

Preface

This book was written to satisfy a variety of needs. First, it is intended to provide an updated summary of the present status of optical data processing: what it has accomplished, what it can accomplish, and how it accomplishes these things. We feel that this presentation of an updated summary is best achieved by treating different applications of optical data processing. A commonality of fundamental tools and operations is used in all cases. These cases are adequately treated in many textbooks and highlighted here in Chapter 1. Since the objective of optical data processing is to apply fundamental techniques to the solution of specific problems, a discussion of specific applications seems appropriate.

This discussion enables the potential user to see the steps required in deciding: if one should use optical processing for a solution to a specific problem; what application areas have been considered, and why; how one uses the fundamental concepts to configure a candidate system solution; how one must modify these basic concepts, refine them and develop new ones to solve specific features of one problem area.

However, this text is also intended for those researchers presently engaged in various aspects of optical processing. By providing an updated review of where various aspects of our field presently stand, we can best direct our future work in the proper direction. By pausing to organize diverse papers and reports and to seek fresh perspectives, we discover what gaps exist in our present understanding, and we can exercise wise choices in deciding which areas to pursue next. Without such a perspective, there is a great danger of overspecialization. By exposing researchers in one area of optical processing to work in other application areas, we often find that techniques and solutions appropriate for one area can be applied to problems in other areas. Quite often, solutions that have been considered for use in one area and found not to be appropriate are quite applicable for use in solving problems in other areas.

For the sake of completeness we include an introductory chapter in which these fundamental concepts and the common concepts of many of the following chapters are highlighted. The specific application areas we select are: crystallography, image enhancement and restoration, synthetic aperture radar, photogrammetry, holographic interferometry and non-destructive testing, biomedical applications and signal processing. A more detailed discussion and review of each of these chapters can be found at the end of Chapter 1.

We thus hope that this text will be of use to those engineers engaged in any form of data processing, to those contemplating the use of optical processing,

and to those researchers who are presently involved in one aspect of optical processing. The material is presented in a form which should make it useful for reference, for individual study, and for short courses. If need be, it and Chapter 1 (as well as the rest of the material) can be supplemented by a basic text or by a companion Topics Appl. Phys. volume (Optical Data Processing, Fundamentals, ed. by S. Lee) to provide more detail on the fundamental principles and thus, with the two books, a text for a graduate level course can be assembled.

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