

Introduction to GPS: The Global Positioning System, 2nd Edition

Ahmed El-Rabbany

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This thoroughly revised edition of the Artech House bestseller, *Introduction to GPS: The Global Position System* offers you an up-to-date, easy-to-understand treatment of this tremendously important technology. The second edition includes a wealth of brand new material, including a chapter on GPS satellite orbit and new coverage of today's hottest issues, such as precise point positioning and location based services. This one-of-a-kind resource offers you the knowledge you need for your work, without bogging you down with advanced mathematics. It addresses all aspects of the GPS, emphasizes GPS applications, examines the GPS signal structure, and covers the key types of measurement being utilized in the field today.

You get an in-depth discussion on the errors and biases that affect GPS measurements, along with guidance on how to overcome them. Moreover, the book shows how the GPS can be used for a number of different accuracy levels. Datums, coordinate systems, and map projections are discussed in a simple manner, offering you a clear understanding of this widely misunderstood area. This unique reference also examines the integration of the GPS with other systems, and looks at future GPS modernization. Over 90 illustrations help clarify major topics throughout the book.

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Introduction – Historical Review. Overview of GPS. GPS Segments. GPS Satellite Generations. Current GPS Constellation. Control Sites. GPS: the Basic Idea. GPS Positioning Service. Why Use GPS?

GPS Details - GPS Signal Structure. GPS Modernization. Types of GPS Receivers. Time Systems. Pseudorange Measurements. Carrier-Phase Measurements. Doppler Measurements. Cycle Slips. Linear Combinations of GPS Observables.

GPS Satellite Orbit – Ideal (Keplerian) Orbit. The Perturbed Orbit. Satellite Visibility. GPS Broadcast Orbit. References.

GPS Errors and Biases – GPS Ephemeris Errors. Selective Availability. Satellite and Receiver Clock Errors. Hardware Delay. Multipath Error. Antenna Phase Center Variations. Receiver Measurements Noise. Ionospheric Delay. Tropospheric Delay. Satellite Geometry Measures. GPS Mission Planning. User Equivalent Range Error.

GPS Positioning Modes - GPS Point Positioning. Precise Point Positioning. GPS Relative Positioning. Static GPS Surveying. Fast (Rapid) Static. Stop & Go GPS Surveying. RTK GPS. Real-Time Differential GPS. Real-Time vs. Postprocessing. Communication (Radio) Link.

Ambiguity Resolution Techniques - Antenna Swap Method. On-the-Fly Ambiguity Resolution. The LAMBDA Method.

GPS Data and Correction Services – GPS Data Service. Precise GPS Orbit and Clock Service. DGPS Radio Beacon Systems. Wide-Area DGPS Service. Wide Area Augmentation System (WAAS). European Geostationary Navigation Overlay System (EGNOS). Multi-site Real-Time Kinematic (RTK) System.

Common GPS Standard Formats - RINEX Format. NGS-SP3 format. RTCM SC-104 Standards for DGPS Services. RTCA Message Format. NMEA 0183 Format.

GPS Integration - GPS/GIS Integration. GPS/LRF Integration. GPS/Signpost (Radio Beacon) Integration. GPS/Dead Reckoning Integration. GPS/Accelerometers Integration. GPS/INS Integration. GPS/MEMS-Based INS Integration. GPS/Pseudolite Integration. GPS/Cellular Integration. GPS/LORAN Integration.

GPS Applications - GPS for Utilities Industry. GPS for Forestry and Natural Resources. GPS for Weather Forecast. GPS for Precision Farming. GPS for Civil Engineering Applications. GPS for Monitoring Structural Deformations. GPS for Monitoring Crustal Movements. GPS for Open-Pit Mining. GPS for Land Seismic Surveying. GPS for Marine Seismic Surveying. GPS for Airborne Mapping. GPS for Cadastral Surveying. GPS for SeaFloor Mapping. GPS for Measuring Water Level Variations. GPS for Vehicle Navigation. GPS for Transit Systems. GPS for Traffic Monitoring. GPS for Maritime Traffic Management. GPS for Pedestrian Navigation. GPS for Retail Industry. GPS for Cadastral Surveying. GPS for Stakeout (Waypoint Navigation). GPS for Precise Timing.

Other Global Satellite Navigation Systems - GLONASS System. Chinese Regional Satellite Navigation System (Beidou System). Future European Global Satellite Navigation System (Galileo System).

Appendix I: Geodetic Principles: Datums, Coordinate Systems and Map Projections.

Appendix II: GPS Accuracy and Precision Measures.

Appendix III: Some Useful Websites.

Author Bio

Ahmed El-Rabbany is an assistant professor at Ryerson University in Toronto, Ontario. He is also an adjunct professor and an honorary research associate at York University and the University of New Brunswick, respectively. He holds a Ph.D. degree in GPS from the University of New Brunswick, Canada.