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A Mathematical Approach to Investigate the Relationship between Association Memory and Latent Semantic Analysis for Word Meanings in English and Chinese

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Abstract: Certain previous researches attempted to characterize how association memory works. The word meanings derived from LSA (latent semantic analysis) are usually showed highly related to the performance of forward association memory. A naïve postulation would assume that the mechanisms for that relationship are mainly due to the processes of semantic similarity. The present work not only validates that the LSA calculation outcome is related to the norm of association memory for both English and Chinese, but also proposes that association memory could be constructed by considering the similar co-occurrences across situations for words from the perspective of LSA. The work further analyzes the constructed association bipartite nets and the results showed that the counts of afferent associations are proportional to the strength of association memory. It can be concluded that the words associated with many other words would have higher probability to have higher LSA values. Finally, we suggest a possible mechanism of how association memory is formed and depicts how words emerging in many other situations would be more probable to be associated with other words, which can be predicted by LSA.