Holography and Deformation Analysis

W. Schumann, J.-P. Zürcher, D. Cuche

The book is composed of four chapters (2–5) and preceded by an *Introduction*. Numerous references are completed with alphabetic list of the authors. The titles of the particular chapters are the following:
- *Elements of Analysis, Geometrical Optics, and Kinematics,*
- *Elements of Holography and Image Modification,*
- *Holographic Interferometry or Fringe Interpretation,*
- *Modification at the Reconstruction in Holographic Interferometry.*

The second Chapter contains some fundamentals of the tensor analysis, and elementary introduction to certain problems in geometrical optics, such as eiconal, ray equation, refraction at interface of media with continuous change of refractive index and finally the kinematics of deformation in term of mechanics of continuum.

The third Chapter deals with the following topics: formation of holographic image including its aberrations in the case of a point image, a brief description of the volume holography theory, deformation and distortion of the image of an object reconstructed from a thin hologram, and two particular modifications during the reconstruction stage affecting the image being reconstructed.

The fourth Chapter is devoted to basic quantitative relations valid at the displacement of an opaque object at the changes of refractive index for an isotropic nonhomogeneous transparent medium. Visibility and localization of interference fringes together with the effect of time averaging during the exposure are also discussed.

In the fifth Chapter the influence of modification of the optical system at reconstruction on the fringe pattern formation, in the case of one reference beam and one hologram, or two reference beams or two holograms, has been discussed.

The book gives a fundamental theoretical description of the phenomena discussed, illustrated by a large number of formulas and figures. The vector or tensor approach, consequently used by the authors throughout the book, is manifested both in the corresponding formulas and the figures. Thus, most figures represent geometrical relations between the vectors of the corresponding physical magnitudes and their transformations. The figures are made very pictorial and carefully, but due to a great number of vectors, angles, numerous denotations of distances and their analytical relations, the reader's attention must be highly concentrated.

While reading the book I got the feeling that there is a shortage of examples illustrating both the derived analytical relations and their verification in experimental practice. Some new topics, which in the hitherto existing literature were discussed rather superficially, are in the book considered in details. Such problems as: distortion of holographic images, theory of volume holograms, holographic interferometry of transparent objects, effect of time averaging during the exposure, and finally the possibilities of interference fringe modifications for the purpose of deformation analysis make the book valuable and important for all scientists applying holographic methods in measurements of opaque body deformations and determination of optical path changes in isotropic and transparent bodies.

Henryk Kasprzak
Institute of Physics,
Technical University of Wrocław,
Wrocław, Poland