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The semantic priming effect has been central in many debates on the structure and dynamics of semantic memory. One view states that concepts in the memory system are interconnected via links of variable strength through which activation spreads. On presentation of a word (prime), its semantic representation will increase in activation, which then spreads via the semantic connections to related concepts. When a second word is presented, whose semantic representation is close to the prime word, shorter lexical decision or naming latencies are observed; the basic semantic priming effect.

This simple semantic network (SSN) model predicts that the more activation is given to the prime, the larger the priming effect. However, it was found that when the prime word had to be retained in short-term memory (STM) while a lexical decision was being made, the priming effect was absent (Davelaar, 2004). This *prime-retention effect* is modulated by semantic distance and the stimulus-onset asynchrony (SOA) between the prime and the target, with weak associates being more affected than strong associates and especially at long SOAs. In order to account for this finding, an extension to Dagenbach and Carr's (1994) Center-Surround hypothesis was proposed. Here, a computational structure is sketched that implements this hypothesis and is easy to incorporate in a recent connectionist models of priming (Huber & O'Reilly, 2003; Plaut & Booth, 2000).

Proposed Model Architecture

The single-layer SSN is changed into a two-layer network and augmented with two types of inhibitory connections that correspond to known anatomical connections in the human cortex (local and global inhibition). The architecture is depicted in Figure 1 and is presented as having a columnar structure, where every column represents a separate concept. Within each column, the input unit (bottom unit) sends activation to the corresponding output unit (top unit) and to the local inhibitory unit (filled circle). The output and inhibitory units are reciprocally connected, which lead to the output unit exhibiting adaptation; with increase in stimulus duration the activation increases from baseline to a maximum and then drops to an intermediate level (cf. Huber & O'Reilly, 2003). Between columns, input units are connected to output and inhibitory units of related concepts, where the connection strength reflects the semantic distance. This inter-columnar organisation implements a semantic on-center/off-surround receptive field. All output units feed into a common global pool of inhibitory units that feeds back to the output units (depicted by the circle-headed arrow). This dynamically enforces a limitation on the maximum number of concepts that can be active simultaneously (cf. Davelaar, et. al., in press). In order to model the prime-retention effect, the output unit of the prime word has a self-recurrent connection (dashed arrow) whose strength affects the probability that the prime remains in STM (conceptualised as sustained activation).

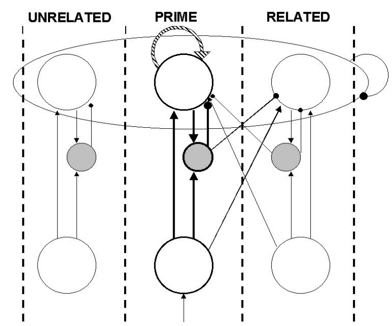

Figure 1. Architecture of a proposed model that captures the prime-retention effect.

Acknowledgments

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