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Electromagnetic Compatibility and Interference Testing; 1.8.5 Vibration Testing; 1.8.6 Balancing; 1.8.7 Mission Simulation Tests; 1.9 Sensors on Orbit; 1.9.1 Reference Frame; 1.9.2 Coordinate Transfer in Three-dimensional Space; 1.9.3 Conic Trajectories; 1.9.4 Attitude of a Spacecraft; Bibliography; 2 Sensors and Signals; 2.1 Sensor Characteristics; 2.1.1 Accuracy and Precision; 2.1.2 Hysteresis; 2.1.3 Calibration; 2.1.4 Transfer Function; 2.2 Types of Signals 2.2.1 Signal Properties 2.2.2 Periodic Signals; 2.2.3 Representing Signals as Impulses; 2.2.4 Random Signals; 2.3 Transforming a Signal; 2.3.1 Analog-to-digital Converter; 2.3.2 Digital-to-analog Converters; 2.3.3 ADC and DAC Errors; 2.3.4 Modulation; 2.4 Data Analysis; 2.4.1 Uncertainty Analysis and Propagation of Error; 2.4.2 Regression Analysis; 2.4.3 Least Square Method; 2.4.4 Fourier Analysis; Bibliography; 3 Noise and Filtering in Spacecraft Sensors; 3.1 Internal Noise; 3.1.1 Thermal Noise; 3.1.2 Thermal EMF; 3.1.3 Parameter Noise; 3.1.4 Dark Current; 3.1.5 Shot Noise 3.1.6 Excess Noise or $1/f$ Noise 3.1.7 Dielectric Absorption; 3.2 External Noise; 3.2.1 Clutter Noise; 3.2.2 Jamming; 3.2.3 Radio Frequency Coupling; 3.2.4 Electromagnetic Field Coupling; 3.2.5 Inductive Coupling; 3.3 Signal-to-Noise Ratio; 3.4 Filter Types; 3.4.1 Low-pass Filter; 3.4.2 High-pass Filter; 3.4.3 Band-pass Filter; 3.5 Digital Filtering; 3.5.1 Window Design; 3.5.2 FIR Filter Design Example; 3.5.3 IIR Filter Design; 3.6 Microwave Filters; 3.7 Optical Filters; 3.8 Digital Image Filtering; 3.9 Kalman Filter; 3.9.1 State-space Representation; 3.9.2 Discrete Kalman Filter; Bibliography 4 Infrared Sensors 4.1 Electromagnetic Waves; 4.1.1 The Electromagnetic Spectrum; 4.1.2 Maxwell's Equations; 4.1.3 Wave Equation; 4.1.4 Solution to Maxwell's Equations; 4.1.5 Phase and Group Velocity; 4.1.6 Polarization; 4.1.7 Radiance; 4.1.8 Irradiance; 4.1.9 Interference; 4.1.10 Diffraction; 4.1.11 Black body Radiation; 4.2 Interaction with Matter; 4.2.1 Atmospheric Absorption; 4.2.2 Reflectance; 4.2.3 Scattering; 4.3 Optics; 4.3.1 Refraction/Reflection; 4.3.2 Concave Mirror; 4.3.3 Lenses; 4.3.4 Lens Combinations; 4.3.5 Aberrations; 4.3.6 Optical Resolution; 4.4 Scanning Mechanisms 4.4.1 Linear Array: Pushbroom

Sommario/riassunto

Spacecraft Sensors, the first of its kind, offers a comprehensive review of many aspects and intricacies of sensors used in the spacecraft industry. It covers sensor development from concept, design, and cost, to building, testing, interfacing, integrating, and on-orbit operation. It is intended for the specialist or non-specialist engineer, scientist, and those involved in the business aspect of the spacecraft industry. Focusing on how these various disciplines contribute to the development of a sensor used in space, this key text: Explains how mathematics, phys
