

# Cognitive Systems I

Christian Freksa, Thomas Barkowsky, & Holger Schultheis

Summer 2006

## Exercise 5: Depth of processing: the effect of elaboration on memory.

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

Craik & Tulving (1975; see slide 36 of the last lecture) examined how recognition memory for words is related to the ways these words have been processed before. In one of their experiments they presented human participants with a number of words. For some of the words the participants had to judge whether it was written in capital letters or not. For other words the judgement concerned category membership. To clarify this experimental procedure, consider the following 4 examples:

1. *Presented:* TREE  
*Question:* Is the word in capital letters?  
*Answer:* yes
2. *Presented:* tree  
*Question:* Is the word in capital letters?  
*Answer:* no
3. *Presented:* tree  
*Question:* Does the word denote a type of plant?  
*Answer:* yes
4. *Presented:* TREE  
*Question:* Does the word denote a type of animal  
*Answer:* no

After the subjects worked on several words they were tested on how good they remembered these words. To test their memory they were again sequentially shown a list of words and had to decide whether the word was one of those they had just worked on.

The main result of this experiment was that words for which categorical questions had had to be answered were more often correctly recognized by the participants than words for which letter questions had to be answered. More precisely, the percentage of correctly recognized words was much higher in the categorical (meaning) than in the letter (print) condition (see slide 36 of the last lecture).

For this exercise your task is to build a computational cognitive model which accounts for the observed memory effect. Your system should be able to act like the participants in the Craik & Tulving experiment, that is, it should work on the words and corresponding questions. This working should appropriately change the memory of your system such that it afterwards exhibits the same memory effects as the human participants. Solving this exercise includes (among other things):

- Creating suitable list of words and questions (at least ten words for each of the four above exemplified conditions).
- Devising and implementing all the components necessary for the system to do the experiment (where possible you can draw on already existing components from previous exercises).
- Devising and implementing a suitable memory representation

- Devising and implementing appropriate memory content to answer the categorical questions (as well as anything else that you deem necessary to properly solve the task)
- Devising and implementing suitable processes working on the memory representation
- Checking whether your system behaves like the human participants (most importantly, that the percentage of correctly recognized words is higher in the category-question condition).
- Write a clear and comprehensive description of your solution which focuses on the major aspects of your system regarding cognitive plausibility. This written description should include a (commented) trace of your model doing the experiment.
- Prepare an oral presentation which concisely presents the major aspects of your system.

To avoid misunderstandings: This exercise is concerned with MEMORY effects. A good solution will be detailed with respect to memory but not too detailed regarding other aspects. Put differently, do not spend too much time on, for example, the processes for reading the words, or deciding between capital and non capital letters, but do spend much time on the effects answering the questions might have on memory.