Frames
Logic and Rules

• Symbolic representation

• Inference mechanism allows conclusions to be drawn from facts and rules.

• Certainty factors and truth maintenance allow rules to deal with uncertainty.
Common Sense Reasoning

• People have vast background knowledge to cope with everyday situations.

• We don’t have to be told everything explicitly because we can call on the background knowledge.

• We use ‘default’ knowledge to handle situations where knowledge is incomplete.

• This is called common sense reasoning.
Defaults and Inheritance

- Inheritance is a way of reasoning by default.
- That is, when information is missing, fall back to defaults.
I own a tan leather chair
John gave the book to Mary
Bilbo owns the magic ring
Bilbo found the magic ring in Gollum's cave
What did Bilbo find?
Bilbo found the magic ring when he visited Gollum's cave
Problems with Semantic Nets

- The dog bit the postman
Every dog has bitten a postman

\((\forall x)\{\text{Dog}(x) \rightarrow (\exists y)[\text{Postman}(y) \land \text{Bite}(x, y)]\}\)
Every dog in town has bitten the constable
Every dog has bitten every postman
Frames

- Frames implement semantic networks.
- They add procedural attachment.
- A frame has slots and slots have values.
- A frame may be generic, i.e. it describes a class of objects.
- A frame may be an instance, i.e. it describes a particular object.
- Frames can inherit properties from generic frames.
Daemons

- Demons are attached to slots to cause side effects when the slot is accessed.

- **if-added** demons are triggered when a new value is put into a slot.

- **if-removed** demons are triggered when a value is removed from a slot.

- **if-replaced** is triggered when a slot value is replaced.
Dæmons (cont’d)

• *if-needed* demons are triggered when there is no value present in an instance frame and a value must be computed from a generic frame.

• *if-new* is triggered when a new frame is created.

• *cache* means that when a value is computed it is stored in the instance frame.
Dæmons (cont’d)

- **range** is triggered when a new value is added. The value must satisfy the range condition.

- **help** is triggered when the range demon is triggered and returns false.

- **multi-valued** means that the slot may contain more than one value.