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Researchers Develop First Flexible, Transparent Image Sensor

Two Austrian researchers have developed the world's first flexible, transparent image sensor, which could be used in many places for which traditional image sensors are unsuitable. This would enable the creation of imaging-producing or sensing applications that could be embedded in everyday objects such as car windshields.

The technology could also be used in user interfaces that replace touchscreens. The approach's ability to sense a person's movements and generate signals would eliminate the need for users to actually touch the screen.

Professor Oliver Bimber and PhD student Alexander Koppelhuber of Johannes Kepler University of Linz's Institute of Computer Graphics, working with Microsoft Research in the UK, developed the new sensor and have already built the first prototypes.

The biggest challenge in developing flexible, transparent image sensors has been the accurate reconstruction of images on the sensor's surface. Bimber's team addressed this issue by doping a luminance-concentrator thin film with fluorescent dye particles. When an image focuses on the film, the substance absorbs light wavelengths, re-emits them at a lower frequency, and transports them to the film's edges.

Two scientists have developed a flexible, transparent image sensor that could be used on car windshields and other places where such sensors currently can't be deployed.

Using photo sensors at the edges and an optical technique the researchers aren't yet discussing in detail, the sensor can measure the distribution of the 2D light field that travels inside the film. The system uses this information, as well as mathematical techniques the Kepler researchers developed, to quickly perform in parallel the complex calculations necessary to reconstruct the image on the film's surface.

The new sensor's lightweight, flexible, clear film could scale as desired and would be inexpensive to manufacture.

The sensors could also be layered. "This allows colors to be imaged—in underlying pixels—one color per layer," Bimber explained. The depth of the pixel presentation would improve the resolution. "Conventional image sensors capture colors in pixels alongside one other, reducing effective resolution," Bimber said.

The layering would also enable presentations with a high-dynamic range between the lightest and darkest parts of an image.

"Currently, we're working on increasing the image quality and resolution," Bimber noted.