VOLUMETRIC DISPLAY

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A volumetric display device is a graphical display device that forms a visual representation of an object in three physical dimensions, as opposed to the planar image of traditional screens that simulate depth through a number of different visual effects. One definition offered by pioneers in the field is that volumetric displays create 3D imagery via the emission, scattering, or relaying of illumination from well-defined regions in (x,y,z) space. Though there is no consensus among researchers in the field, it may be reasonable to admit holographic and highly multiview displays to the volumetric display family if they do a reasonable job of projecting a three-dimensional light field within a volume.

Most, if not all, volumetric 3D displays are either autostereoscopic or automultiscopic; that is, they create 3D imagery visible to the unaided eye. Note that some display technologists reserve the term “autostereoscopic” for flat-panel spatially multiplexed parallax displays, such as lenticular-sheet displays. However, nearly all 3D displays other than those requiring headwear, e.g. stereo goggles and stereo head-mounted displays, are autostereoscopic. Therefore, a very broad group of display architectures are properly deemed autostereoscopic.

Volumetric 3D displays embody just one family of 3D displays in general. Other types of 3D displays are: stereograms / stereoscopes, view-sequential displays, electro-holographic displays, parallax "two view" displays and parallax panoramagrams (which are typically spatially multiplexed systems such as lenticular-sheet displays and parallax barrier displays), re-imaging systems, and others. Although first postulated in 1912, and a staple of science fiction, volumetric displays are still under development, and have yet to reach the general population. With a variety of systems proposed and in use in small quantities — mostly in academia and various research labs — volumetric displays remain accessible only to

academics, corporations, and the military. So-called "static volume" volumetric 3D displays create imagery without any macroscopic moving parts in the image volume. It is unclear if the rest of the system must remain stationary for membership in this display class to be viable.

This is probably the most 'direct' form of volumetric display. In the simplest case, an addressable volume of space is created out of active elements that are transparent in the off state but are either opaque or luminous in the on state. When the elements (called voxels) are activated, they show a solid pattern within the space of the display.

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Several static-volume volumetric 3D displays use laser light to encourage visible radiation in a solid, liquid, or gas. For example, some researchers have relied on two-step upconversion within a rare earth-doped material when illuminated by intersecting infrared laser beams of the appropriate frequencies.

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