Biological Vision and Applications
Module 07-02: Frame-based Knowledge Representation

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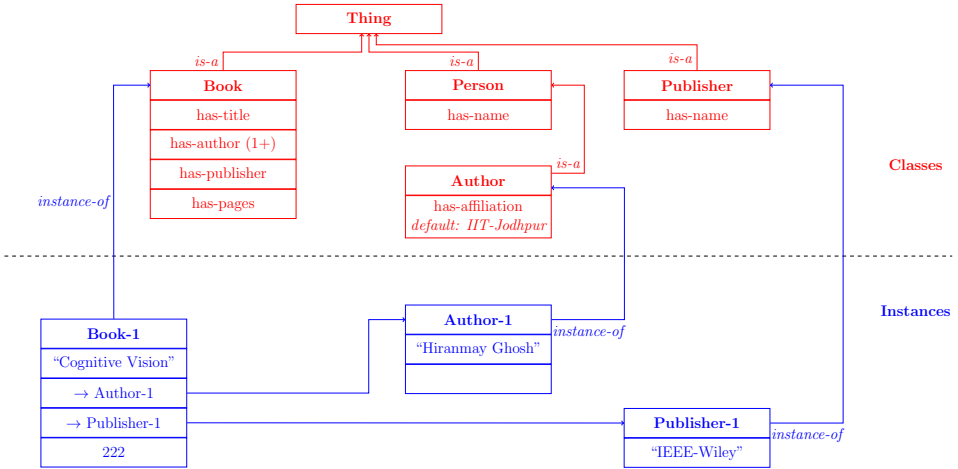
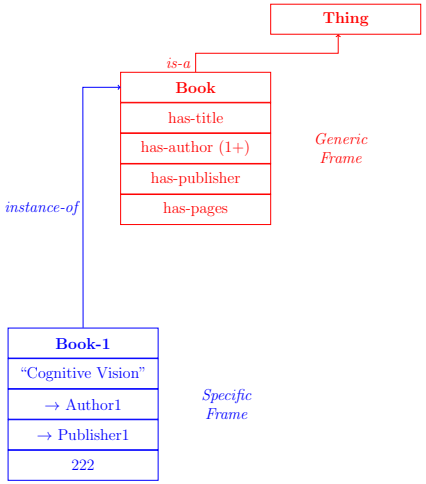
Frame-based representation



Frames, slots and fillers



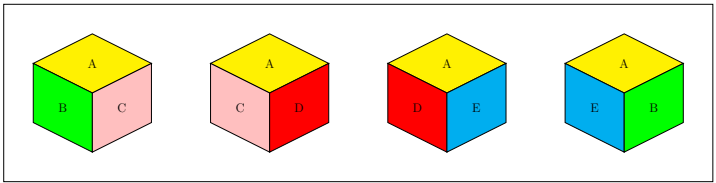
- A frame has a label
- A frame consists of one or more slots (attributes)
- A slot contains a filler (value)
  - Reference to another frame
  - Literal
  - not specified
- A frame inherits attributes and default values of it's parent
- Value restrictions
  - Data types / range
  - Cardinality

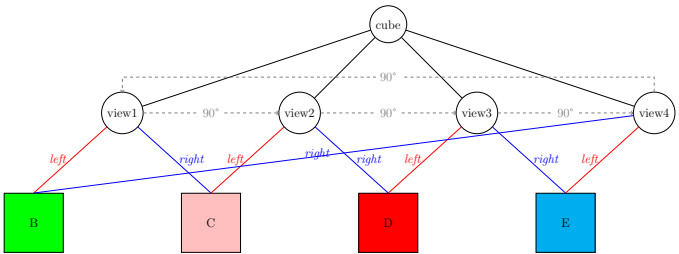
Ontology and data

- The generic frames and their interconnections define a model (schema) for a domain
  - A domain is a bounded part of the world
  - The model is also known as an ontology
  - An ontology imposes constraints on data and their organization
- The specific frames represent instances of the classes (data)
  - They are defined and organized following the constraints of the ontology
- Web Ontology Language (OWL)
  - W3C recommended standard for web-based knowledge representation
  - Is defined as a schema over RDF/RDFS

Frame based representation & Visual cognition

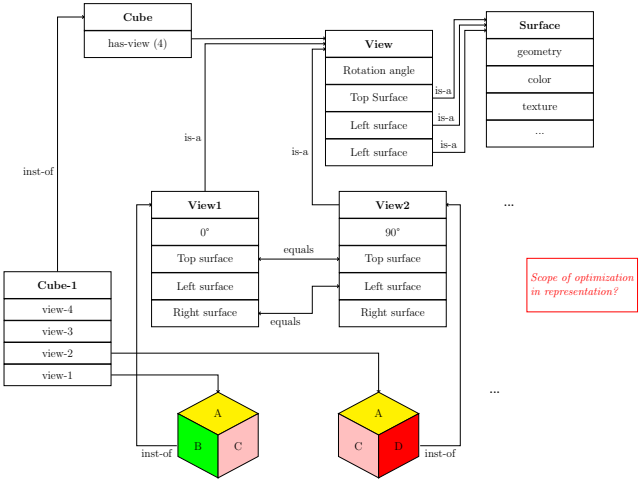
Visual events and viewpoints



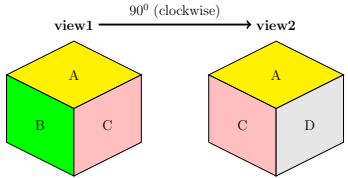


Frame based representation & Visual cognition

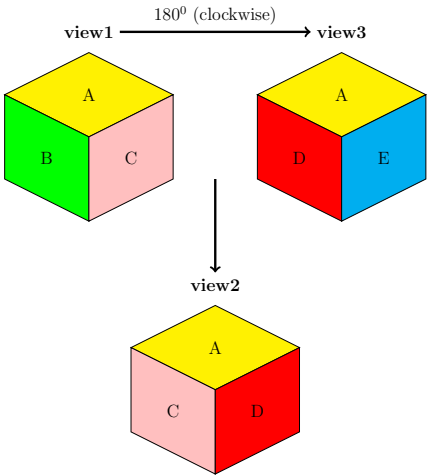
Viewpoints: frame-based representation



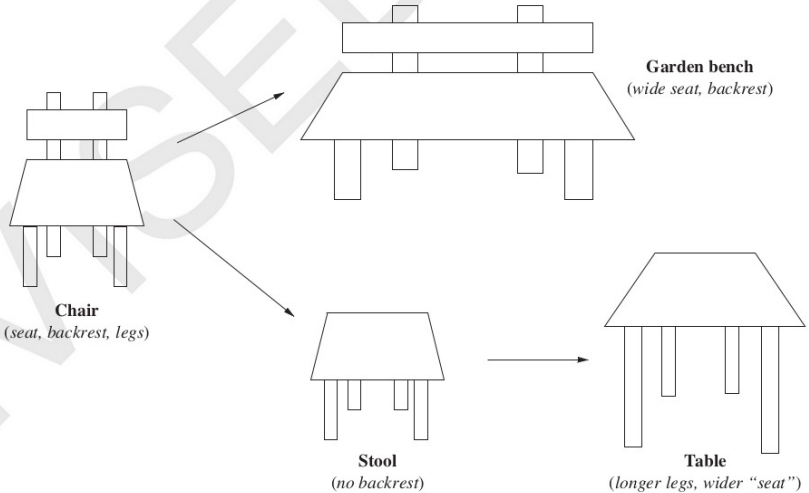
Inferencing with visual frames



Only one observation is needed for View 2



Specialization of concepts



Frame-based representation and Visual cognition

Summary

- A compact and efficient representation of visual world
- A frame represents a specific view of a system (object / scene)
  - Remembered in declarative memory
- A frame-system is a collection of frames representing different views of a system
  - Different frames of a system describe the system from different viewpoints
  - Change of viewpoint (movement) results in transformations across the frames
- When one receives a new percept, one recalls the nearest matching frame from memory
  - Leads to object recognition
- If no available frame sufficiently match the current situation, the closest frame is extended to define a new system

Minsky's paper (1974) *

Quiz

Quiz 07-02

End of Module 07-02