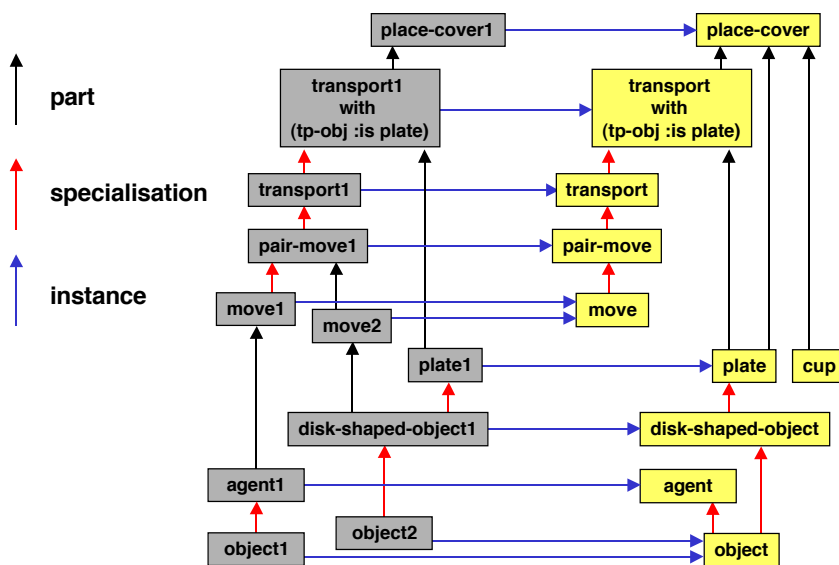


Navigating in Hallucination Space

1

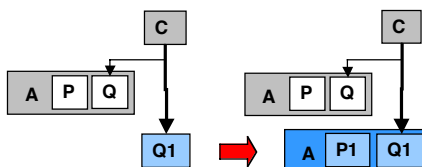
Typical Model-based Interpretation Steps



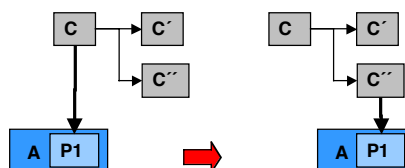
2

Three Kinds of Interpretation Steps

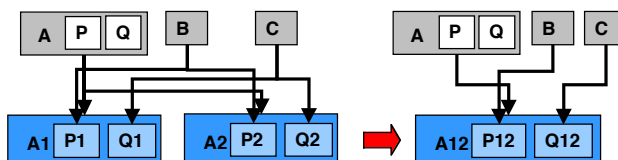
aggregate instantiation
("part-whole-reasoning")



instance refinement
("specialisation")



instance merging
("converging evidence")



3

Interpretation Steps vs. Configuration Steps

5 types of configuration steps in structure-based configuration:

- | | |
|--------------------|--|
| 1 specialization | going down the is-a hierarchy |
| 2 parameterization | selecting one of several slot values |
| 3 decomposition | choosing a part for an aggregate |
| 4 integration | choosing an aggregate for a part |
| 5 merging | merging two instances constructed by different paths |

3 types of interpretation steps in scene interpretation:

- | | |
|---------------------------|-----------------------|
| • aggregate instantiation | corresponds to 4 |
| • instance refinement | corresponds to 1 or 2 |
| • instance merging | corresponds to 5 |

4

What is the Space of Interpretations?

"Vision is controlled hallucination"
(Max Clowes 1971)

Interpretations are educated guesses because of the many-to-one nature of image formation. But what guesses are useful?

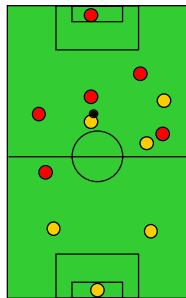
- Interpretations must be consistent
 - there are many interpretations consistent with given evidence
 - consistency tolerates interpretations without any evidence (complete hallucination)
- Interpretations must be "preferred"
 - aggregates vs. individual objects
 - most special concepts, basic categories, dissolved disjunctions
 - more likely vs. less likely interpretations
- Interpretations must be context and task dependent
 - *"Context is everything. Remove context and everything goes with it."* (Scott Kelso)
 - What is context?

5

Recognizing Intentions

6

Early Work on Recognizing Intentions and Plans



Intention recognition in soccer games
(Retz-Schmidt 91):

"Brandt dribbelt, um dem gegnerischen Tor nahe zu kommen"

("Brandt dribbles to get close to the opposing goal")

"Meier läuft zu Brandt, um ihn am Torschuß zu hindern"

("Meier runs to Brandt to prevent him from shooting a goal")

- model-based representation of plans and counter plans
- partial instantiation allows predictions and explanations

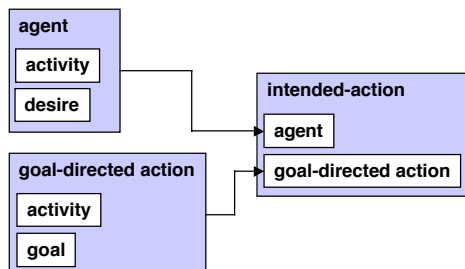
7

Aggregate Models for Intention Recognition

Intended actions may be described by aggregates which connect observable actions with (unobservable) intentions of an actor.

```

name:      scene-intended-place-cover
parents:   :is-a scene-intended-action
parts:     sipc-pc :is-a scene-place-cover
           sipc-ag :is-a scene-agent
           with (sipc-ag.desire = sipc-pc.goal)
constraints: (temporal, spatial and other constraints on parts)
    
```



If an action is known to be goal-directed and an agent performs such an action, the agent is ascribed the intention to attain the goal.

8

Plan Recognition

Given:

- observed actions
- knowledge about likely goals of actor

 predict further actions

 plan own actions (cooperative or adversary)

Example ("smart room" or service robotics scenario):

Observations: tea-time: person gets up - person walks to door - ...

Predictions: ... - person goes to kitchen - person prepares tea

Plan recognition by

- matching partial action sequences to plan models
(same principle as occurrence recognition)
- generating likely plans from the initial action sequence