1. Record Nr. UNINA9910777464703321

Autore	Bekir Esmat
Titolo	Introduction to modern navigation systems [[electronic resource] /] / Esmat Bekir
Pubbl/distr/stampa	New Jersey, : World Scientific, c2007
ISBN	1-281-91858-X 9786611918583 981-270-875-8
Descrizione fisica	1 online resource (256 p.)
Disciplina	623.893 629.04/5 629.045
Soggetti	Inertial navigation systems Inertial navigation Global Positioning System
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes bibliographical references and index.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Preface; Contents; Introduction; 1. Vectors and Matrices; 1.1 Introduction; 1.2 Vector Inner Product; 1.3 Vector Cross Products and Skew Symmetric Matrix Algebra; 2. Coordinate Transformation between Orthonormal Frames; 2.1 Introduction; 2.2 Direction Cosine Matrices; 2.3 The Direction Cosine Matrix is a Unitary Matrix; 2.4 The Direction Cosine Matrix is a Transformation Matrix; 2.5 DCM Fixed Axis; 2.6 The Rotation Matrix; 2.7 Inner and Outer Transformation Matrices; 2.8 The Quaternion; 3. Forms of the Transformation Matrix; 3.1 Introduction; 3.2 Simple Frame Rotations; 3.3 Euler Angles 3.4 Rotation Vector3.5 Quaternion; 3.6 Simple Quaternions; 3.7 Conversion between Forms; 3.7.1 Conversion between DCM and Euler; 3.7.2 Conversion between DCM and Quaternion; 3.7.3 Conversion between Euler Angles and Quaternion; 3.8 Dynamics of the Transformation Matrix; 3.8.1 DCM Differential Equation; 3.8.2 Quaternion Differential Equation; 3.8.3 Rotation Vector Differential Equation; 3.8.4 Euler Angles Differential Equation; 4. Earth and Navigation; 4.1 Introduction; 4.2 Earth, Geoid and Ellipsoid; 4.3 Radii of

Curvature; 4.4 Earth, Inertial and Navigation Frames; 4.5 Earth Rate
4.6 The Craft Rate n en 4.7 Solution of the DCM n e C; 4.8
Gravitational and Gravity Fields; 5. The Inertial Navigation System
Equations; 5.1 Introduction; 5.2 Body Frame of Reference; 5.3 Inertial
Sensors; 5.3.1 The Accelerometer; 5.3.2 The Rate Gyro; 5.4 The
Attitude Equation; 5.5 The Navigation Equation; 5.6 Navigation
Equations Computational Flow Diagram; 5.7 The Navigation Equation in
Earth Frame; 6. Implementation; 6.1 Introduction; 6.2 The Rotation
Vector Differential Equation; 6.3 The Attitude Equation; 6.4 The Craft
Velocity Equation; 6.5 The Craft Position Equation
6.6 The Vertical Channel7. Air Data Computer; 7.1 Introduction; 7.2 US
Standard Atmosphere 1976; 7.3 Pressure Altitude; 7.4 Vertical Channel
Parameter Estimation Using Inertial and Air Data; 7.5 Density Altitude;
7.6 Altitude (Descend/Climb) Rate; 7.7 Air Speed; 7.8 Indicated Air
Speed (IAS); 8. Polar Navigation; 8.1 Introduction; 8.2 The Wander
Azimuth Navigation; 8.3 Prospective of the Wander Azimuth Approach;
8.4 Polar Circle Navigation Algorithm; 8.5 Alternative Polar Circle
Navigation Frame; 9. Alignment; 9.1 Introduction; 9.2 IMU Alignment;
9.3 Alternative Algorithm for b n C
9.4 Estimation of the Accelerometer and Gyro Biases9.5 Effects of
Biases on Estimate of b n C; 10. Attitude and Heading Reference
System; 10.1 Introduction; 10.2 Attitude Initialization; 10.3 Heading
Initialization; 10.4 Gyro Drift Compensation; 10.5 G Slaving; 10.5.1 X-
Gyro Bias; 10.5.2 Y-Gyro Bias; 10.5.3 Z-Gyro Bias; 10.6 Alternative
Approach for Gyro Drift Compensation; 10.7 Maneuver Detector; 10.7.1
Rate Gyro Threshold Selection; 11. GPS Aided Inertial System; 11.1
Introduction; 11.2 Navigation Frame Error Equation; 11.2.1 Craft Rate
Error n en ; 11.2.2 Earth Rate Error n ie
11.2.3 Position Errors

Sommario/riassunto

The emerging technology of very inexpensive inertial sensors is available for navigation as never before. The book lays the analytical foundation for understanding and implementing the navigation equations. It starts by demystifying the central theme of the frame rotation using such algorithms as the quaternions, the rotation vector and the Euler angles. After developing navigation equations, the book introduces the computational issues and discusses the physical aspects that are tied to implementing these equations. The book then explains alignment techniques.Introduction to Modern Navigation