

錯覚と数理の融合研究プロジェクトセミナー

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Can touch correct visual illusions?

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Perceiving the correct shapes of objects is necessary for inferring object qualities, manipulating tools, avoiding obstacles, and other aspects of functioning successfully in the world. Since observers can estimate object properties from larger distances using vision than they can from touch, generally vision makes predictions that touch relies on, such as the shape of a handle or chair. However, since the information in retinal images is inherently under-determined, the inferential power of vision arises from employing intelligent heuristics/assumptions/priors, but this inevitably leads to illusory percepts in some cases. What are the possible functions of touch in such cases? Observers could rely entirely on the haptic percept and ignore the erroneous visual percept, or touch could temporarily correct the visual percept, or there could be longer lasting effects if observers learn to change their visual prior assumptions or weights for different visual cues. We tested these possibilities by measuring the effects of various types of haptic feedback on the perception of real objects and proper perspective projections of 3-D surfaces. The results show that in the perception of 3-D shapes, haptic information can dominate vision in some cases by changing percepts. The effects take time to develop, are attenuated by distance, drastically reduced by gaps in the surface, and fade rapidly after the cessation of the feedback. These dynamic shifts in qualitative perceived shapes could be a key to whether haptic feedback modifies the gain of neurons responsible for percepts of 3-D curvatures and slants, or the shape-tuning, or whether haptic-visual interactions happen after independent decisions in the two modalities.

連絡先：「現象数理学」共同利用・共同研究拠点

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