In this first edition of their excellent work, Drs. Wang and Wang provide a roadmap for arriving at the delineation and visualization of hospital service areas (HSAs) by using a variety of geocomputational methods. The wealth of tools and automated geoprocessing workflows presented in this specialized but comprehensive book illustrate how GIS shines at its brightest when it brings to bear its ability to help solve a matter of critical and current importance. The central problem addressed by the authors is how hospitals deliver health services to patients based on both parties' geographic location. All in all, given the depths it explores, the book is elegant and relatively concise with chapters never exceeding thirty-two pages in length. In its seven chapters, it provides the reader with a thoughtfully constructed architecture and precisely written text geared to demonstrate in detail the diverse ways of answering questions based on topological relationships between hospitals and the patients they serve. To do so, the authors first introduce the reader – with clarity and detail – to the necessary mathematical formulations, which are central to modeling the spatial relations of interest, and later use them in software programs tailored to processing the data from case studies.

Occasionally, chapters start out with a discussion connecting them to other chapters, they typically contain five sections, and all have a last section being a rich and articulate summary. The first chapter *Why Hospital Service Areas?* is unique in that it provides an overview of the rest of the chapters, and in that it describes in detail the contents of the GIS datasets and program files, serving as a source of metadata. In the words of the authors, Chapter 2—*Estimating Distance and Travel Time Matrices in GIS*, examines a fundamental task in spatial analysis: estimating distance and travel time. Defining HSAs often requires a distance (or travel time) matrix between patient (resident) locations and hospitals. This chapter and subsequent ones contain screenshots as the authors lead the reader step-by-step through the geoprocessing tasks. The software applications used to calculate origin-destination (OD) travel time matrices are ArcGIS and Google Maps API. Chapter 3—*Analysis of Spatial Behavior of Health Care Utilization in Distance Decay*, examines patterns in health care utilization using the concept of distance decay, by analyzing data from the state of Florida. Chapter 4—*Delineating Hospital Service Areas by the Darmouth Method* starts out with a narrative detailing the background and history of the Darmouth Atlas of Health Care Project and the methods used in that work to delineate HSAs and Hospital Referral Regions
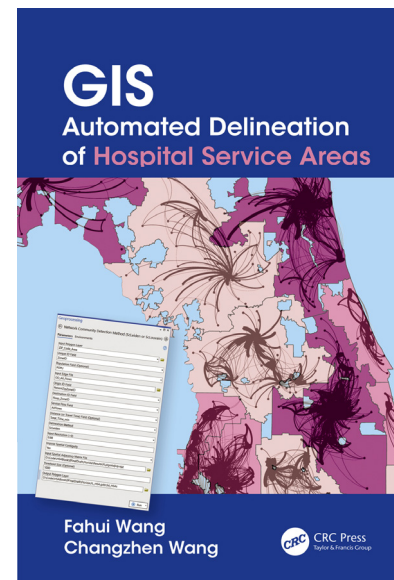
## GIS Automated Delineation of Hospital Service Areas, 1st Edition.

Fahui Wang and Changzhen Wang

**Reviewed by** Demetrio P. Zourarakis, PhD, GISP, CMS (GIS, RS, Lidar). Adjunct Assistant Professor, University of Kentucky, CAFE. Visiting Lecturer, Kentucky State University, CACS.

(HRRs). Again, the authors show in a tutorial-like way how to create the delineations using the geoprocessing tools provided and applying them to the Florida case study data. Chapter 5—*Delineating Hospital Service Areas by the Huff Model* introduces two different methods to determining HSAs: the Proximal Area Method and the Huff Model, together with mathematical derivations of the formulae used. Implementation of this model in ArcGIS Pro is demonstrated later in the chapter. Chapter 6—*Delineating Hospital Service Areas by Network Community Detection Methods* explains how several types of network community

detection methods can help delineate HSAs, by relying on patient service flow datasets between patient residences and hospital locations. The final chapter, Chapter 7—*Delineating Cancer Service Areas in the Northeast Region of the USA* presents the data utilized in the cancer care case study, while applying the concepts introduced and developed in prior chapters – such as distance decay. In closing, in the section entitled *List of Major GIS Datasets and Program Files* the authors provide the reader with online links for accessing datasets, tools and scripts for automated workflows, and their output, for use with a diversity of software. In essence, the authors provide the readership with a toolkit containing multiple tools for delineating HSAs: the Dartmouth method, the Huff model, the two network community detection methods, and several data processing tools that support these HSA delineation methods.

The book also sports two appendices meant as user guides for the estimation of large OD drive time matrices and network flows: Appendix A—*User Guide: Estimating a Large OD Drive Time Matrix* and Appendix B—*User Guide: How to Create Curved-Line and Straight-Line Network Flow Maps*. As in the case of previous chapters, both appendices contain numerous screenshots illustrating the processing results step-by-step.

With this book, exclusively in electronic format, the pleasure of paging through a physical book is absent, and unlike with past reviews, there is also no need to carry voluminous tomes around. To the non-specialist, this is a critical work for understanding the state-of-the-practice of GIS applied to this very real-world problem, particularly in light of the pandemic of recent years, and the current focus and efforts to address service accessibility-related aspects of diversity, equity, and inclusiveness (DEI). At the very least, GIS professionals supporting the mission of agencies and teams in the domains of urban planning and even day-to-day emergency preparedness and response will benefit from the use of this resource.

In closing, this rare jewel of a volume and the methodologies developed, demonstrated, and showcased in it should be the cornerstone for one or more intermediate or advanced courses in GIS curricula.