

HOLOGRAPHY DEFINITION

Holography is a technique that enables a wavefront to be recorded and later reconstructed. It is best known as a method of generating three-dimensional images, and has a wide range of other uses, including data storage, microscopy, and interferometry. In principle, it is possible to make a hologram for any type of wave.

A hologram is a recording of an interference pattern that can reproduce a 3D light field using diffraction. In general usage, a hologram is a recording of any type of wavefront in the form of an interference pattern. It can be created by capturing light from a real scene, or it can be generated by a computer, in which case it is known as a computer-generated hologram, which can show virtual objects or scenes. Optical holography needs a laser light to record the light field. The reproduced light field can generate an image that has the depth and parallax of the original scene.[1] A hologram is usually unintelligible when viewed under diffuse ambient light. When suitably lit, the interference pattern diffracts the light into an accurate reproduction of the original light field, and the objects that were in it exhibit visual depth cues such as parallax and perspective that change realistically with the different angles of viewing. That is, the view of the image from different angles shows the subject viewed from similar angles.

A hologram is traditionally generated by overlaying a second wavefront, known as the reference beam, onto a wavefront of interest. This generates an interference pattern, which is then captured on a physical medium. When the recorded interference pattern is later illuminated by the second wavefront, it is diffracted to recreate the original wavefront.[2] The 3D image from a hologram can often be viewed with non-laser light. However, in common practice, major image quality compromises are made to remove the need for laser illumination to view the hologram.

A computer-generated hologram is created by digitally modeling and combining two wavefronts to generate an interference pattern image. This image can then be printed onto a mask or film and illuminated with an appropriate light source to reconstruct the desired wavefront.[2] Alternatively, the interference pattern image can be directly displayed on a dynamic holographic display.[3]

Holographic portraiture often resorts to a non-holographic intermediate imaging procedure, to avoid the dangerous high-powered pulsed lasers which would be needed to optically "freeze" moving subjects as perfectly as the extremely motion-intolerant holographic recording process requires. Early holography required high-power and expensive lasers. Currently, mass-produced low-cost laser diodes, such as those found on DVD recorders and used in other common applications, can be used to make holograms. They have made holography much more accessible to low-budget researchers, artists, and dedicated hobbyists.

Most holograms produced are of static objects, but systems for displaying changing scenes on dynamic holographic displays are now being developed.[4][5]

The word holography comes from the Greek words ὅλος (holos; "whole") and γραφή (graphē; "writing" or "drawing").