Poster session 11. Perceptual Organisation

A Neurodynamic Model of the Role of Accentuation in Figure-ground Segregation

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The accentuation had been recently proposed as a general principle of figure-ground assignment that can override classical Gestalt principles such as size, closure, or convexity. Here, we developed a neurodynamic model to account for properties of accentuation and its relation to other figural cues. The model consists of four processing stages, each involving retinotopic maps: 1) a set of feature maps that compute bottom-up saliency; 2) a network for visual segmentation that employs inhibitory connections to segregate surfaces into distinct layers; 3) a feature-based winner-take-all network that selects most salient locations in the map and 4) a network that enables spreading of enhanced neural activity from the most salient locations to all connected locations. Proposed networks form a feedback loop that guides surface segregation. Computer simulations showed that the model correctly predicts appearance in many of the stimulus configurations designed to test the effectiveness of accentuation. These include examples showing that accentuation biases square-diamond illusion, generates reversals of tessellations, and dominates over size, closure, convexity, and similarity. The model suggests that the accentuation is a consequence of surface segregation that is automatically triggered by the most salient locations in the image. The proposed model also accounts for similarity-based groupings and the pointing illusion and its variants.

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Visual Perception of Bouncing and Jumping

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We systematically explored the degree of consistency between the physical and the perceptual laws of the events of bouncing and jumping. Several parameters of the animation were manipulated across four experiments. Participants were presented with animations showing a small disk moving vertically back and forth repeatedly along the vertical axis of the screen, and had to indicate if the display showed the bounce of a physical inanimate object, the animated motion of a living creature, or an undefined motion. The results revealed that uniform acceleration tended to enhance visual impressions of a physical bounce, although this effect was more evident in the case of one bouncing cycle than in the case of three bouncing cycles, and for values of acceleration much smaller than 9.81 m/s2; moreover, physical bounce impressions were more likely for values of C (coefficient of restitution) < 1, and by delays at the impact in the range 0-30 ms. The animated jump impressions were more likely for values of C > 1 and by delays between 90-150 ms. Interestingly, neither physical bounces nor animated jumps were affected by the presence or the absence of a bouncing surface. Overall, the results indicate that visual impressions of physical bounce and animated jump strongly depend on kinematics, can be visually perceived in a relatively direct and automatic manner, and are largely independent of the corresponding physical laws, consistently with the Gestalt-theoretic account of event perception.

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Effect of Interocular Grouping Demands on Binocular Rivalry

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Binocular rivalry is the phenomenon that when two incompatible images are simultaneously presented, one to each eye, the two images compete with each other to be the dominant percept. Remarkably, binocular rivalry accommodates interocular grouping so that if portions of two globally coherent images are shown to each eye, subjects still perceive the global pattern far more often than would be expected by chance. In this study, we recorded subject's perceptual reports (N = 48) while viewing classic rivalry with orthogonal gratings (red in one eye and green in the other). This was compared to conditions with increasing grouping demands; stimuli were divided into 2, 4 or 6 patches with alternating patches shown to each eye. With classic BR, subjects perceived one of the two coherent images ~75% of the time, and reported a mixed (piecemeal) percept 25% of the time. With 2-patch stimuli, dominance of either global percept vs. a mixed percept were each seen ~50% of the time. For 4 or 6 patches, the global dominance time is reduced only modestly and saturates such that dominance, or mixed percepts were always seen ~40% and 60% of the time, respectively. Mean dominance durations: 1-2 sec throughout. Mean mixed durations: 0.5 -3 seconds. Data suggests that grouping across the vertical meridian is slightly more robust than across horizontal meridian, and future plans include analysis