



Numerical Simulation of Optical Wave Propagation With Examples in MATLAB (SPIE Press Monograph Vol. PM199)

Jason D. Schmidt

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Wave-optics simulation is an immensely useful tool for many applications. The simulation techniques in this book are directly applicable to atmospheric imaging, astronomy, adaptive optics, free-space optical communications, and LADAR. In addition, many of the basic techniques are applicable to integrated optics and nonlinear, anisotropic, and optically active media.

Numerical Simulation of Optical Wave Propagation is solely dedicated to wave-optics simulations. The book discusses digital Fourier transforms (FT), FT-based operations, multiple methods of wave-optics simulations, sampling requirements, and simulations in atmospheric turbulence.

This book will benefit optical scientists and engineers at all levels as a guide for FT-based data analysis, imaging system analysis, and wave-optics simulations. Professors can use this book to augment their Fourier optics courses and for independent studies with students. Problem sets are given at the end of each chapter. Students will learn principles and techniques from this book that can be utilized throughout their careers in optics. All readers will also benefit from the use of the MATLAB® scripting language and the provided CD that contains code for the basic tools and examples used throughout the book.

Contents

- Foundations of Scalar Diffraction Theory
- Digital Fourier Transforms
- Simple Computations Using Fourier Transforms
- Fraunhofer Diffraction and Lenses
- Imaging Systems and Aberrations
- Fresnel Diffraction in Vacuum
- Sampling Requirements for Fresnel Diffraction
- Relaxed Sampling Constraints with Partial Propagations
- Propagation Through Atmospheric Turbulence
- Appendix A: Function Definitions
- Appendix B: MATLAB Code Listings
- References
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