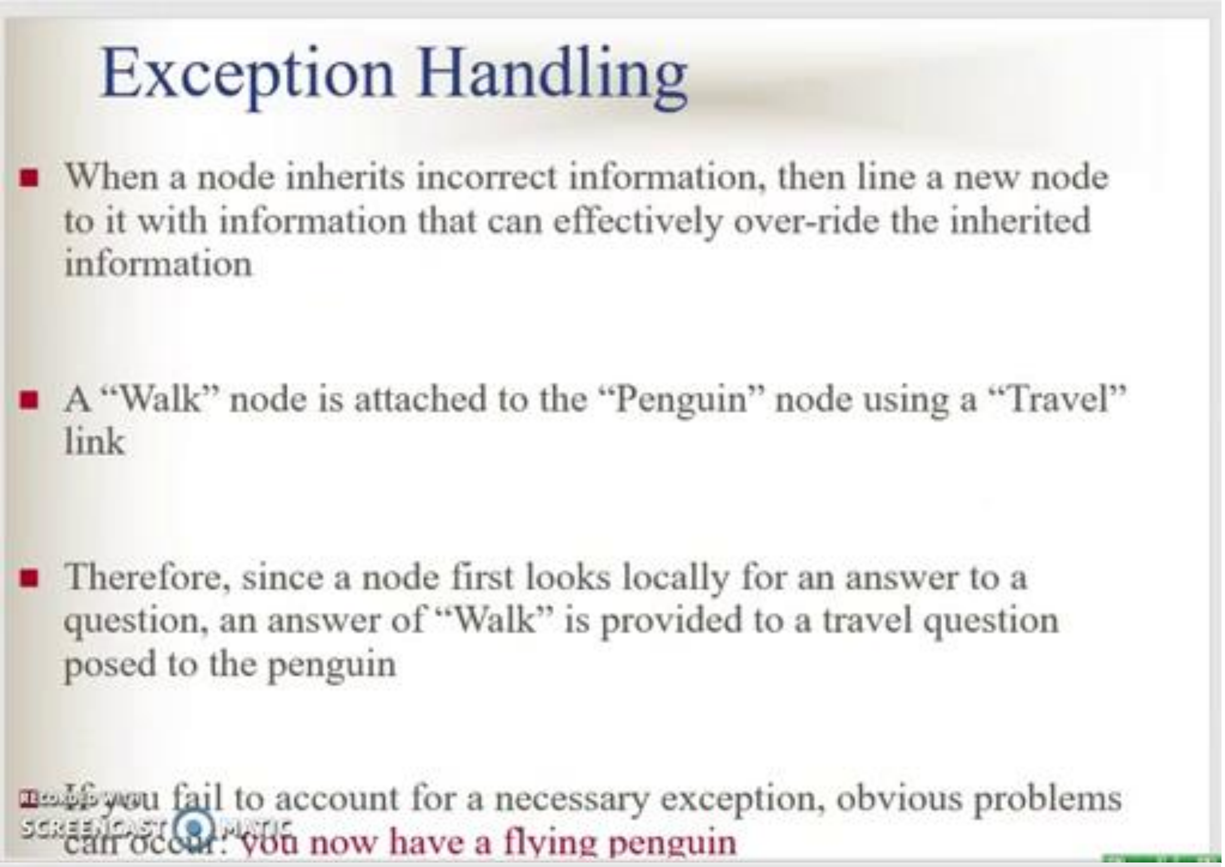
Semantic Network Operation

- The "tweety" node has no way to answer the question, so it asks the "canary" node.
- Pass the question along until one of the nodes can provide the answer.
- An answer of "fly" is found, and sent back along the links to the user.
- A semantic network equipped with an inheritance feature provides an efficient way to process information



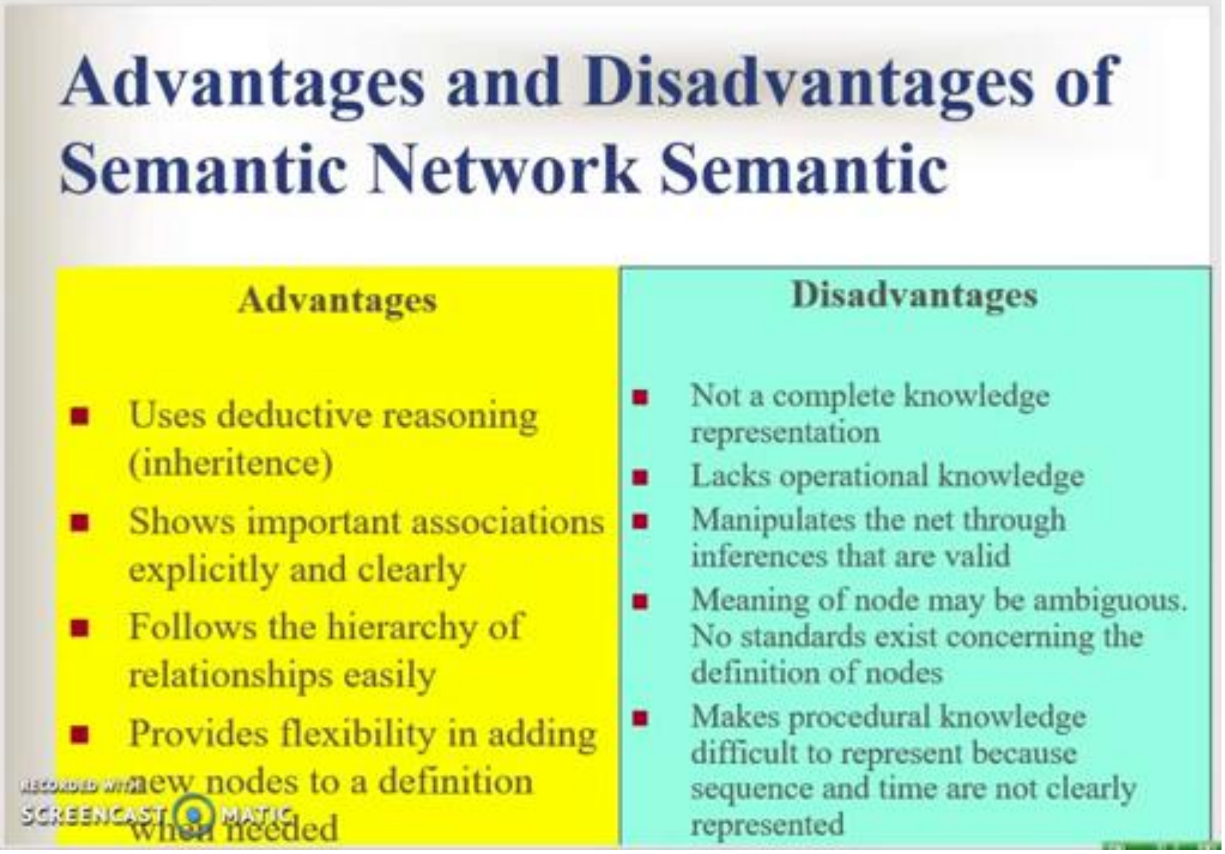
Exception Handling

- Inheritance is a powerful feature in a semantics network, but it can cause problems.
- Consider the figure again, the "Penguin" node is linked to the "Bird" node, it inherits the information "TRAVEL-Fly"
- We would expect that a penguin is kind of bird and can fly – a mistake
- Overcome this using exception handling technique
- Requires for exception on a local basis



Exception Handling

- When a node inherits incorrect information, then line a new node to it with information that can effectively over-ride the inherited information
- A "Walk" node is attached to the "Penguin" node using a "Travel" link
- Therefore, since a node first looks locally for an answer to a question, an answer of "Walk" is provided to a travel question posed to the penguin
- If you fail to account for a necessary exception, obvious problems can occur: you now have a flying penguin



Advantages and Disadvantages of Semantic Network Semantic

Advantages	Disadvantages
■ Uses deductive reasoning (inheritence) ■ Shows important associations explicitly and clearly ■ Follows the hierarchy of relationships easily ■ Provides flexibility in adding new nodes to a definition when needed	■ Not a complete knowledge representation ■ Lacks operational knowledge ■ Manipulates the net through inferences that are valid ■ Meaning of node may be ambiguous. No standards exist concerning the definition of nodes ■ Makes procedural knowledge difficult to represent because sequence and time are not clearly represented