Second Edition

Assessing the Accuracy of Remotely Sensed Data

Principles and Practices

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Dedication

The second edition of this book is dedicated to our families, including our spouses Jeanie Congalton and Gene Forsburg: our children Ashton, Emma, and Brandon Congalton, and our parents Bob and Janet Congalton, John and Jean Samson, Mary Green, William and Carol McDevitt, and Frank and Janet Forsburg. Together they have made us much more than we would be alone. We are forever grateful for their love, support, and companionship.

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Preface

The field of assessing the accuracy of maps derived from remotely sensed data has continued to develop and mature since the first edition of this book was published in 1999. The original eight chapters have been expanded to eleven. Of most significance is a new chapter that covers positional accuracy. The accuracy of any spatial data set is a combination of both the positional accuracy and the thematic accuracy. Therefore, a complete presentation of how to assess the positional accuracy of a map has been added along with a discussion of the impact of positional accuracy on thematic accuracy. The use of fuzzy accuracy assessment has increased since the first edition, and we have included an entire chapter on this important process. Also, the chapter on assessing the accuracy of a map of change detection has been expanded with a more thorough discussion of the special sampling issues that must be considered to effectively assess the change. Finally, a new case study has been presented that is up-to-date and reflects the complications and issues one would face when conducting an accuracy assessment today.

Acknowledgments

There are a large number of people to thank for their help on this book. The first edition of this book was inspired by Dr. John Lyon and dedicated to Dr. Roy Mead. In addition, we are especially thankful to Dr. John Jensen, Dr. Greg Biging, Dr. Tom Lillesand, Dr. Jim Smith, Mr. Ross Lunetta, Mr. Mike Renslow, Dr. George Lee, and Dr. Jim Campbell for their positive feedback and support. Along the way, many colleagues at Pacific Meridian Resources, Space Imaging Solutions, Fugro-Earthdata, Dewberry, Tukman Geospatial and Sanborn Solutions as well as numerous graduate students in the Department of Natural Resources at the University of New Hampshire helped make this book better.

We would especially like to thank Mr. Mike Palmer for the many hours of discussion on change detection accuracy assessment that added significantly to this second edition. Many professionals have contributed to our new chapter on positional accuracy assessment. We would like to especially thank Drs. George Lee, Greg Biging, and Dave Maune, who carefully reviewed multiple drafts of Chapter 3 and provided invaluable new materials, insight and clarification. We would also like to thank Dewberry, the NOAA Coastal Services Center, and Sanborn Solutions for allowing us to use samples of their real world accuracy data in our examples. Additionally, we thank Mark Tukman of Tukman Geospatial and Chad Lopez of Fugro–Earthdata for their contribution and insight. We also gratefully acknowledge all of our friends and colleagues in the geospatial community who inspired and encouraged us on many occasions. Finally, we would like to thank our families for the time they managed without us while we worked on this book.

About the Authors

Russell G. Congalton is professor of remote sensing and GIS in the Department of Natural Resources and the Environment, University of New Hampshire. He is responsible for teaching courses in photogrammetry and photo interpretation, digital image processing, and geographic information systems. Russ has authored or coauthored more than 150 papers and conference proceedings. He is the author of eight book chapters and is coeditor of a book on spatial uncertainty in natural resource databases titled *Quantifying Spatial Uncertainty in Natural Resources: Theory and Applications for GIS and Remote Sensing*. Russ served as president of the American Society for Photogrammetry and Remote Sensing (ASPRS) in 2004–2005 and as the National Workshop Director for ASPRS from 1997–2008. In January 2008 he was appointed editor-in-chief of *Photogrammetric Engineering and Remote Sensing*.

Dr. Congalton received a B.S. (in natural resource management) from Rutgers University in 1979. He earned an M.S. (1981) and a Ph.D. (1984) in remote sensing and forest biometrics from Virginia Tech. In addition to his academic position, Russ served as chief scientist of Pacific Meridian Resources from its founding in 1988 until 2000, and then as chief scientist of Space Imaging Solutions from 2000–2004. Currently he serves as senior technical advisor with the Solutions Group of Sanborn, the oldest mapping company in the U.S.

Kass Green is the current president of the American Society of Photogrammetry and Remote Sensing (ASPRS 2008–09) and the president of Kass Green and Associates, where she consults on geospatial strategy, technology and policy issues to private, educational, and public organizations. Several years ago, Kass retired as president of Space Imaging Solutions. Prior to joining Space Imaging (now GeoEye), Kass was the president of Pacific Meridian Resources, a geospatial services company she cofounded in 1988 and sold to Space Imaging in 2000.

Kass received her B.S. degree in forestry from the University of California at Berkeley and her M.S. degree in resource policy and management from the University of Michigan; she advanced to her Ph.D. candidacy at the University of California at Berkeley.