

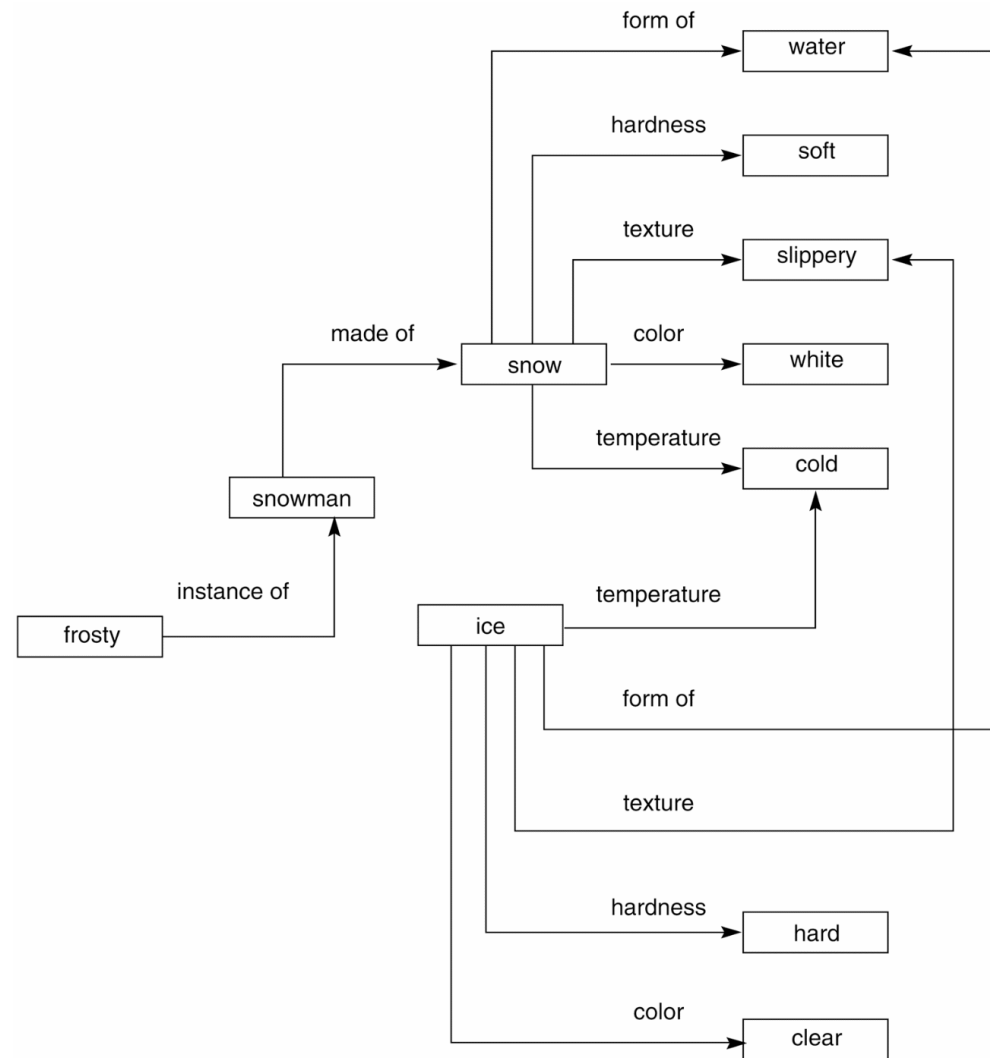
A brief look at semantic networks

A semantic network is an irregular graph that has concepts in vertices and relations on arcs.

Relations can be ad-hoc, but they can also be quite general, for example, “is a” (ISA), “a kind of” (AKO), “an instance of”, “part of”.

Relations often express physical properties of objects (colour, length, and lots of others).

Most often, relations link two concepts.

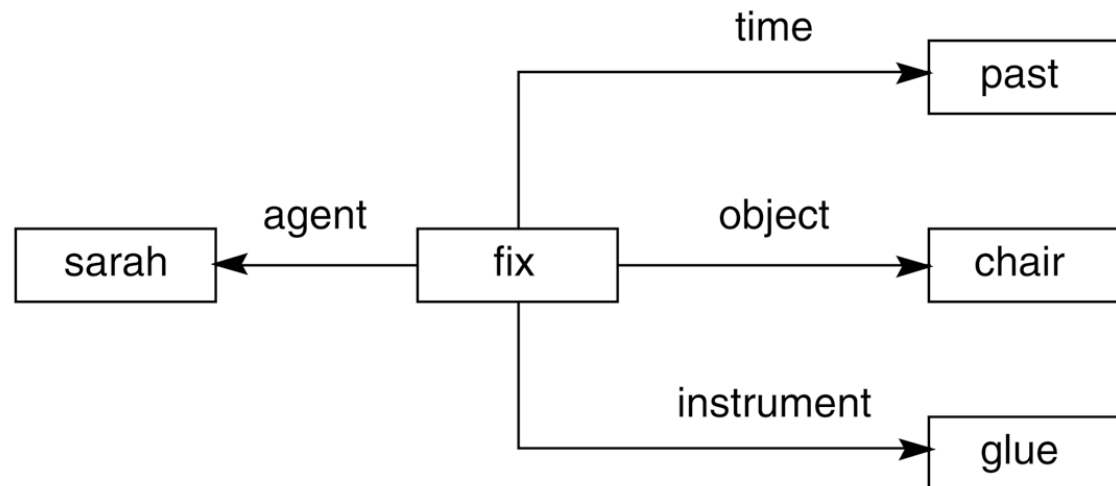


... semantic networks (2)

General semantic relations help represent the meaning of simple sentences in a systematic way.

A sentence is centred on a verb that *expects* certain arguments.

For example, verbs usually denotes actions (with *agents*) or states (with passive *experiencers*, for example, “he dreams” or “he is sick”).

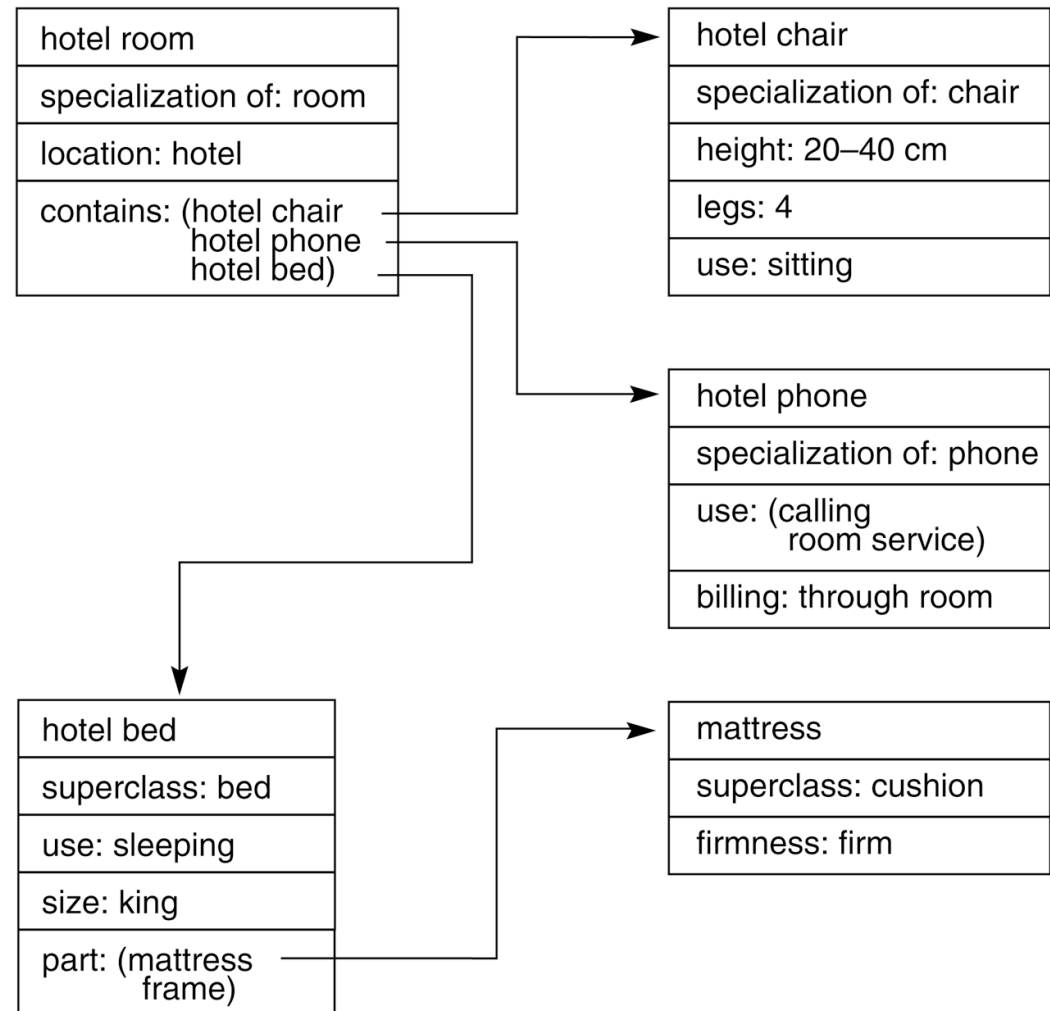


Frames and frame systems

A frame represents a concept;
a frame system represents an
organization of knowledge
about a set of related concepts.

A frame has slots that denote
properties of objects. Some
slots have *default* fillers, some
are empty (may be filled when
more becomes known about an
object).

Frames are linked by relations
of specialization/generalization
and by many ad-hoc relations.



Conceptual graphs

John Sowa created the conceptual graph notation in 1984. It has substantial philosophical and psychological motivation.

It is still quite a popular knowledge representation formalism, especially in semantic processing of language, and a topic of interesting research.

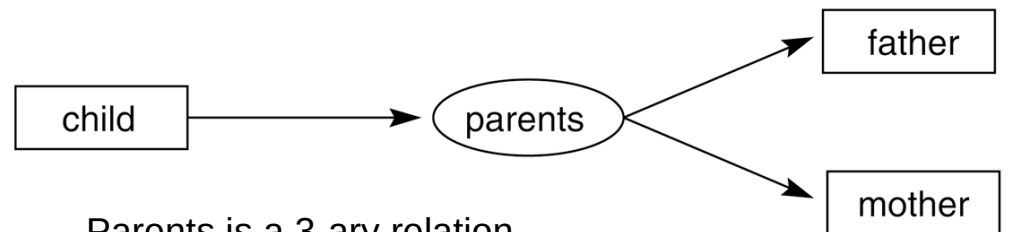
Conceptual graphs can be expressed in first-order logic but due to its graphical form it may be easier to understand than logic.



Flies is a 1-ary relation.

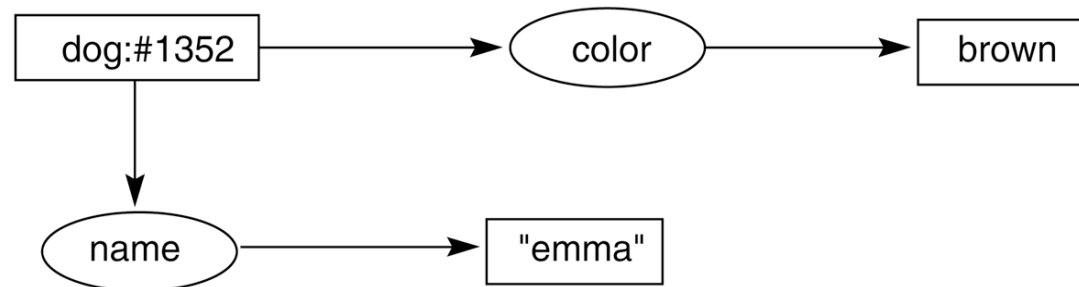
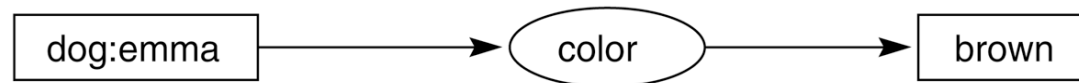
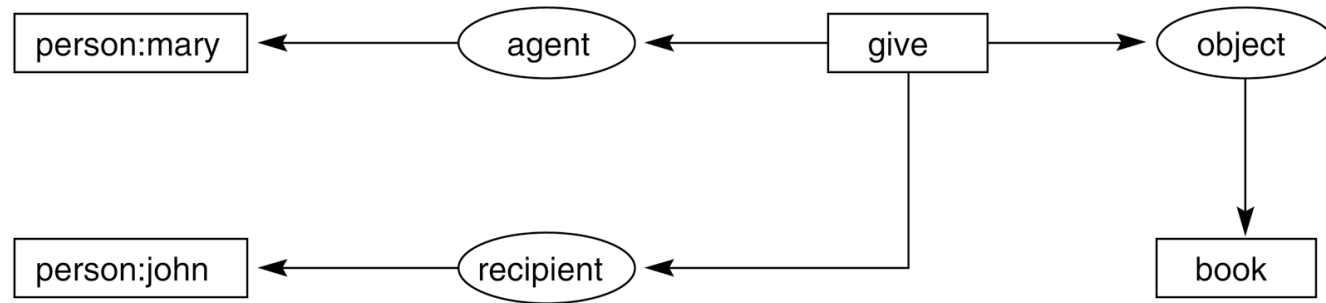


Color is a 2-ary relation.



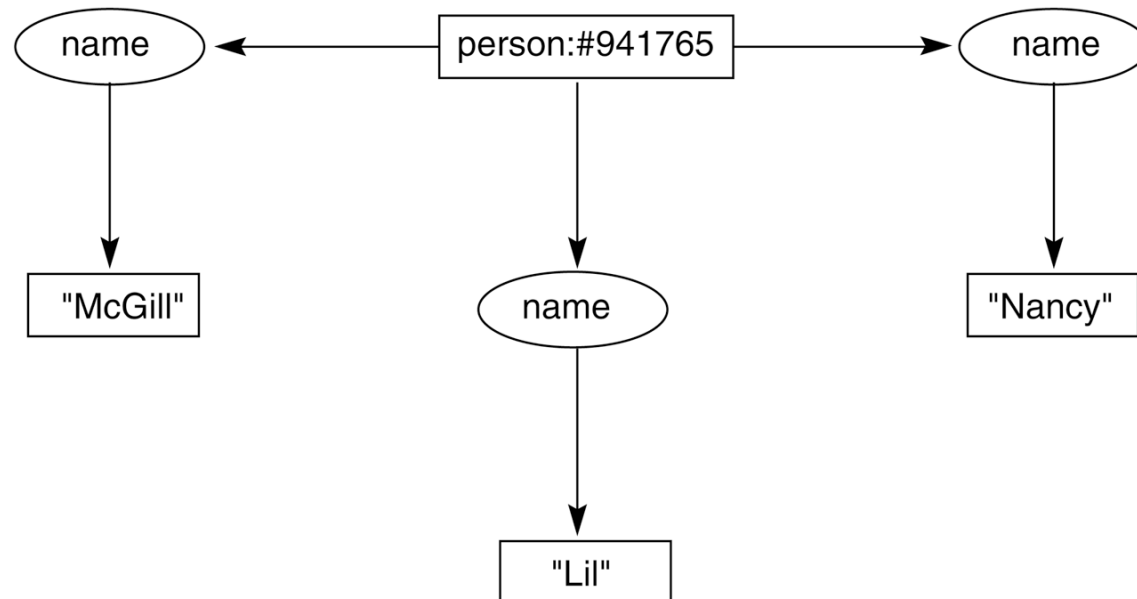
Parents is a 3-ary relation.

Conceptual graphs (2)



Conceptual graphs (3)

Her name was Magill, and she called herself Lil,
but everyone knew her as Nancy.

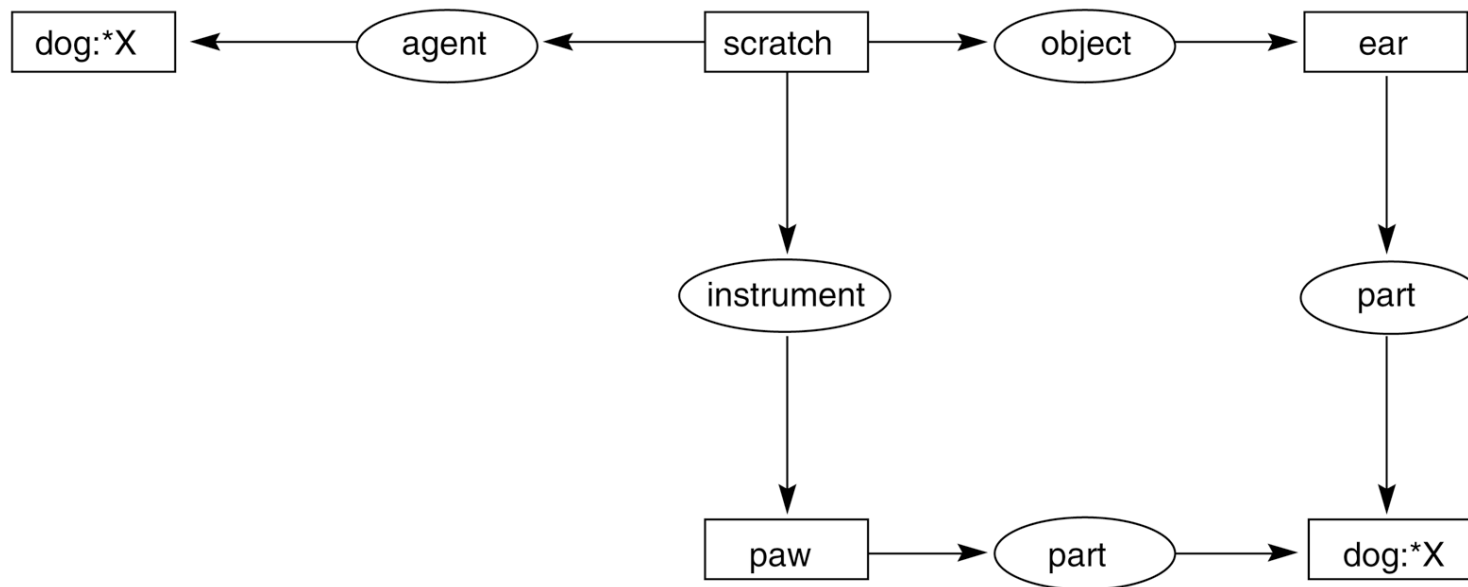


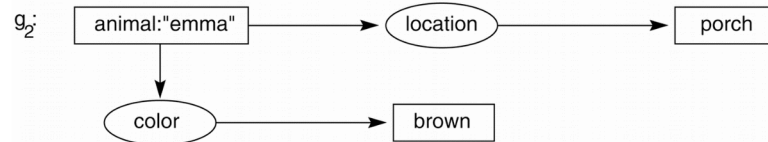
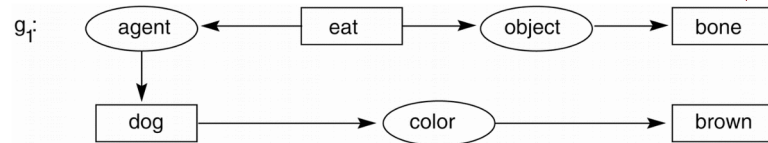
Lil



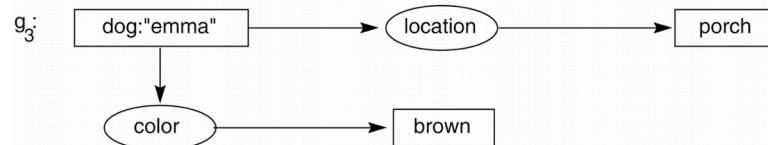
Conceptual graphs (4)

Variables allow us to express the identity of an individual.

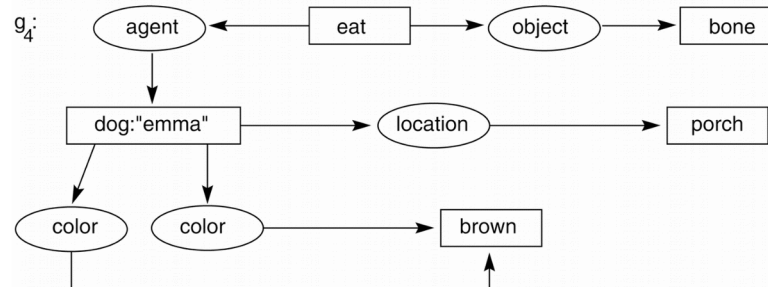




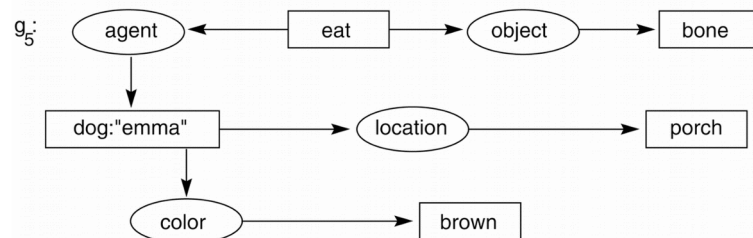
The restriction of g_2 :



The join of g_1 and g_3 :



The simplify of g_4 :



Conceptual graphs (5)

Specialization and type hierarchy

dogs are animals

(g_1) A brown dog eats a bone.

(g_2) ... Emma, the brown animal on the porch...

(g_3) ... Emma, the brown dog on the porch...

(g_4) Emma, the brown dog on the porch, eats a bone.

The challenge is to get this from text!

Conceptual graphs (6)



A conceptual graph



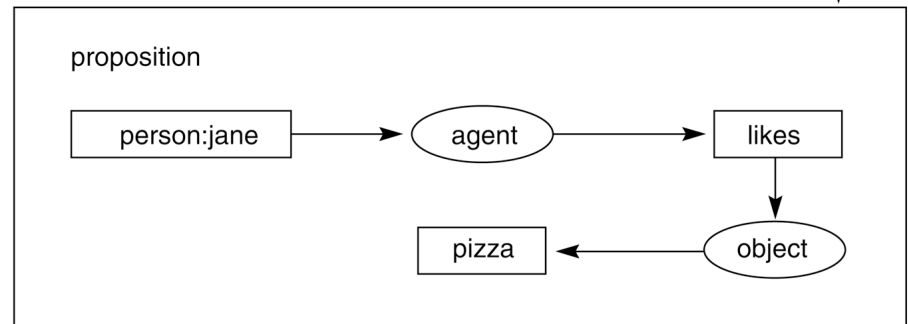
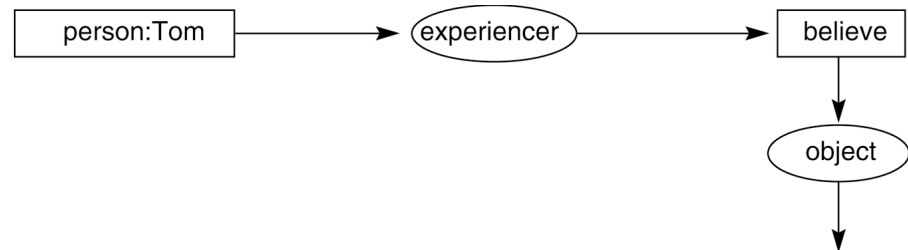
Inheritance of a property by a subclass



Inheritance of a property by an individual

Inheritance

Beyond first-order logic



Conceptual graphs (7)

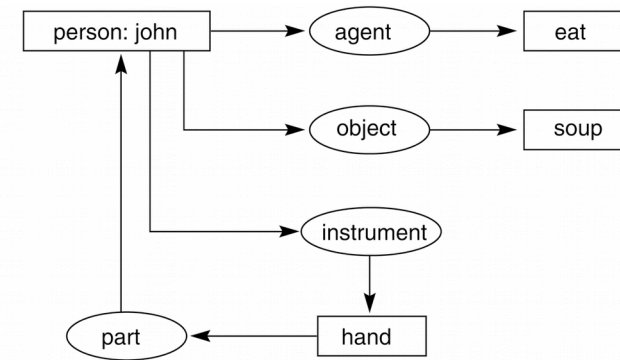
proposition:



neg

Negation and quantification

Two simple puzzles



proposition:

