Written by Roger Douglas
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Researchers at MIT have come up with a new approach that could have significant advantages over existing systems for transparent displays.

The new system embeds nanoparticles in the transparent material. These tiny particles can be tuned to scatter only certain wavelengths, or colors, or light, while letting all the rest pass right through. The glass remains transparent enough to see colors and shapes clearly through it, while a single-color display is clearly visible on the glass.

The researchers demo this by projecting a blue image in front of a scene containing cups of several colors, all of which can clearly be seen through the projected image.

The team's demonstration used silver nanoparticles — each about 60 nanometers across — that produce a blue image, but it is possible to create full-color display images using this technique. Three colors (red, green, and blue) will produce what we perceive as full-color, and each of the three colors would still show only a very narrow spectral band, allowing all other hues to pass through freely.

"The glass will look almost perfectly transparent," says MIT, "because most light is not of that precise wavelength" that the nanoparticles are designed to scatter. That scattering allows the

projected image to be seen in much the same way that smoke in the air can reveal the presence of a laser beam passing through it.

Such displays might be used, for example, to project images onto store windows while still allowing passersby to see clearly the merchandise on display inside, or to provide heads-up windshield displays for drivers or pilots, regardless of viewing angle.

This group's demo is just a proof-of-concept, and that much work remains to optimize the performance of the system. Silver nanoparticles, which are commercially available, were selected for the initial testing because it was "something we could do very simply and cheaply," the MIT team says. The team's promising results, without any attempt to optimize the materials, suggest much commercial potential in this approach.

The particles could be incorporated in a thin, inexpensive plastic coating applied to the glass, like the tinting applied to automotive windows. This would work with commercially available laser projectors or conventional projectors that produce the specified color.

The work, which also included MIT graduate student Bo Zhen, recent PhD recipient Wenjun Qiu, MIT affiliate Ofer Shapira, and Brendan Lacey of the U.S. Army Edgewood Chemical Biological Center, was supported by the Army Research Office and the National Science Foundation.

The video is worth watching.

Watch MIT Demo Their Transparency Technology