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Seeing materials from image movements

～Motion-based liquid perception by human vision～

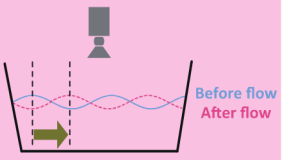
Abstract

Human observers can easily perceive various properties of materials, for example, the shininess of metal. Previous research has investigated the perception of rigid materials. However, it is unclear how the visual system creates the representation of non-rigid materials such as liquid. Here we demonstrate that the visual system recognizes several properties of liquid by exploiting image motion and deformation. We report that human observers recognize liquid from image motion flow and its smoothness, and that dynamic image deformation can trigger transparent liquid impression. Clarification of the image information that produces material perception can contribute to development of technology to easily modify the appearance of materials in a movie.

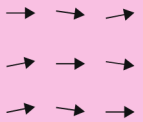
Our findings 1

Human observers can recognize liquid from image motion.

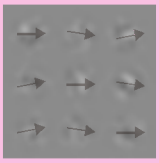
1. Taking a liquid flow movie



2. Computing motion information from the movie



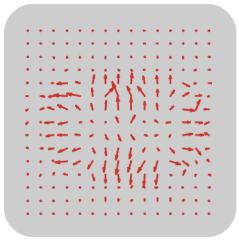
3. Noise motion based on computed motion information



Noise motion is sufficient to trigger the impression of liquid flow.

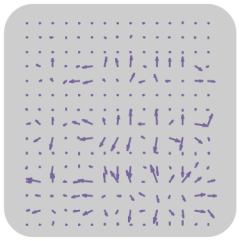
Our findings 2

Smoother motion flow produces Stronger liquid impression



Smooth motion flow

Strong liquid impression

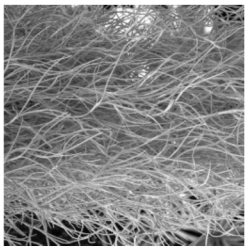


Non-smooth motion flow

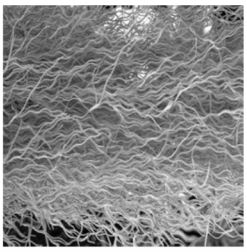
Weak liquid impression

Our findings 3

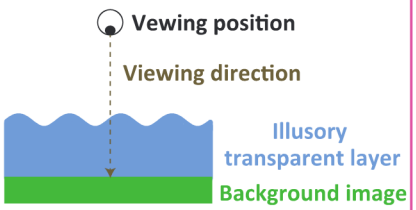
Human observers recognize transparent liquid by exploiting specific information in dynamic deformation



An image without deformation



An image with deformation



Dynamic deformation produces transparent liquid impression.

Related work

[1] T. Kawabe, K. Maruya, S. Nishida, “Seeing transparent liquids from dynamic image distortion,” in *Abstract presented at the 12th Annual, Meeting of the Vision Sciences Society, J Vis*, 13(9):208, 2013.

[2] K. Maruya, T. Kawabe, S. Nishida, “Material from motion - Human perception of fluid properties from motion vector fields,” in *Abstract presented at the 12th Annual, Meeting of the Vision Sciences Society, J Vis*, 13(9): 207, 2013..

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