Manipulated "Holograms": Fantastic Becomes Real

Loyko, Oleksandr

For years futurists have been imagining a world, where hologram technology is an integral part of everyday life (like Tony Stark's lab in "IronMan"). My project is aimed to turn this vision into reality by creating realistic images that look similar to holograms and can easily be manipulated using gestures. The main principle that is used is called "Pepper's Ghost" illusion. One of the devices that implement such effect is Pepper's Pyramid-truncated square pyramid with sides at 45 degree angle (glass or transparent plastic). 4 projections of an object are projected on the pyramid sides and there appears an illusion of an object floating in the air inside the pyramid. Usually expensive LED displays are used for projection and thus the device is expensive, fragile and fixed in size. I suggested replacing a LED display with a projector, making it much cheaper and more flexible in size. I have developed the software using OpenCV and OpenGL libraries that recognizes gestures or voice commands to move, rotate or resize images in real time. Gesture recognition is based on finding "convexity defects" of a hand. The background is subtracted to get rid of extra pixels before finding the "defects". After recognition one can use a pointer or grab a colorful thing to make manipulations. The program takes 3D images as ".obj" files as an input and automatically gives an image to be projected onto the pyramid. It is possible to load several models simultaneously, and manipulate them either separately or together. Such an option allows building a whole project based on the details in 3D. The proposed solution is low-cost, lightweight, easy-to-implement, and portable. It can be used for a range of applications including advertising, architecture, teaching, emergency operations, etc.

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