The 3-D Global Spatial Data Model
Principles and Applications, Second Edition

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Global COGO, Inc.

The global spatial data model or GSDM preserves the integrity of three-dimensional spatial data while also providing additional benefits such as simpler equations, worldwide standardization, and the ability to track spatial data accuracy with greater specificity and convenience. This new second edition demystifies the concepts of spatial data accuracy and provides mathematical clarity to issues of network accuracy and local accuracy while describing their chronological development. Ideal for both beginner and advanced levels, this book also provides guidance and insight on how to link to the data collected and stored in legacy systems.
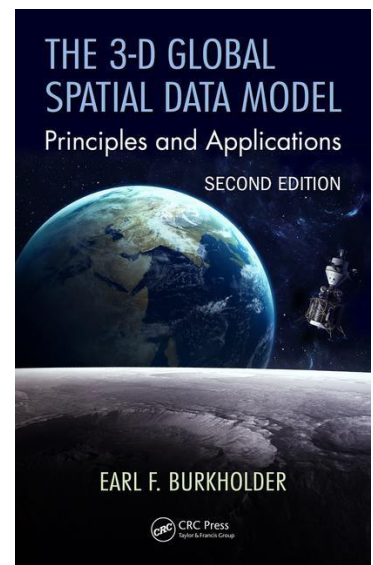
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KEY FEATURES

- Provides context for modern uses of digital spatial data and incorporates concepts of adjustment and data manipulation.
- Demystifies the concepts of spatial data accuracy and provides mathematical clarity to issues of network accuracy and local accuracy while describing their chronological development.
- Explains the fundamental concepts of solid geometry and error propagation.
- Details the history of the development of global spatial data model (GSDM).
- Integrates detailed examples of linear least squares adjustments and contains additional examples and universal application of 3-D spatial data concepts.

SELECTED CONTENTS

Foreword. Preface to the Second Edition. Preface to the First Edition. Acknowledgments. Author. List of Abbreviations. Chapter 1 The Global Spatial Data Model (GSDM) Defined. Chapter 2 Featuring the 3-D Global Spatial Data Model. Chapter 3 Spatial Data and the Science of Measurement. Chapter 4 Summary of Mathematical Concepts. Chapter 5 Geometrical Models for Spatial Data Computations. Chapter 6 Overview of Geodesy. Chapter 7 Geometrical Geodesy. Chapter 8 Geodetic Datums, Chapter 9 Physical Geodesy. Chapter 10 Satellite Geodesy and Global Navigation Satellite Systems. Chapter 11 Map Projections and State Plane Coordinates. Chapter 12 Spatial Data Accuracy. Chapter 13 Using the GSDM to Compute a Linear Least Squares GNSS Network. Chapter 14 Computing Network Accuracy and Local Accuracy Using the Global Spatial Data Model. Chapter 15 Using the GSDM—Projects and Applications. Appendix A: Rotation Matrix Derivation. Appendix B: 1983 State Plane Coordinate Zone Constants. Appendix C: 3-D Inverse with Statistics. Appendix D: Development of the Global Spatial Data Model (GSDM). Appendix E: Evolution of Meaning for Terms: Network Accuracy and Local Accuracy. Index.

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Reviews

"As a practicing surveyor responsible for producing 3D geodetic survey control to establish and define the NSRS relationship on large transportation and infrastructure projects involving cutting edge state of the art geospatial technology such as Mobile Lidar and UAV Lidar / Imagery Acquisition, I am utterly astounded that we are still working in the dark ages using State Plane Coordinates, and so dissatisfied with the outcome, we scale them back to the ground where we made the measurements in the first place. Seriously, how much longer must we endure the Grid vs. Ground non-solution? How many more classes and workshops on Grid vs. Ground must there be? A better solution, the LDP still lingers with only some limited examples of implementation. With the problems caused by the improper use of the SPCS over the past several decades, it is unlikely that a more sophisticated solution like the LDP will replace the former. The NSRS will be redefined shortly, only a few years away, including a new gravimetric vertical datum. The time for the GSDM is here right now. Read this book today. Become an advocate and a voice promoting the GSDM. Your children will thank you for it and your grandchildren will remember you for it."
—Jesse Kozlowski, Geodetic Surveyor, Maser Consulting, Philadelphia, Pennsylvania, USA

"**The 3-D Global Spatial Data Model: Principles and Applications, 2nd Edition** is remarkable in its complete and comprehensive treatment of the geocentric Cartesian coordinate system, which is the basis for modern geomatics. Earl Burkholder has delved deeply into every aspect of this coordinate system and used it to produce a unified approach to handling all aspects of geospatial data. The book is essentially self-contained, including fundamentals such as number systems, logic, arithmetic, algebra, and geometry; plus more advanced topics in geometric geodesy, physical geodesy, and error theory. The treatment includes worked examples so it is accessible to readers at many levels and interests. Geodesy is the foundation of geomatics, and this books makes an important contribution to the field."
—Thomas Meyer, University of Connecticut, USA

"This Second Edition of **The 3D Global Spatial Data Model** further exploits the rigorous simplicity of 3D solid geometry through a 'deep dive' into the fabric of the GSDM. The theories and algorithms covered in the 1st edition are revisited and enhanced with additional evidence (including a more substantive analysis of local and network accuracies), Principles and Applications. As a Measurement Technology Evangelist, this book is a must study for geospatial professionals, academics, software developers, Private and Public Sector GIS Coordinators...etc. or anyone frustrated with the status quo."
—Robert L. Green, Geodetic Consultant, Albuquerque, New Mexico, USA

"The book is very well written and offers a rare source for surveyors on fundamental principles and emerging technologies, particularly GNSS. It discusses in details the 3-D nature of spatial data and relates it to modern measurement systems. Besides introducing basic mathematical concepts that are essential for all surveyors working with the satellite geodesy, it covers the fundamentals of both geometric and physical geodesy. Additionally, it covers geodetic datum(s) very thoroughly. It goes beyond these topics and provides a unique insight on map projections.

—Ahmed F. Elaksher, California State Polytechnic University, Pomona, USA