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Nota di contenuto	Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms; Contents; Preface; Acknowledgments; CHAPTER ONE: Basics of Fourier Analysis; 1.1 FORWARD AND INVERSE FOURIER TRANSFORM; 1.1.1 Brief History of FT; 1.1.2 Forward FT Operation; 1.1.3 IFT; 1.2 FT RULES AND PAIRS; 1.2.1 Linearity; 1.2.2 Time Shifting; 1.2.3 Frequency Shifting; 1.2.4 Scaling; 1.2.5 Duality; 1.2.6 Time Reversal; 1.2.7 Conjugation; 1.2.8 Multiplication; 1.2.9 Convolution; 1.2.10 Modulation; 1.2.11 Derivation and Integration; 1.2.12 Parseval's Relationship; 1.3 TIME-FREQUENCY REPRESENTATION OF A SIGNAL 1.3.1 Signal in the Time Domain 1.3.2 Signal in the Frequency Domain; 1.3.3 Signal in the (JTF) Plane; 1.4 CONVOLUTION AND MULTIPLICATION USING FT; 1.5 FILTERING/WINDOWING; 1.6 DATA SAMPLING; 1.7 DFT AND FFT; 1.7.1 DFT; 1.7.2 FFT; 1.7.3 Bandwidth and Resolutions; 1.8 ALIASING; 1.9 IMPORTANCE OF FT IN RADAR IMAGING; 1.10 EFFECT OF ALIASING IN RADAR IMAGING; 1.11 MATLAB CODES; REFERENCES; CHAPTER TWO: Radar Fundamentals; 2.1 ELECTROMAGNETIC (EM) SCATTERING; 2.2 SCATTERING FROM PECs; 2.3 RADAR CROSS SECTION (RCS); 2.3.1 Definition of RCS; 2.3.2 RCS of Simple Shaped Objects

2.3.3 RCS of Complex Shaped Objects 2.4 RADAR RANGE EQUATION; CHAPTER FOUR: Inverse Synthetic Aperture Radar Imaging and Its Basic Concepts; 4.1 SAR VERSUS ISAR; 4.2 THE RELATION OF SCATTERED FIELD TO THE IMAGE FUNCTION IN ISAR; 4.3 ONE-DIMENSIONAL (1D) RANGE PROFILE; 4.4 1D CROSS-RANGE PROFILE; 4.5 2D ISAR IMAGE FORMATION (SMALL BANDWIDTH, SMALL ANGLE); 4.5.1 Range and Cross-Range Resolutions; 4.5.2 Range and Cross-Range Extends; 4.5.3 Imaging Multi-Bounces in ISAR; 4.5.4 Sample Design Procedure for ISAR; 4.6 2D ISAR IMAGE FORMATION (WIDE BANDWIDTH, LARGE ANGLES); 4.6.1 Direct Integration
4.6.2 Polar Reformatting 4.7 3D ISAR IMAGE FORMATION; 4.7.1 Range and Cross-Range Resolutions; 4.7.2 A Design Example; 4.8 MATLAB CODES; REFERENCES; CHAPTER FIVE: Imaging Issues in Inverse Synthetic Aperture Radar; 5.1 FOURIER-RELATED ISSUES; 5.1.1 DFT Revisited; 5.1.2 Positive and Negative Frequencies in DFT; 5.2 IMAGE ALIASING; 5.3 POLAR REFORMATTING REVISITED; 5.3.1 Nearest Neighbor Interpolation; 5.3.2 Bilinear Interpolation; 5.4 ZERO PADDING; 5.5 POINT SPREAD FUNCTION (PSF); 5.6 WINDOWING; 5.6.1 Common Windowing Functions; 5.6.2 ISAR Image Smoothing via Windowing; 5.7 MATLAB CODES
REFERENCES 6.1 SCENARIOS FOR ISAR; 6.1.1 Imaging Aerial Targets via Ground-Based Radar; 6.1.2 Imaging Ground/Sea Targets via Aerial Radar; 6.2 ISAR WAVEFORMS FOR RANGE-DOPPLER PROCESSING; 6.2.1 Chirp Pulse Train; 6.2.2 Stepped Frequency Pulse Train; 6.3 DOPPLER SHIFT'S RELATION TO CROSS RANGE; 6.3.1 Doppler Frequency Shift Resolution; 6.3.2 Resolving Doppler Shift and Cross Range; 6.4 FORMING THE RANGE-DOPPLER IMAGE; 6.5 ISAR RECEIVER; 6.5.1 ISAR Receiver for Chirp Pulse Radar; 6.5.2 ISAR Receiver for SFCW Radar; 6.6 QUADRADURE DETECTION; 6.6.1 I-Channel Processing; 6.6.2 Q-Channel Processing
6.7 RANGE ALIGNMENT

Sommario/riassunto

This book provides a full representation of Inverse Synthetic Aperture Radar (ISAR) imagery, which is a popular and important radar signal processing tool. The book covers all possible aspects of ISAR imaging. The book offers a fair amount of signal processing techniques and radar basics before introducing the inverse problem of ISAR and the forward problem of Synthetic Aperture Radar (SAR). Important concepts of SAR such as resolution, pulse compression and image formation are given together with associated MATLAB codes. After providing the fundamentals for ISAR imaging, the book gives the