

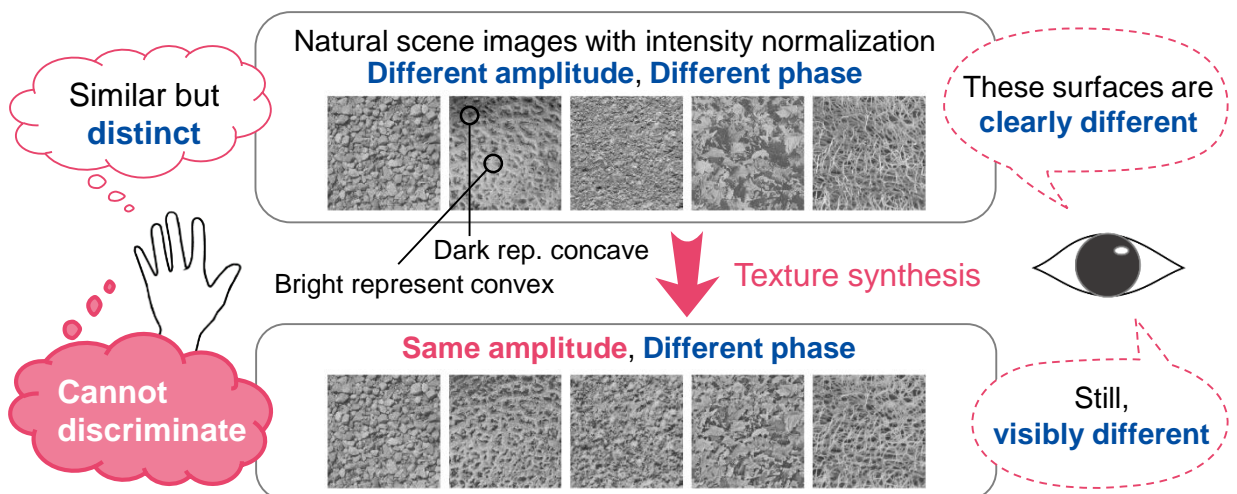
Abstract

Humans sense spatial patterns through their eyes and hands. Past studies have revealed differences (as well as similarities) between vision and touch in **texture processing** (e.g., eye is good at detecting texture boundaries, while hand can discriminate subtle texture differences), but the **underlying computational differences** remain poorly understood. Here we transcribed various textures as surface relief patterns **by 3D-printing**, and analyzed the tactile discrimination performance regarding the sensitivity to **image statistics**. We found that **visually very different patterns cannot be distinguished by touch** if they differ only in higher-order statistics. Human tactile texture processing differs from visual one not only in spatio-temporal resolution but also in (in)sensitivity to higher-order image statistics.

Manipulation of surface texture by image processing

Treat a height map as a grayscale image

- Converting the depth pattern of surface carving into a luminance value of a monochrome image
- Conduct image processing on the image then 3D print
- Investigated that tactile texture perception is sensitive to the Fourier amplitude spectrum while not to the Fourier phase spectrum



Touch is more sensitive to small differences in the amplitude spectrum
Vision is more sensitive to higher-order statistics, including the phase spectrum

➤ Realize the design of different looks with identical tactile feeling

References

[1] S. Kuroki, S. Sawayama, S. Nishida, "Haptic metameric textures," bioRxiv, 2019. doi: <https://doi.org/10.1101/653550>

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