New device improves full-color image projection

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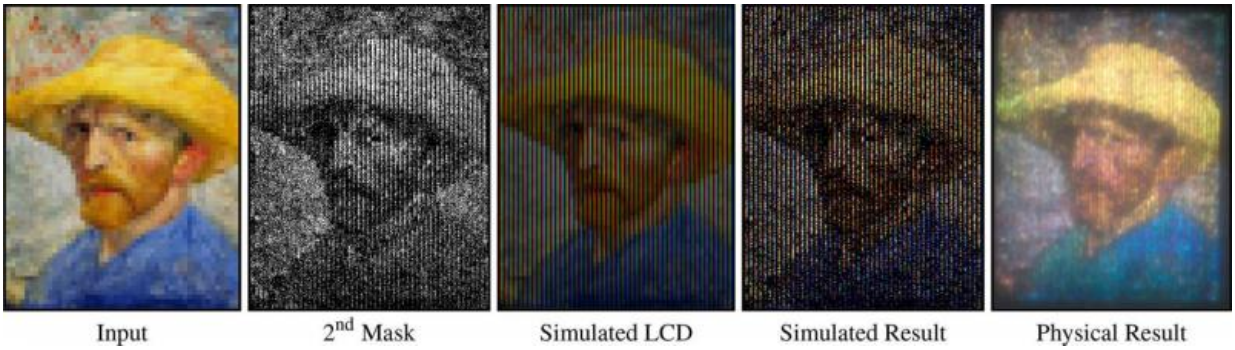

Credit: Rafael Hostettler et al.

A team of researchers at Disney Research and Dartmouth College has developed a new way to display full-color images using only two black patterns printed on transparencies affixed to two sides of a prism.

The first pattern creates a structured pattern of light that, when passing through the prism, creates a repetition of rainbows that are then filtered by the second pattern to produce a chosen full-color image. The research was presented recently at the 23rd Pacific Conference on Computer Graphics and Applications (Pacific Graphics 2015), where it won the "Best Paper Award."

"In the future, this technique could allow for projectors and displays

with better color fidelity or even displays, which could dynamically trade off light efficiency, color fidelity and resolution," says senior author Wojciech Jarosz, previously a senior research scientist at Disney Research Zürich and now an assistant professor of computer science at Dartmouth. Other members of the team included first author Rafael Hostettler and Ralf Habel and Markus Gross, all from Disney Research Zürich.

Recently, many methods and devices have been proposed that use optical elements or optical material properties in unusual and intriguing ways to reveal hidden images or create unexpected and surprising effects through shading/shadowing, refraction/reflection or attenuation to name a few examples. In this spirit, the Dartmouth-Disney team created a device that projects full-color images out of white light without having any colored part, consisting only of two grey-scale masks attached to one or two prisms. The source of the color thus remains initially unclear until one realizes that white light consists of different wavelength components that are decomposed by the prism(s) through dispersion and filtered by the masks. In addition to potentially improving the displays of the future, their device provides intriguing applications in art and entertainment as well as education by providing an engaging way to demonstrate and teach the physics of dispersion to children.

Jarosz's research is concerned with capturing, simulating, manipulating and physically realizing complex visual appearance. In effect, he strives to understand why things look the way they do, how we can simulate their interaction with light efficiently, how we can intuitively author or edit that appearance and how we can create physical objects with control over their appearance. His research has been incorporated into production rendering systems and has been used in the making of feature films, including Disney's "Tangled" and "Big Hero 6".

More information: A PDF of the study is available at the project

website.

Provided by Dartmouth College