新的显示形态：大视角桌面集成成像光场 3D 显示器

DOI: 10.12086/oee.2023.231012.h02

桌面光场 3D 显示提供了一种新的显示形态，同时具有传统桌面和 3D 显示屏的功能，用户围坐或围站在显示器四周的同时可互动共享观看 3D 影像，可支持多用户的协同工作和交互，因此在电子沙盘、会议办公、桌面游戏等领域可产生重要应用。

王琼华教授的北航和川大团队提出并研制了桌面集成成像光场 3D 显示器，在 43.5 英寸的大显示尺寸下实现了 68.7°的大径向 3D 视角，径向上运动视差平滑正确。研究团队基于集成成像对光场离散重构的思想，通过设计大相对孔径的复合透镜阵列，对 2D 显示屏上像素发出的光线方向进行自由空间的大范围调制，保证再现 3D 像点发出的光线以大角度出射，到达四周人眼。桌面集成成像光场 3D 显示由三个关键部件组成：超高分辨率 LCD 面板（7680×8640 个像素）、复合透镜阵列和光学扩散屏。复合透镜阵列包含正六边形蜂窝排布的数千个复合透镜元，其中每个复合透镜元又包含 3 片透镜。研究人员在设计复合透镜阵列时，一方面注意平衡与 3D 视角存在制约关系的深度、空间 3D 分辨率参数，另一方面保证大视场角下的像质优于中心零度视场。

Opto-Electronic Advances, 2023, **6**(6): 220178.
https://www.oejournal.org/article/doi/10.29026/oea.2023.220178.

A brand-new display form: integral imaging-based tabletop light field 3D display with large viewing angle

DOI: 10.12086/oee.2023.231012.h02

The key to a good 3D tabletop viewing experience is achieving a large 3D viewing angle in the radial direction, which enables users to view correct 3D images from large oblique viewing positions without having to cling to the table.

The research group of Prof. Qiong-Hua Wang report a tabletop light field 3D display based on integral imaging. This work achieved a large radial viewing angle of 68.7° in a large display size of 43.5 inches, with smooth and correct perspective and parallax in the radial direction.

They have developed a compound lens array with a large relative aperture based on the discrete light field reproduction concept in integral imaging. This lens array modifies the direction of light rays emerging from 2D display pixels in a wide range of space, ensuring that light emerging from 3D image points exits at a large angle and then reaches the human eyes around. The tabletop light field 3D display comprises three main components, namely an ultra-high-resolution LCD panel with 7680×8640 pixels, a compound lens array consisting of thousands of compound lens units arranged in a regular hexagonal pattern, and a light shaping diffuser screen. Each compound lens unit contains three lenses arranged along a common axis, and the compound lens array design focuses on balancing the parameters of depth of field and 3D spatial resolution, which are constrained by the 3D viewing angle. Additionally, the imaging quality is superior at large field angles compared to central field angles.

Opto-Electronic Advances, 2023, **6**(6): 220178.
https://www.oejournal.org/article/doi/10.29026/oea.2023.220178.