SFB 378 - Forstetzungsantrag (4. F rderperiode: 2005, 06, 07) zu Teilprojekt EM 1 VEVIAG: Functional and Neuro-scientific Analysis of Visual Working Memory

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EM 1 AERA: Task-specific encoding and recoding in working memory

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Research Topics

Our former research has shown that visuo-spatial working memory is on the one hand domain-specific, but on the other hand also flexible by recoding of input information according to the task requirements and the restrictions of the available resources. Therefore, the **dynamic reconfiguration of working memory is the focus of the final section of our research project**. Such recoding operations were already formerly postulated but they remained hypothetical because no methods were available to empirically substantiate them. Advances in EEG/ERP methodology and in brain imaging render the analyses of such recoding-operations possible. By this the neuro-cognitive approach will provide an understanding of the elementary mechanism of spatial learning.

AERA will have again three research topics that we plan to handle with the same team that successfully worked on the research topics of VeViAg3. The three topics are:

§ **The auditory spatial interface** (responsible researcher: G nther Lehnert): Of principal interest are recoding operations of spatial information provided by auditory material in route and map learning depending on resource limitations. The focus will be on the interplay of auditory (3D sound) and visual information in spatial learning and navigation. ERP methods will be the main research methodology in this field. Some of these studies are planned in cooperation with RENA and with respect to ERP methods, with ARCADE.

§ **Domain-specific maintenance mechanisms in working memory** (responsible researcher: Manuela M nzer-Schrobildgen): The focus of this research is the (re)configuration of processing modules for maintenance depending on task demands. We want to show that, according to subjects tasks and resource limitations, different domain-specific processing modules are used for maintenance. In this research a combination of behavioral and fMRI methods will be used. Therefore, the research will be conducted in cooperation with ARCADE and with the Department of Neuroradiology of Saarland University Hospital.

§ **Assisted cognition in multimodal learning environments** (responsible researcher: Beate Seidler): We want to investigate learning in instrumented environments as those developed by BAIR. The aim is to find how information is optimally distributed over multiple channels so that it can be successfully integrated by the user. Specifically, we are interested not only in short-term but also in long-term effects of adaptation-strategies which were designed to minimize local resource costs. We expect that adaptation strategies that focus on optimization either of the local or of the global utility are different. Additionally, we investigate how the resource-dependent processes change with the affective states of the users.

Cooperation within SFB 378
The three research topics have three different partner projects. Research on assisted cognition will be done in cooperation with BAIR. Spatial navigation will be investigated in cooperation with RENA. Research on mechanisms for maintenance will be coordinated with ARCADE. In the latter project expertise is one of the main research topics. This will be of relevance also for the to-be-investigated maintenance mechanism.

Manpower requirements: 3 Bat IIa /2 (continuation of the existing contracts)
3 student researchers, 19 hours per week for each

Additional costs: **per year:** **7 T_**

about 5 T_ for payment of participants
about 2 T_ for laboratory supplies
(EEG and reaction time lab)

in **2005**: **8,5 T_ in total**

consists of: 6,7 T_ Commander XG
an MRI compatible sound system
for auditory stimulation with 3DSound
in the fMRI experiments

1,8 T_for replacement of the
medium sized EEG cap

in **2006**: **1,8 T_**
for replacement
of the large sized EEG cap

Zimmer Hubert: Selected Publications between 1998 and 2003:

Selected Publications:
D ller, C., Opitz, B., **Mecklinger, A.** Krick, C., Reith, W. & Schr ger, E. Prefrontal cortex involvement in preattentive auditory deviance detection: Neuroimaging and electrophysiological evidence. *Neuroimage*

Mecklinger, A., Gruenewald, C., Besson, M., Magni , & von Cramon, D.Y. (2002) Separable neuronal circuities for manipulable and non-manipulable objects in working memory. *Cerebral Cortex*, *12*, 1115-1123.

Mecklinger, A. & Opitz, B. (in press). Neglecting the posterior parietal cortex. The role of higher order perceptual memories for working memory retention. *Behavioral and Brain Sciences*.

Zimmer, H. D., Speiser, H. & Seidler, B. (2003). Spatio-temporal working memory and short-term object-location memory use different memory mechanisms. *Acta Psychologica*, in press.

Zimmer, H. D. & Speiser, H. (2002). The irrelevant picture effect in visuo-spatial working-memory: fact or fiction? *Psychologische Beitr ge*, 44, 223-247.

Zimmer, H.D. (2001) How to optimise human way finding: a cognitive science approach to a user-adaptive design. *Cognitive Processing*, *2*, 309-322.