Proposing a Cognitive System for Universal Mental Spatial Transformations

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Abstract

Mental spatial transformation processes are often modeled by assuming imaginal processes, highly task-specific assumptions, or both. We propose the existence of a dedicated, unified cognitive system for the simulation of spatial processes, and show ways to model this system, including an ACT-R implementation that is currently in development. Results of spatial cognition and brain-imaging research support this proposal. Operations of this system are proposed to be influenced by their complexity, which we assume to be a product of the extent and amount of necessary transformation steps. This complexity is further assumed to be limited in its extent, possibly explaining decision time effects between task difficulties in a mental folding task as being caused by cognitive re-encoding processes. A model for the mental folding task lacking such a spatial system is presented, serving as a baseline to demonstrate the need of a system dedicated to mental transformations.