

# SpatialSTEM

...a mathematical structure for teaching and communicating fundamental concepts  
in spatial reasoning, map analysis and GIS modeling

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This presentation describes the idea of **spatialSTEM for teaching map analysis and modeling fundamentals within a mathematical/statistical context** that resonates with science, technology, engineering and math/stat communities. The premise is that “maps are numbers first, pictures later” and we do mathematical things to mapped data for insight and better understanding of spatial patterns and relationships within decision-making contexts ...from *Where* is *What* graphical inventories to a *Why*, *So What* and *What If* problem solving environment. This map-*ematical* approach focuses on analytical tools used in spatial reasoning by the non-GIS community instead of traditional “GIS mechanics” of data acquisition, storage, retrieval, query and display of map features directed toward GIS specialists. The goal is to get the STEM communities to “think with maps” and infuse direct consideration of spatial patterns and relationships into their endeavors, as an alternative to traditional spatially-aggregated math/stat procedures that assume uniform or random distribution in geographic space.

**Reference:** (PowerPoint slides and live URL links to references are posted at [www.innovativegis.com/basis/present/Arkansas\\_Sep2013/](http://www.innovativegis.com/basis/present/Arkansas_Sep2013/))

- [Simultaneously Trivializing and Complicating GIS](http://www.innovativegis.com/basis/Papers/Other/SpatialSTEM/TrivializingComplicating_GIS.pdf) — white paper describing a mathematical structure for Spatial Analysis/ Statistics.  
[http://www.innovativegis.com/basis/Papers/Other/SpatialSTEM/TrivializingComplicating\\_GIS.pdf](http://www.innovativegis.com/basis/Papers/Other/SpatialSTEM/TrivializingComplicating_GIS.pdf)
- [SpatialSTEM: a mathematical/statistical framework for understanding and communicating grid-based map analysis](http://www.innovativegis.com/basis/Papers/Other/ASPRS13_sSTEM/), paper presented at ASPRS 2013 Annual Conference, Baltimore, Maryland, March 28, 2013.  
[http://www.innovativegis.com/basis/Papers/Other/ASPRS13\\_sSTEM/](http://www.innovativegis.com/basis/Papers/Other/ASPRS13_sSTEM/)
- [A Math/Stat Framework for Grid-based Map Analysis and Modeling](http://www.innovativegis.com/basis/MapAnalysis/Topic30/Topic30.htm) — more detailed discussion of SpatialSTEM in Topic 30 in the *Beyond Mapping III* online book in the three-part compilation series of the *Beyond Mapping* columns published in *GeoWorld* since 1989.  
<http://www.innovativegis.com/basis/MapAnalysis/Topic30/Topic30.htm>
- [Further SpatialSTEM Readings](http://www.innovativegis.com/Basis/Courses/SpatialSTEM/sSTEMreading.pdf) — a comprehensive listing of URL links to over 125 additional readings on the grid-based map analysis/modeling concepts, terminology, considerations and procedures described in the papers on SpatialSTEM.  
<http://www.innovativegis.com/Basis/Courses/SpatialSTEM/sSTEMreading.pdf>
- [Math/Stat Classification of Spatial Analysis and Spatial Statistics Tools \(Spatial Analyst by Esri\)](http://www.innovativegis.com/basis/Papers/Other/Esi_Forestry2012/SA_SS_Operations_SpatialAnalyst.pdf) — white paper listing of Esri’s *Spatial Analyst* module operations by traditional mathematics and statistics categories.  
[http://www.innovativegis.com/basis/Papers/Other/Esi\\_Forestry2012/SA\\_SS\\_Operations\\_SpatialAnalyst.pdf](http://www.innovativegis.com/basis/Papers/Other/Esi_Forestry2012/SA_SS_Operations_SpatialAnalyst.pdf)
- [Beyond Mapping Compilation Series](http://www.innovativegis.com/basis/MapAnalysis/ChronList/ChronologicalListing.htm) — a compilation of nearly two hundred “Beyond Mapping” columns appearing in *GeoWorld* 1989 to 2013 organized into three online books.  
<http://www.innovativegis.com/basis/MapAnalysis/ChronList/ChronologicalListing.htm>
- [SpatialSTEM paper, Seminar and Workshop Materials](http://www.innovativegis.com/basis/Courses/GMcourse13/) — links to materials in support of a 25 minute paper, 50 minute seminar and four-hour workshop on SpatialSTEM.
- [GIS Modeling Course Materials](http://www.innovativegis.com/basis/Courses/GMcourse13/) — all of the supporting materials for teaching a 10-week graduate level college course (2013).  
<http://www.innovativegis.com/basis/Courses/GMcourse13/>



**Joseph K. Berry** is a leading consultant and educator in the application of Geographic Information Systems (GIS) technology. He is the principal of Berry and Associates // Spatial Information Systems (BASIS), consultants and software developers in GIS technology and the author of the “Beyond Mapping” column for *GeoWorld* magazine since 1989. He has written over two hundred papers on the theory and application of map analysis techniques, and is the author of the popular books *Beyond Mapping* (Wiley, 1993), *Spatial Reasoning* (Wiley 1995) and *Map Analysis* (GeoTec Media, 2007). Since 1976, he has presented college courses and professional workshops on geospatial technology to thousands of individuals from a wide variety of disciplines. Dr. Berry conducted basic research and taught courses in GIS and Remote Sensing for twelve years at Yale

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