

# Cognitive Systems I

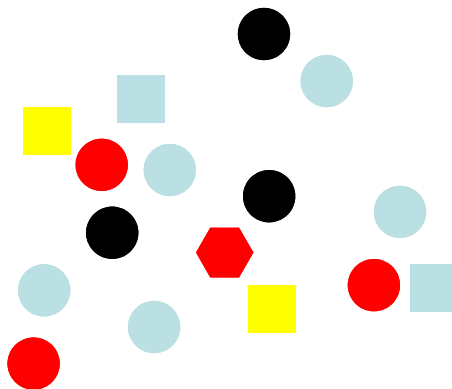
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## Exercise 1: Design and Implementation of a Simple Cognitive Architecture

(to be done in groups of 3-5 students, return per email by 08 May 2006 to [cosy-exercises@informatik.uni-bremen.de](mailto:cosy-exercises@informatik.uni-bremen.de))

A **cognitive architecture** is a software system that models components and processes of a (natural) cognitive system to explain intelligent behavior. Typical components of a cognitive architecture are, for example, memory systems (long-term memory, working memory, ...), perceptual systems (vision, ...), systems for thinking and reasoning, etc. The aim of this exercise is the design and the implementation of a simple cognitive architecture that models the processing of simple visual stimuli as discussed in the first lecture (see Fig. 1).



**Fig. 1.** Colored geometric objects as input of the cognitive architecture

The cognitive system to be modeled should be able to answer questions like: how many black circles are there in the picture? how many yellow squares? etc.

In dealing with these questions, the cognitive effects demonstrated in the lecture should be met by the cognitive architecture:

- the task can be dealt with under time pressure, but there is a minimal time required for successfully dealing with the task.
- the cognitive process is optimized with respect to the task to be performed on (when the question refers to black circles, other colors and forms are ignored).
- the solution of the task is still available after the visual stimulus has disappeared and can be reproduced by the cognitive system.

The task in more detail:

- Describe the design of your cognitive architecture: which cognitive components are necessary to cope with the given task? How do these components interact with each other?
- Implement the cognitive architecture in a language of your choice, such that the system can perform on the task described above and that the interplay between the components of the cognitive architecture can be observed. Let the visual input to the architecture be an array (e.g., 20\*15 cells). The cells of this array contain the attributes of the objects contained in them (e.g. "blue", "square"). Every cell contains not more than one object. The question to the system can be specified in a textual form that allows for the parameters "form" and "color".
- Describe the behavior of your system by using a number of appropriate examples