An Integrative Theory of Spatial Orientation in the Immediate Environment

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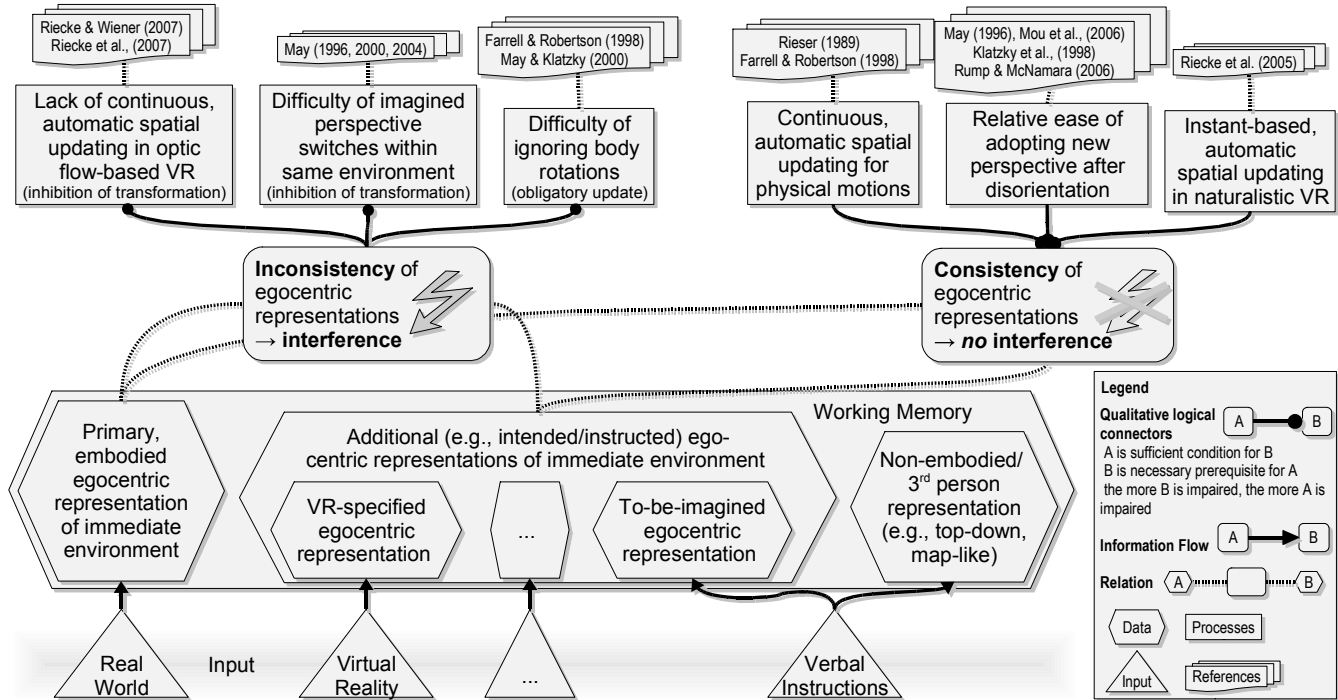Department of Psychology, Vanderbilt University, 111 21st Ave S., Nashville, TN 37203, USA

Figure 1: Outline of our spatial orientation framework that integrates the notions of *interference* and *consistency* (abridged).

Keywords: Spatial orientation; spatial updating; egocentric; reference frame; theory; model; interference; framework

Modeling spatial orientation processes

The goal of this manuscript is to develop a theoretical framework that integrates two current theories of spatial orientation: May (2004) proposed that the difficulty of imagined perspective switches is caused, at least in part, by **interference** between the sensorimotor and the to-be-imagined perspectives. Riecke & von der Heyde (2002) developed a theoretical framework that is based on a network of logical propositions (i.e., necessary and sufficient conditions). They proposed that automatic spatial updating can only occur if there is a **consistency** between the observer's concurrent egocentric reference frames (e.g., mediated by real world perception, virtual reality [VR], or imagined perspectives, see Fig. 1, bottom left).

We propose that the underlying processes are the same, in the sense that a consistency between egocentric representations (Riecke & von der Heyde, 2002) is equivalent to an absence of interference (May, 2004). Whenever the current egocentric representations of the immediate surroundings are *consistent*, there should be *no interference* (cf. Fig. 1, top right). According to Riecke & von der Heyde (2002), this state enables automatic spatial updating. We propose that this lack of interference might also be able to explain

other important phenomena, such as the relative ease of adopting a new perspective after being disoriented. Conversely, *interference (inconsistency)* between the primary, embodied egocentric representation and a to-be-imagined (e.g., experimentally instructed) egocentric representation implies the difficulty of adopting a new perspective (cf. Fig. 1, top left). We posit that such interference or inconsistency also explains the difficulty people have in ignoring bodily rotations. Integrating logical and information flow representations in one coherent framework not only provides a unified representation of previously seemingly isolated findings and theories, but also fosters a deeper understanding of the underlying processes and enables clear, testable predictions.

Acknowledgments

References

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