

# Novel method helps recover obscured images

January 23 2023

---

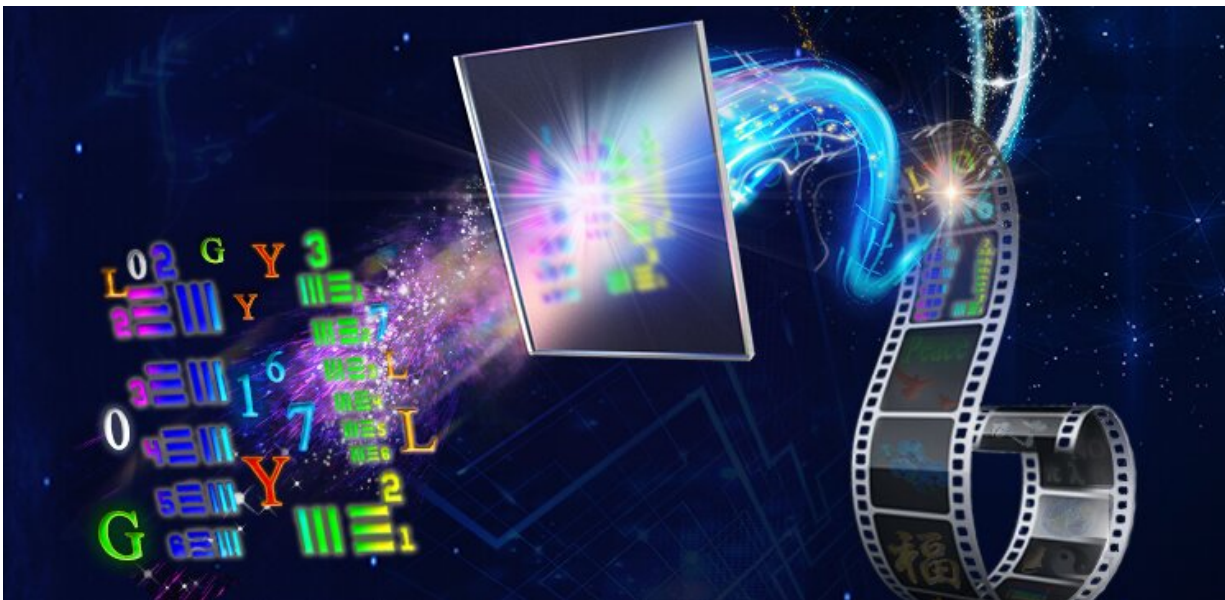


Illustration of the speckle-correlation imaging system designed by KAUST researchers and collaborators. The technique can produce real-time imaging of static and moving objects using simple or low-cost devices. Credit: KAUST; Wenhong Yang

A novel method that produces a clear image by using a simple cost-effective random scattering medium in real time could help overcome problems of obscured images.

When light passes through a light-scattering material, it is diffused rather than absorbed, which means a clear image of the source object is lost.

Scattering media include clouds, which poses problems for Earth-based astronomy, and body tissue, which affects [medical imaging](#).

Previous methods for reconstructing scattered light have required some initial knowledge of the object and the ability to control the wavefront of light illuminating it. This has involved complicated optical elements and high vulnerability to motion and mechanical instability. Computational algorithms are then able to post-process the detected light to generate an image.

To get more efficient ways of reconstruction, speckle-correlation imaging was proposed. This extracts information about the source from fluctuations in the intensity, or speckles, in the transmitted light.

However, many of the technologies based on speckle-correlation need time-consuming and intricately calibrated computational reconstruction. Also, still missing is some information such as the image orientation and location.

Wenhong Yang and Qiaoqiang Gan from KAUST, working with Jietao Liu from the Xiong'an Institute of Innovation in China, have developed a way to directly obtain a clear image from a single shot of the speckle image.

"We have developed a strategy of calibration-free, reconstruction-free, [real-time](#) imaging of static and moving objects with their actual orientation information," explains Yang. "This [novel technique](#) only requires simple or low-cost devices, without the post-computational reconstruction"

The team passed light from a small standardized test object through a thin diffusing material. By moving a camera in a direction away from the diffuser, they were able to build a three-dimensional image, taking

slices through the speckles.

By looking at enlarged sections of these images, the researchers, to their surprise, could directly see reproductions of the test object; they could see through the random diffuser with the [naked eye](#) and real-time video imaging. It required no complex equipment for the active control of light nor prior knowledge of the source or diffusion medium. They could also find the lost orientation information and location of the test object.

The research is published in the journal *Photonix*.

"Our work presents a significant step in the field of scattering imaging and will shed light on new avenues for imaging through diffusive media," says Yang.

**More information:** Jietao Liu et al, Directly and instantly seeing through random diffusers by self-imaging in scattering speckles, *Photonix* (2023). [DOI: 10.1186/s43074-022-00080-2](https://doi.org/10.1186/s43074-022-00080-2)

Provided by King Abdullah University of Science and Technology

Citation: Novel method helps recover obscured images (2023, January 23) retrieved 26 April 2024 from <https://phys.org/news/2023-01-method-recover-obscured-images.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.