Course 03-05-H-711.01

Cognitive Systems I

Christian Freksa, Thomas Barkowsky, & Holger Schultheis

Summer 2006

Exercise 4: The Stroop Interference Effect: controlled vs. automatic processing of visual information

(to be done in groups of 3-5 students, return per email by 19 June 2006 to cosy-exercises@informatik.uni-bremen.de)

In the next lecture you will get to know the *Stroop Interference Effect* (see Fig. 1): the task is not to read the presented words, but to name the colors in which they are printed (spoken aloud and as fast as possible).

Fig. 1. Example stimulus fort the Stroop Interference Effect.

This task is usually difficult for humans, because the meaning of the word and the perceived color are not in accord with each other. The automatic recognition of the word meaning interferes with the more effortful, controlled processing of the color. This effect illustrates that visual stimuli, which are perceived via sensoric memory are not necessarily consciously processed in working memory, but may be processed automatically. The interference effect does not occur if word meaning and color do agree („red“ is displayed in red color etc.), the words are in a language the participant does not know, the words do not name colors (e.g., clean, fast, ill, …), or the words have no meaning (e.g., gund, plon, schrink, …).

Modify your cognitive architecture such that it can model the Stroop Interference Effect. Where applicable you can reuse already existing parts of your architecture. One part of your system should realize some form of sensoric memory accompanied by two processes working on the content of that store. One process should be automatic and unconscious (for determining the word meaning) and the other controlled (for recognizing the color). To determine the result your system ought to have some mechanism for resolving conflicts between the color information from the two different sources (word meaning and word color). Occurring interference should show up al least in prolonged reaction times and where applicable also in certain frequency of incorrect responses. Moreover, think about the

above mentioned cases where no interference occurs: May there be differences in reaction times regarding the different forms of non-interference? If so, how could you realize such difference in reaction times in your system?

The task in more detail:

a) Describe your concept of the extensions: which additional components are necessary for solving the task(s)? How is the interplay between these components realized?

b) Implementation of the cognitive architecture: implement the components such that the above described tasks can be accomplished by the system and that the interplay of the components can be observed.

c) Exemplify how your system reacts to different requests. In doing so, you need to develop appropriate stimulus material with which you can test the above cases with and without interference.