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## The World's First Flexible and Transparent Image Sensors

*A research breakthrough at the Institute of Computer Graphics, JKU: Prof. Oliver Bimber and Alexander Koppelhuber M.Sc., have developed a revolutionary new image sensor. Made in Austria, it is the world's first flexible and completely transparent image sensor.*

For the past year and a half, both researchers have worked on flexible sensor solutions in cooperation with Microsoft Research in Cambridge. *“At the moment it is more or less fundamental research.”* Prof. Bimber explained. *“But the first prototypes already exist.”*

### **Flexible Film**

Essentially, the transparent film is doped with fluorescent particles. The film absorbs certain wavelengths of light that are then re-emitted with lower frequency and transported to the edge of the film. Using photo sensors and a special optical trick, the distribution of light extending to the film edge at all positions and in each direction can be measured. The measurements are the two-dimensional light field transported within the film. Similar to computer tomography, the information collected can be used to reconstruct an image that is focused on the film's surface.

The advantages are countless: the film is light, completely transparent, can be scaled to any size, placed anywhere, and is extremely flexible. In addition, the manufacturing costs are very low. *“Currently we are working on continuing to increase the image quality and resolution in which both hardware and software is developed further.”* Prof. Bimber explained. Although the time required for computing for image reconstruction is high, it does not affect the current implementation of the reconstruction algorithm that is executed in

parallel on conventional graphic cards: a 64\*64 pixel image, for example, requires an equation system containing 14 million entries – currently this takes 0.15 seconds.

### **Attaining More Flexibility**

In the global race on research for new optical sensors, the JKU has a clear edge. The new sensors are not only flexible in design, scale and malleability, they can also be layered. *“This allows colors to be imaged – in underlying pixels – one color per layer. Conventional image sensors capture colors in pixels alongside one other, reducing effective resolution.”* remarked the graphics expert. Also, various levels of light exposure can be measured within the different layers. *“This means that lighter and darker areas can be simultaneously captured and things like overexposure and underexposure – something we see with today’s cameras when taking photos of high-contrast scenes – will be a thing of the past.”* said Prof. Bimber.

### **Diverse Applications**

The sensor is particularly interesting for new user interfaces. *“This is the reason Microsoft will continue to fund our research for an additional three years. Thanks to our technology, in the future we will no longer have to deal with touch screens.”* And since the thin film can be placed anywhere in any form and size, it may be possible to adhere it to everyday objects, such as car windshields, converting them to an image sensor. The new application potential is vast.

The technology has also been nominated for the Adolf Adam Computer Science Award which will be presented at a ceremony on December 20 ([http://informatik.jku.at/teaching/adam\\_award](http://informatik.jku.at/teaching/adam_award)).

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