Lenticular Objects: 3D Printed Objects with Lenticular Lens Surfaces That Can Change their Appearance Depending on the Viewpoint

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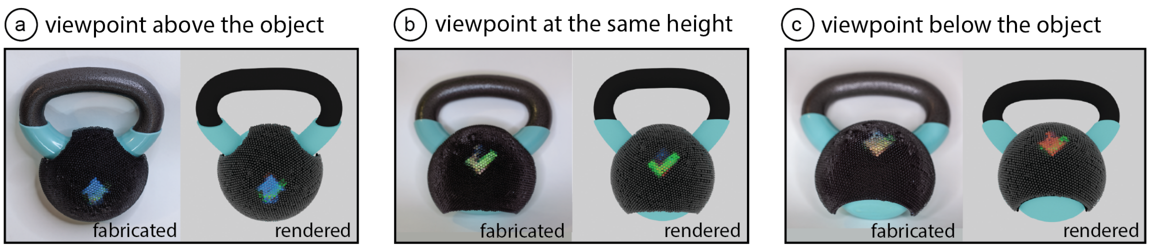

Fig. 1. 3D printed objects with lenticular lens surfaces enable viewers to see different appearances from different viewpoints (a: looking down; b: looking horizontally; c: looking up). Our user interface supports designers in setting up different viewpoints and assigning the corresponding textures. On export, it automatically generates the files for fabrication. Designers can then 3D print the object geometry, lenses, and underlying color patterns in a single pass with a multi-material 3D printer.

In this demo, we present a method that makes 3D objects appear differently under different viewpoints. We accomplish this by 3D printing lenticular lenses across the curved surface of objects. By calculating the lens distribution and the corresponding surface color patterns, we can determine which appearance is shown to the user at each viewpoint.

We built a 3D editor that takes as input the 3D model, and the visual appearances, i.e. images, to show at different viewpoints. Our 3D editor then calculates the corresponding lens placements and underlying color pattern. On export, the user can use ray tracing to live preview the resulting appearance from each angle. The 3D model, color pattern, and lenses are then 3D printed in one pass on a multi-material 3D printer to create the final 3D object.

To determine the best fabrication parameters for 3D printing lenses, we printed lenses of different sizes and tested various post-processing techniques. To support a large number of different appearances, we compute the lens geometry that has the best trade-off between the number of viewpoints and the protrusion from the object geometry. Finally, we demonstrate our system in practice with a range of use cases for which we show the simulated and physical results side by side.

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