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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 32(32)

ISSN

1069-7977

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Publication Date

2010

Peer reviewed

When Distance Relationship Contradicts Similarity in SUSTAIN

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Abstract: SUSTAIN is an influential multiple clusters (i.e., prototypes) model for categorization, in which the cluster nearer to the stimulus is activated for categorization. Due to that the cluster activation is the average of the dimensional similarity weighted by attention, the choice between clusters is little influenced by the dimension on which the similarity difference to the stimulus between clusters is negligible, even with equivalent dimensional attention weights and the clusters having the same distance difference on dimensions (e.g., 1 vs.2 on dimension 1 and 4 vs.5 on dimension 2). This is evident in modeling Experiment 1 in Erickson and Kruschke (1998) that SUSTAIN activates the rule-category cluster, which is actually farther to the critical item than the exception-category cluster. The computer simulation results suggest that the larger the learning rate, the more likely this similarity-distance contradiction occurs. With the SUSTAIN using the ALCOVE's similarity computation equation, this contradiction disappears.