

# LOCAL ENHANCING CONNECTIONS AMONG SPATIAL FREQUENCY FILTERS MIGHT MEDIATE GESTALT GROUPING PRINCIPLES

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There has been a revived interest in understanding the internal mechanisms underlying Gestalt principles in both neural physiological and visual psychophysical studies in recent years. It has been shown that perceptually, a group of Gabor elements with locally aligned orientations pops out from a background comprising the same Gabors with random orientations. A local association field (LAF, Field, Hayes & Hess, 1993) around each V1 filter working at suprathreshold contrast levels was proposed to account for the orientation-dependent grouping effect. We aimed to investigate whether LAF can be understood as mutual enhancing connections among V1 filters. We have found a substantial reduction in the detection threshold of a Gabor patch presented in a match-to-LAF configuration as compared to that in a non-match condition. Probability summation cannot account for the magnitude of such reduction. We have also obtained results inconsistent with the LAF model. Specifically, when the orientations of the three Gabors in a triplet were all the same, a substantial threshold reduction was also found, even when the triplet was in an invalid configuration. While such results are at odds with the LAF model, they are consistent with the law of similarity proposed by the Gestalt psychologists. It thus appears that there are excitatory connections both between filters of the same orientation preferences, regardless of their relative cortical positions, and between filters arranged in a manner that matches the LAF configurations.

**Keywords:** Gestalt psychology, Local association field, Law of good continuation, Law of similarity, Contextual effect, Long-range connection, Detection threshold, Probability summation.