

Project R1-[ImageSpace]

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objectives and goals



R1-[ImageSpace]

- computational architecture
 - cognitive adequacy
 - construction of mental spatial knowledge representations
 - mental reasoning about spatial environments
- application to assistance scenarios
 - interaction with external diagrammatic media
 - spatial reasoning and mental planning

theoretical background



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- artificial intelligence
 - spatial & diagrammatic reasoning
 - cognitive modeling
- spatial cognition
 - spatial problem solving
 - human memory and mental reasoning
 - spatial mental models & mental images

theoretical conception of the computational model



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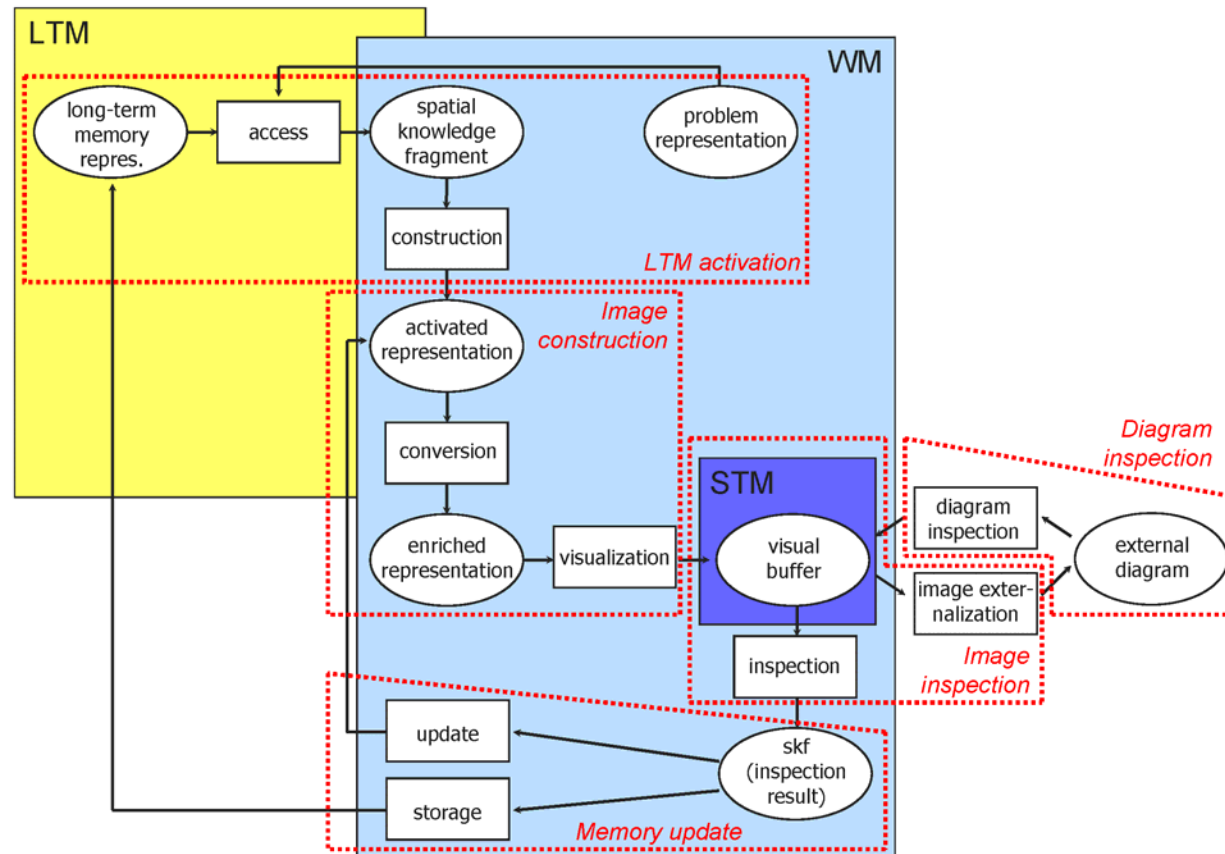
- comprehensive review of literature and analysis of empirical findings
 - memory, perception, imagery, neuropsychology, attention, cognitive control, spatial & diagrammatic reasoning, ...
- compilation of *catalog of relevant empirical findings*
 - relation between empirical studies and modeling conceptions
 - publicly available

overview of architecture



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- first outline of computational architecture *Casimir*



workshop organization



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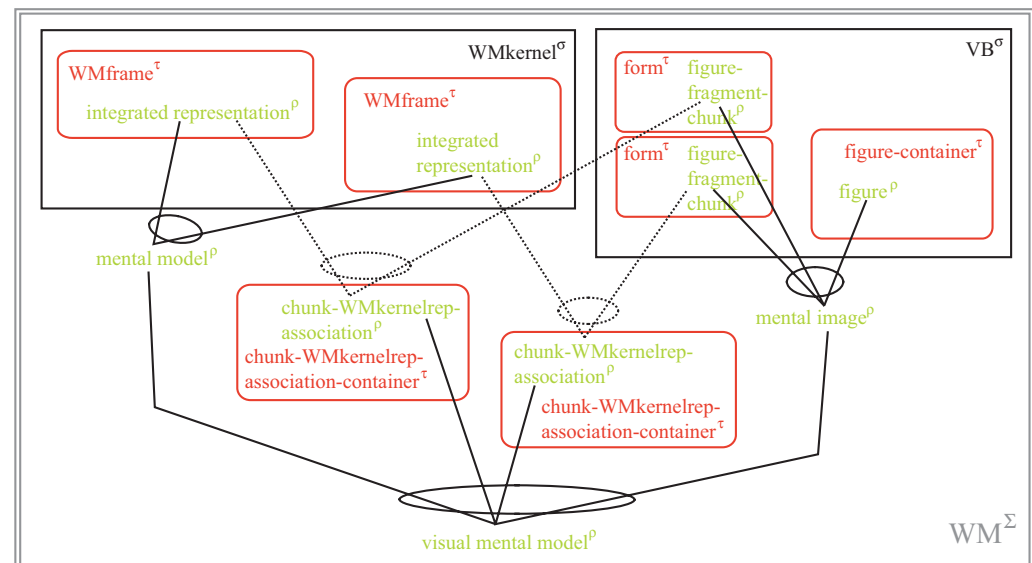
- organization of international workshop on *Spatial and Visual Components in Mental Reasoning*
 - jointly with R2-[BackSpace]
 - publication of special issue of *Spatial Cognition and Computation*

development of the architecture



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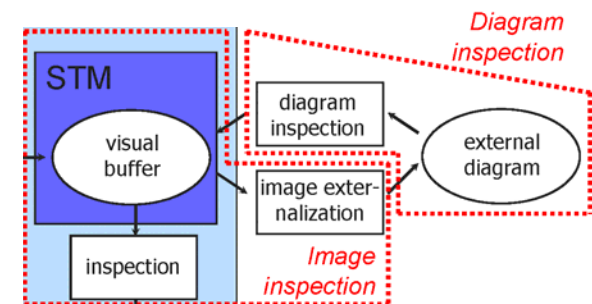
- more formal specification of the architecture
- development of internal control mechanism for mental reasoning
 - PhD project
Holger Schultheis
- revision of conception of mental image
- start with implementation



mental and external diagrammatic representations



- image externalization and diagram inspection
- two workshops
 - *Mental conceptions of emergent spaces in architectural design (DCC'04)*
 - cooperation with ETH Zurich
 - *AAAI Spring Symposium on Reasoning with mental and external diagrams*
 - cooperation with Mary Hegarty (UCSB)

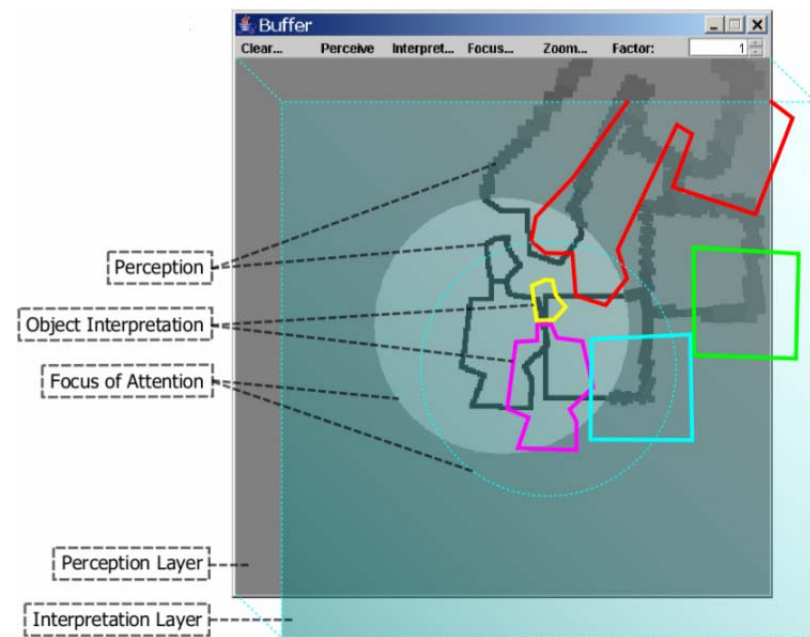


mental and external diagrammatic representations



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- a prototypical implementation
 - demonstration of image externalization and re-perception
 - diploma thesis by Peter König
- a land-use planning scenario
 - 4-semester grad student project
- application of cognitive results to construction of external diagrammatic representations
 - cooperation with I2-[MapSpace]



collaborative human-computer interaction



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- eye movements as indicator for construction of mental representations
- influence of external events on mental knowledge construction processes
 - PhD project Sven Bertel
 - cooperation with Mary Hegarty (UCSB)

model-based assistance in environmental space



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- interaction between assistant system and human user performing on a spatio-temporal planning task
 - PhD project Inessa Seifert
- development of indoor localization system
 - WLAN based
 - cooperation with I2-[MapSpace]

outlook on rest of phase I



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- completion of the implementation of Casimir
 - internal components
 - interaction with external representations
- development and implementation of demo application scenarios
- assessment of the architecture
 - with respect to modeling adequacy
 - with respect to requirements of assistance scenarios
- publication of results

summary of R1-[ImageSpace] in phase I



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- development of *Casimir* architecture
 - representation structures and processes
 - cognitive control
- application of modeling to spatial assistance
 - collaborative human computer interaction (pictorial space)
 - spatio-temporal mental planning (environmental space)

perspectives for 2007-2010



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- incorporating results of Casimir assessment
 - improving cognitive adequacy
 - decentral control of mental resources
 - scalable structures for visual and spatial knowledge components
- mental representation and processing of shape information
 - relation of shape to other aspects of spatial knowledge
 - cooperation UCSB (psychology)
- attention in visual perception and its relation to the construction of multipart mental images
 - eyetracking studies
 - cooperation A5-[ActionSpace]

perspectives for 2007-2010 (cont'd)



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- theoretical foundation of relation between cognitive model and assistance function
 - interfaces between mental and external domain
 - roles of the model in the interaction process
- mental processing of route instructions
 - representation-theoretic aspects of cognitively adequate route directions
 - interaction between cognitive agents with map-like representations
 - cooperation I2-[MapSpace]
- demonstrations of Casimir in assistance scenarios
 - demonstration of capabilities
 - assessment of cognitive performance with respect to assistance
- application of Casimir to design problems in architecture
 - cooperation ETH Zurich