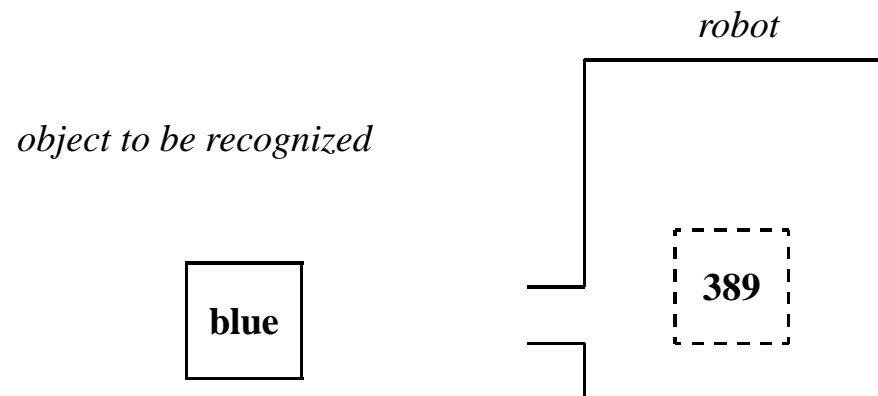


3.2 From perception to recognition

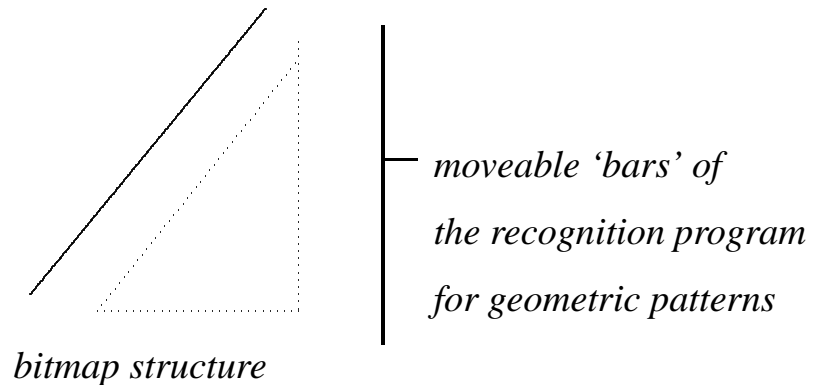
3.2.1 Two criteria to evaluate CURIOUS

- Measuring the active and reactive behavior (behavior test)
- Measuring the cognitive processing directly (cognition test)

3.2.2 Internal bitmap representation of external object



3.2.3 Analysis of an internal bitmap representation



3.2.4 Definition of the context

The context of a cognitive agent CA at a given point of time t includes

1. the total of all current cognitive parameter values CA_t ,
2. the logical analyses of the parameter values and their combinations (reconstructed patterns),
3. the conceptual structures used to classify the reconstructed patterns and their combinations.

3.3 Iconicity of formal concepts

3.3.1 I-concept_{loc} of a square (token)

$$\left[\begin{array}{l} \text{edge 1: 2cm} \\ \text{angle 1/2: } 90^0 \\ \text{edge 2: 2cm} \\ \text{angle 2/3: } 90^0 \\ \text{edge 3: 2cm} \\ \text{angle 3/4: } 90^0 \\ \text{edge 4: 2cm} \\ \text{angle 4/1: } 90^0 \end{array} \right]_{loc}$$

3.3.2 Definition: I-concept_{loc}

An I-concept_{loc} results from successfully matching an M-concept onto a corresponding parameter constellation at a certain space-time location.

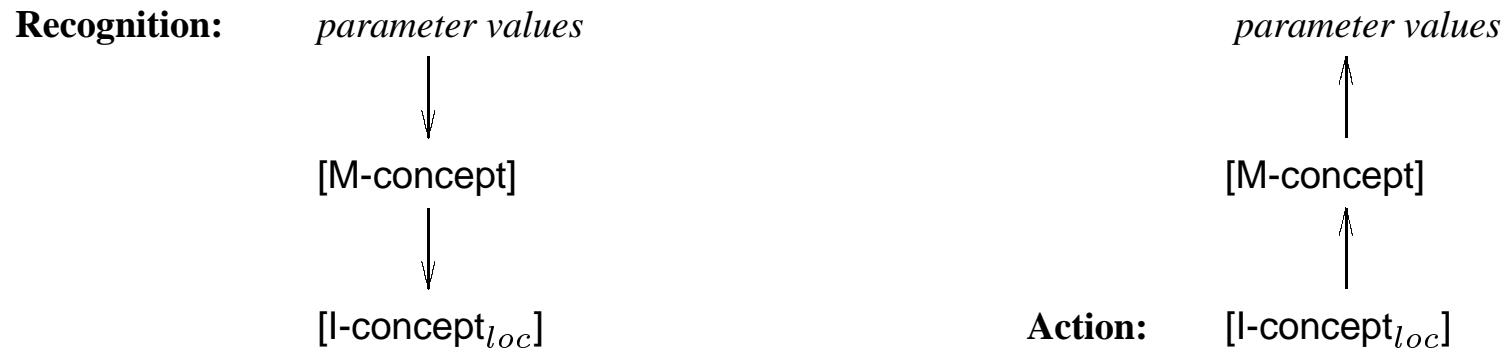
3.3.3 M-concept square (type)

$$\left[\begin{array}{l} \text{edge 1: } \alpha \text{ cm} \\ \text{angle 1/2: } 90^0 \\ \text{edge 2: } \alpha \text{ cm} \\ \text{angle 2/3: } 90^0 \\ \text{edge 3: } \alpha \text{ cm} \\ \text{angle 3/4: } 90^0 \\ \text{edge 4: } \alpha \text{ cm} \\ \text{angle 4/1: } 90^0 \end{array} \right]$$

3.3.4 Definition: M-concept

An M-concept is the structural representation of a characteristic parameter constellation whereby certain parameter values are defined as variables.

3.3.5 Contextual recognition and action



3.3.6 Aspects of iconicity

- The parameter values of the internal context are images insofar as they reflect the corresponding structures of the real world.
- The reconstructed patterns (I-concepts_{loc}) are images of parameter values because they are logical analyses of parameter values.
- The M-concepts of the internal context are images insofar as they (i) originate as abstractions over similar parameter constellations and (ii) characterize associated classes of reconstructed patterns.

3.3.7 Fallacious arguments against iconicity

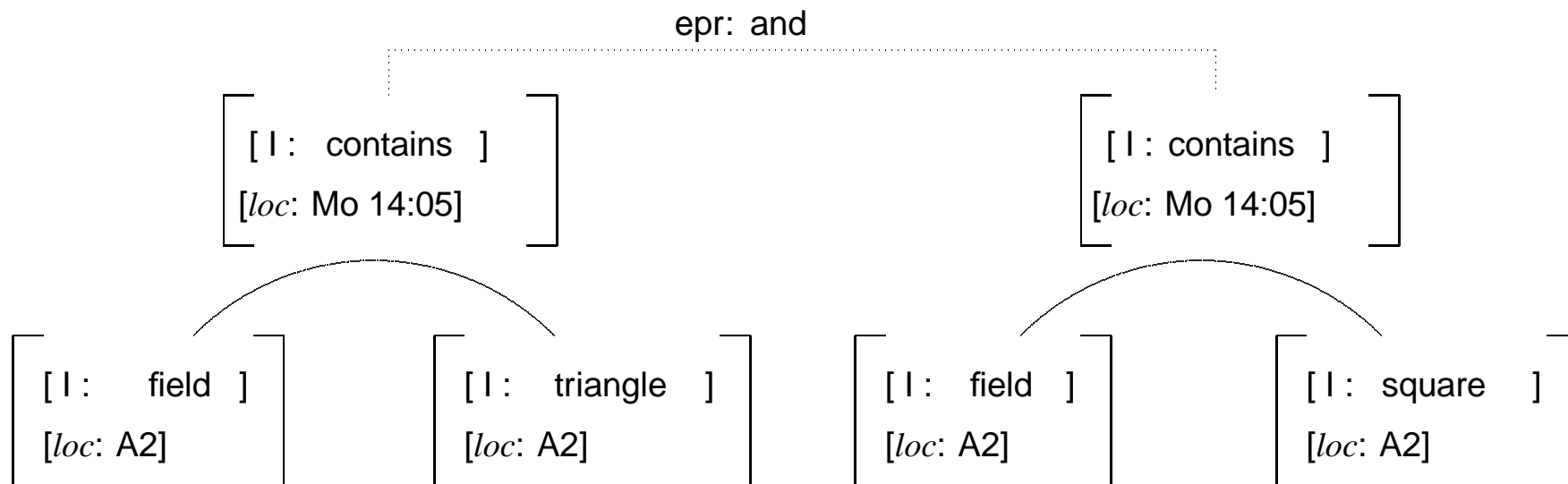
- If one were to surgically search the brain of a person who has seen a tree, one would not find such an image.
- In the case of, e.g., a triangle, what *kind* should the concept should be *exactly* : isoceles, scalene, right-angled? (BERKELEY 1685–1753).
- If there are pictures in the mind, then there must be someone to see them. Yet postulating a little man (homunculus) in the head to see the images would not do because the little man would have images in his little head in turn, requiring another homunculus, and so on. Since postulating a homunculus is of no help to understand the interpretation of images, the images themselves are concluded to be superfluous (HUME 1711–1776).

3.4 Contextual I-propositions

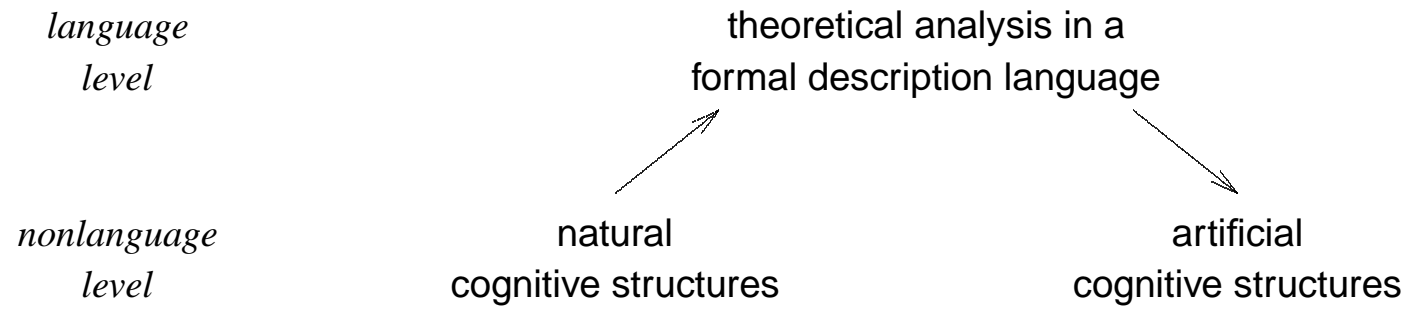
3.4.1 The three elements of basic propositions

<i>logic</i>	<i>world</i>	<i>language</i>
1. functor	relation	verb
2. argument	object	noun
3. modifier	property	adjective-adverbial

3.4.2 An example of two contextual propositions

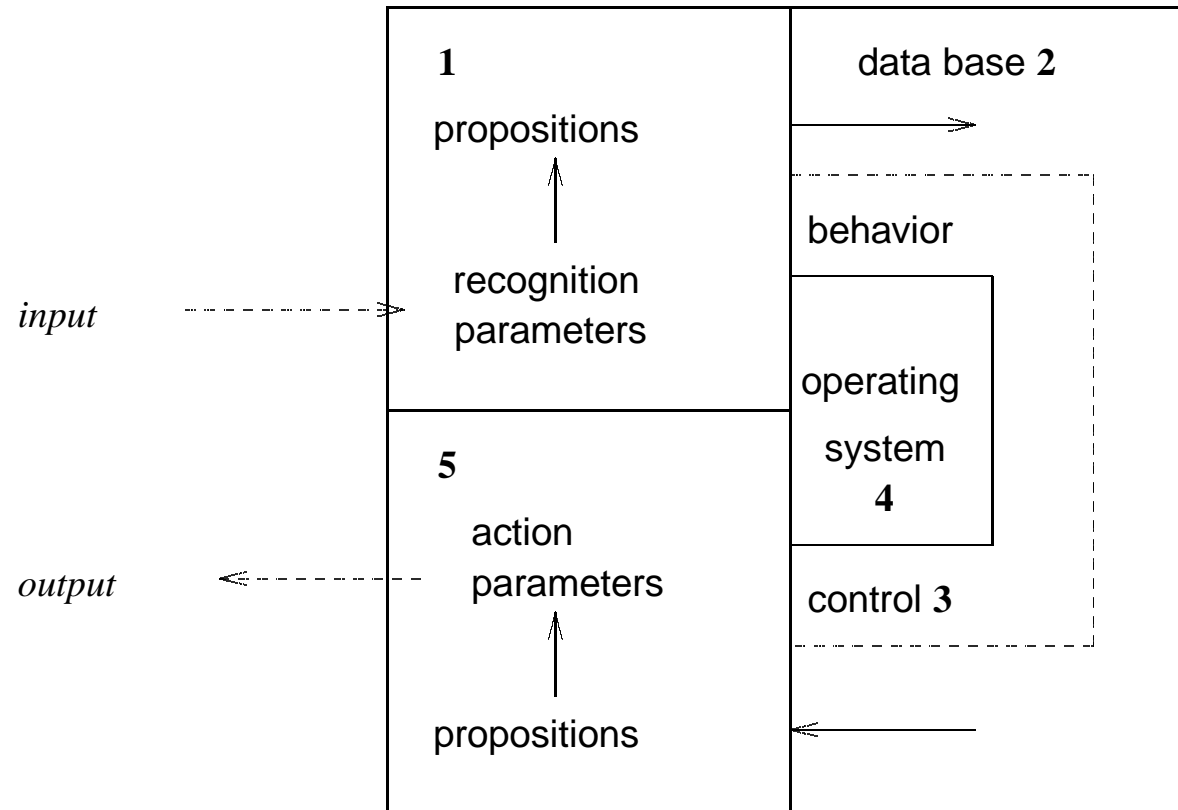


3.4.3 Artificial modeling of natural cognition



3.5 Recognition and action

3.5.1 Schematic structure of context-based cognition



3.5.2 Example of a behavior control program

1. Primary analysis of the current task environment:
 - (a) Move into the start field A1.
 - (b) Analyze the current field:
 - i. Approximate bitmap outline with edge program.
 - ii. Measure color value inside the bitmap outline.
 - iii. Derive I-proposition.
 - (c) Write I-proposition at index P-0.1 (present) into the database.
 - (d) If current field is not D4, move into the next field and enter state b. Otherwise go to 2.
2. Secondary analysis of current task environment (inferences):
 - (a) Count all triangles, rectangles, squares, red triangles, etc., in the primary analysis P-0.1 and write the result at index P-0.2 into the database.
 - (b) Compare the current secondary analysis P-0.2 with the previous secondary analysis P-1.2 and write the result (e.g. 'number of red triangle increased by 2') at index P-10.3 into the database.
3. Wait for 10 minutes.
4. Return to state 1.

3.5.3 CURIOUS as an autonomous agent (nouvelle AI)

Without a carefully built physical grounding any symbolic representation will be mismatched to its sensors and actuators. These groundings provide the constraints on symbols necessary for them to be truly useful.'

R.A. Brooks, 1990, S. 6.

3.5.4 CURIOUS as a physical symbol system (classic AI)

The total concept [of a physical symbol system] is the join of computability, physical realizability (and by multiple technologies), universality, the symbolic representation of processes (i.e. interpretability), and finally, symbolic structure and designation.

A. Newell & H. Simon 1975, p. 46