Warping images using your PC graphics card

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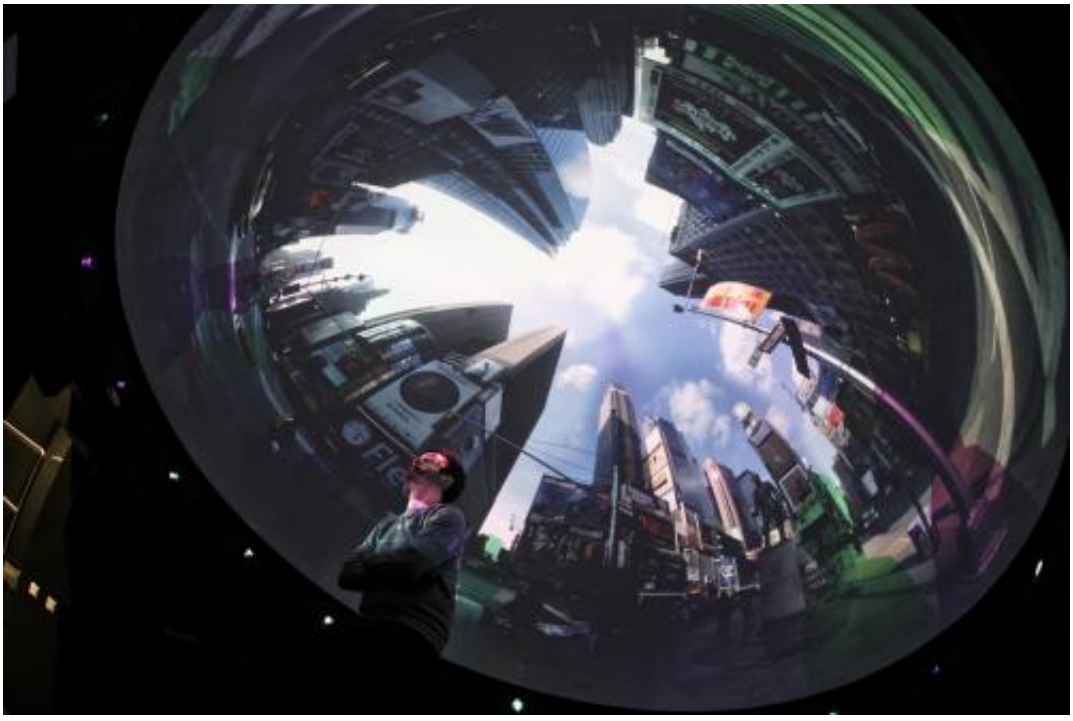

Using modern domed projection screens to take a virtual stroll around New York's Times Square. Now the technology has also been integrated directly in desktops' graphics card drivers. Credit: Fraunhofer FOKUS / Matthias Heyde

By projecting images onto contoured surfaces you get a virtual experience that puts you at the center of the action. Now, a quick and easy calibration technique could help the concept find a wider application beyond the planetarium.

It's almost as if you were weightless. You can reach out and touch the

Big Dipper and all around you are multitudes of twinkling stars. The glowing band of the Milky Way is clear in the sky, leaving you with the impression of actually being enveloped within it. In short, the perfect illusion – numerous projectors broadcasting a recreated version of the actual night sky onto the huge dome of the planetarium. The biggest of these domed projection screens measure over 20 meters in diameter. Now, scientists from the Fraunhofer Institute for Open Communication Systems FOKUS in Berlin have joined forces with graphics card manufacturer NVIDIA to integrate the technology required to project images of this type using a standard PC graphics card. "Desktop warping" allows any Windows desktop display to be projected onto curved screens – just like in a planetarium.

But how exactly do you go about "warping" screens? Manuel Schiewe, a FOKUS researcher who has dedicated a lot of time to the topic, is on hand to provide some answers. To get an even picture on a curved screen, each of the projectors must be precisely calibrated with one another. Each of them projects a part of the image, parts which together form the whole. "It's a bit like a puzzle. Every piece has to slot in exactly with the others to get the right picture," explains Schiewe. Projectors must be set up so that the images they project are of an equal brightness and suitable for a curved surface. This requires Schiewe to recalibrate the images, which were originally intended for a flat screen.

Initially, the only way this could be done was to calibrate manually. "As soon as the position of the projectors moved even slightly, we had to step in and make manual adjustments," recalls Schiewe. The solution came from Fraunhofer FOKUS's laboratories in Berlin, where researchers developed a piece of software that automatically calibrates images to match the projection screen. To do this, cameras capture test images generated by the projectors. The software then uses image processing algorithms to calculate the current calibration of the images on the projection screen. It then has all the information it needs to make auto-

matic corrections to the calibration and brightness of the images. "Today, planetariums, theme parks and simulators use the `Projector auto-alignment' tool to guarantee an even picture on large contoured surfaces," says Schiewe.

Integrating the software into graphics card drivers

Until now, this technology has been available only in combination with Fraunhofer FOKUS's media player, which is designed for specific media formats such as films, images, text or graphics. To be able to project any type of content calls for special software and hardware tools, connected between the graphics card and the projector. Time and cost escalate when users have to connect extra devices, and this also results in a delay in video display. "That is why we took the decision to integrate the automatic calibration software straight into graphics cards' drivers. This way, the whole Windows desktop – and any Windows pro- grams – automatically adjust to curved projection screens. Companies can easily make the most of being able to project onto any surface using their on-board graphics card. Their staff have more ways to communicate with one another, and can do so in a targeted manner. It's easier, too, to exchange and present content more effectively – even over long distances," explains Schiewe.

One example is remote maintenance of oil platforms. Ever since the "Deep Water Horizon" accident, engineers have increasingly been monitoring these platforms offshore, with all the most important data and developments from out at sea flowing into land-based control rooms. Modern media technologies such as "Desktop warping" display information about the platform in a way that immerses the controllers and, in a virtual sense, puts them at the center of the action.

More information: www.fokus.fraunhofer.de/en/viscom/index.html

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