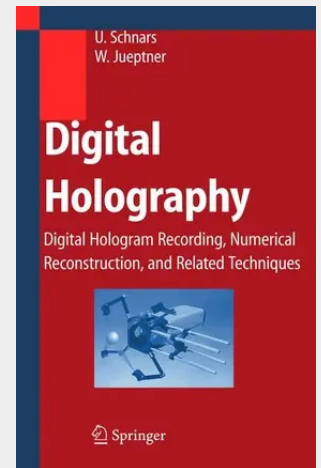


Digital Holography

Digital Hologram Recording, Numerical Reconstruction, and Related Techniques

This highly practical and self-contained guidebook explains the principles and major applications of digital hologram recording and numerical reconstruction (Digital Holography). A special chapter is designated to digital holographic interferometry with applications in deformation and shape measurement and refractive index determination. Applications in imaging and microscopy are also described. Special techniques such as digital light-in-flight holography, holographic endoscopy, information encrypting, comparative holography, and related techniques of speckle metrology are also treated

Sag' ich zum Augenblicke verweile doch, Du bist so schön J. W. v. Goethe, „Faust“ An old dream of mankind and a sign of culture is the conservation of moments by taking an image of the world around. Pictures accompany the development of mankind. However, a picture is the two-dimensional projection of the three-dimensional world. The perspective – recognized in Europe in the Middle Ages – was a first approach to overcome the difficulties of imaging close to reality. It took up to the twentieth century to develop a real three-dimensional imaging: – born invented in 1948 holography. Yet still one thing was missing: the phase of the object wave could be reconstructed optically but not be measured directly. The last huge step to the complete access of the object wave was Digital Holography. By Digital Holography the intensity and the phase of electromagnetic wave fields can be measured, stored, transmitted, applied to simulations and manipulated in the computer: An exciting new tool for the handling of light. We started our work in the field of Digital Holography in 1990. Our motivation mainly came from Holographic Interferometry, a method used with success for precise measurement of deformation and shape of opaque bodies or refractive index variations within transparent media. A major drawback of classical HI using photographic plates was the costly process of film development.



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