5. Semantic Networks and Description Logics

5.1 Introduction

*Bernhard Nebel*

- Motivation & History
- Semantic Networks
- Frame Systems
- Outlook: The main ideas
Motivation & History

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⇒ Semantic Networks (first proposed by Quillian 67)
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  ~ Semantic Networks (first proposed by Quillian 67)

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  - **Semantic Networks** (first proposed by Quillian 67)
  - **Frame Systems** (Minsky 81)
  - **Structural Inheritance Networks** and **Description Logics** (Brachman 78)
Example: Quillian’s Semantic Memory

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In psychological experiments, the question *Can canaries sing?* was answered faster than the question *Do canaries have feathers?*. 
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- Possible disadvantages
  - The meaning of nodes and links is not clear and only defined procedurally by the inference algorithms
  - There is no semantics of semantic networks
Frame Systems: The idea

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- Then **match** frame against actual situation
  - use information in the frame to fill in missing details
  - explain differences
  - apply procedural knowledge
Example: Birthday party

The meaning of a child’s birthday is very poorly approximated by any dictionary definition like “a party assembled to celebrate a birthday” [...] This lacks all the flavor of the culturally required activities. Children know that the “definition” should include more specifications, the particulars of which can normally be assumed by the way of default assignments (Minsky 81):

Dress: Sunday best
Present: must please host
Games: hide and seek,
        pin tail on donkey
Decor:   balloons, favors, crepe-paper
Party-meal: cake, ice-cream, soda, hot dogs
...
How to select Birthday Party?

Child's Birthday Party

Dress:

Present:

Party-Meal:

Games:

Birthday Party

Party-Meal:

Clothes

Sunday Best

Ice Cream

Flavor:

Present

How to select
Semantic Networks and Frames: Important Ideas

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\[ \text{Inheritance} \quad (\text{strict, non-strict, \ldots}) \]
Semantic Networks and Frames: Important Ideas

- **Hierarchical** organization
- **Object-centered** organization
- **Restricting the expressiveness** wrt. full first-order logic
  - Inheritance (strict, non-strict, ...)
  - Using descriptions in the inference process to recognize things
Semantic Networks and Frames: Important Ideas

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- **Restricting the expressiveness** wrt. full first-order logic
  - **Inheritance** (strict, non-strict, …)
  - **Using descriptions** in the inference process to recognize things

→ **Note**: Nowadays semantic networks and frames are hardly used anymore
  – but the above ideas are still employed
Literature

Anthologies:


Special papers:

