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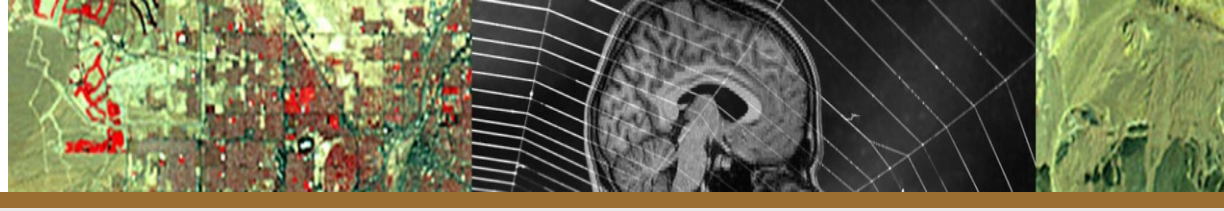

Spatial Concepts and Spatial Reasoning in the Social Sciences

(an agenda for undergraduate education)

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International Workshop on Spatial Cognition and Learning
Freiburg, Germany
13-14 September 2008

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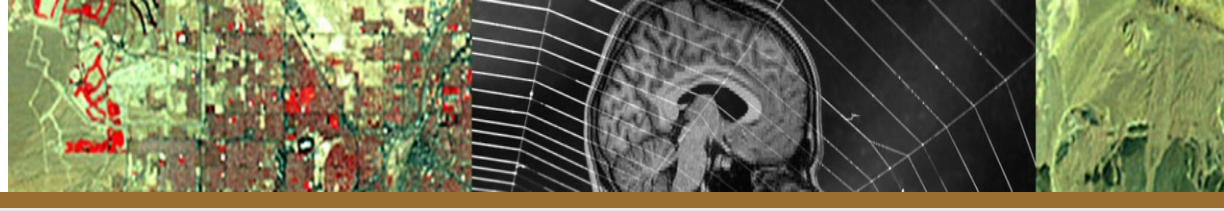

Founded in 2007 as a center for spatial studies under the direction of Michael Goodchild

Mission: to facilitate the integration of spatial thinking into processes for learning and discovery in the natural, social, and behavioral sciences at the University of California, Santa Barbara and to promote dissemination nationally and internationally.

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Creative Studies | Humanities & Fine Arts | Social Sciences | Engineering | Education
Natural & Biological Sciences | Environmental Sciences & Management

Cognition Perception Representation Visualization Computation Modeling Simulation Analysis Application

Information-technology Integration

Applying Concepts of Spatial Thinking
to Describe, Analyze, Understand & Predict, & to Create, Plan & Design

Space-time Patterns & Processes

GOALS

- Exchange ideas & resources
- Promote new tools, research & applications
- Enhance spatial literacy
- Build campus-wide community of spatial thinkers

PROGRAMS

- Seminars & workshops
- Consultation
- Web resources
- Curriculum for spatial thinking in undergraduate education

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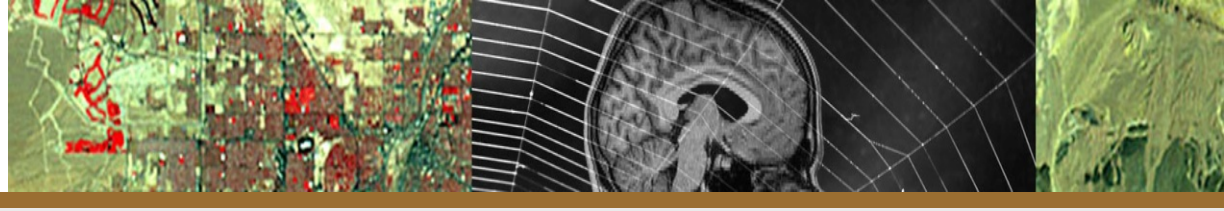

Contrasting but Complementary Perspectives

SILC

Spatial Intelligence Learning Center

Focus:

- spatial cognition
- understanding spatial learning
- Improve K-12 education practices to foster spatial skills & spatial functioning

Methodology:

- Identify basic elements of spatial thinking
- Controlled experiments to measure understanding, learning, & skill development

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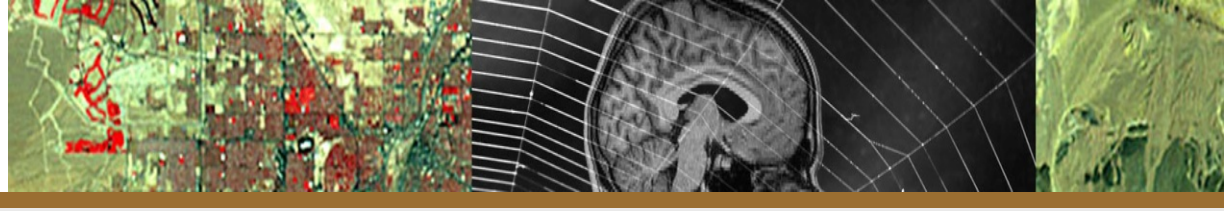
Focus:

- Geospatial concepts in social, environmental, & behavioral sciences
- Curriculum development for undergraduate education

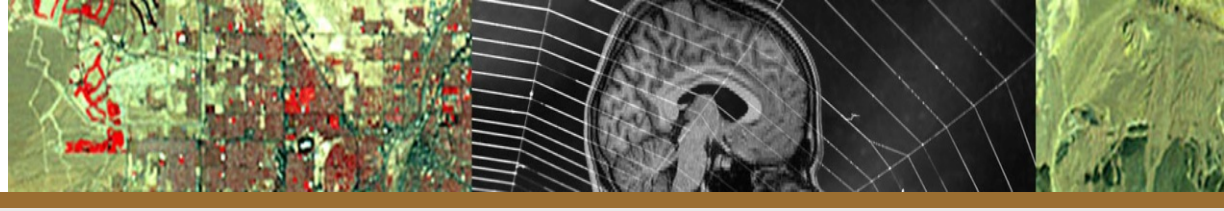
Methodology:

- Identify fundamental geospatial concepts
- Context dependent applications (re: disciplines, theory, problems, policies)
- Tools of spatial analysis (e.g., GIS)



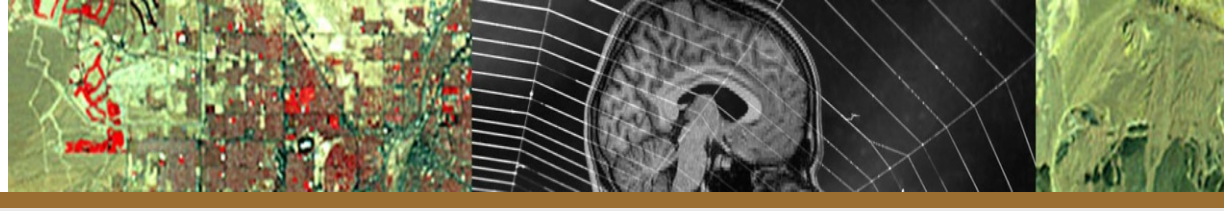
Context Dependence in the Social Sciences

- **Social sciences** focus on interdependence among people & groups, grounded in place, space, & time
- Applications of **spatial thinking** & **spatial concepts** in the social sciences are seen as aids to understanding social patterns & processes
- **Curriculum development** in support of spatial thinking in the social sciences is/should be context dependent & reflective of complexity in real-world social situations



Geo-spatial Concepts in the Social Sciences

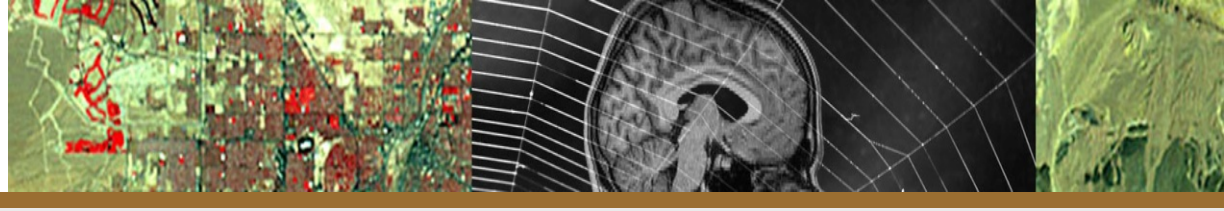
- **Location** – Understanding formal & informal methods of specifying "where"
- **Distance** – The ability to reason from knowledge of relative position
- **Network** – Understanding the importance of connections
- **Neighborhood & Region** – Drawing inferences from spatial context
- **Overlays** – Inferring spatial associations by comparing mapped variables by locations
- **Scale** – Understanding spatial scale & its significance
- **Spatial Heterogeneity** – The implications of spatial variability
- **Spatial Dependence** – Understanding relationships across space (Tobler's First Law)
- **Objects & Fields** – Viewing phenomena as continuous in space-time or as discrete



Integrating Spatial Concepts for Spatio-temporal Reasoning in the Social Sciences

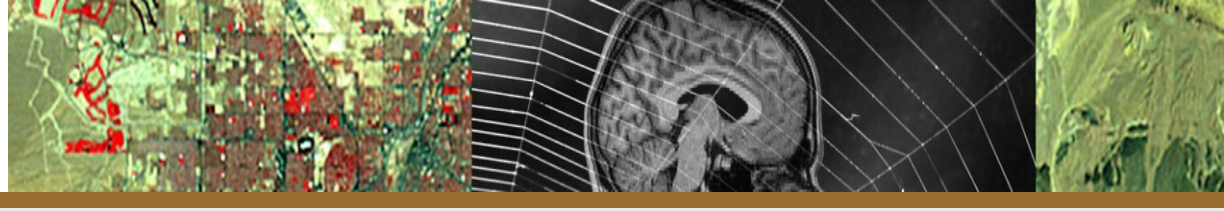
Applications in the social sciences generally **integrate multiple spatial concepts simultaneously** to engage general types of **spatial reasoning** to:

- (1) detect changes in the uses of, & regionalization of, space(s);
- (2) measure physical arrangements and clustering of phenomena to identify spatial patterns;
- (3) document spatial patterns over time to infer processes;
- (4) study flows (e.g., migration, trade, & shopping patterns) between specific locations as indicators of spatio-temporal interactions; &
- (5) measure spatial (& space-time) associations to test hypotheses.



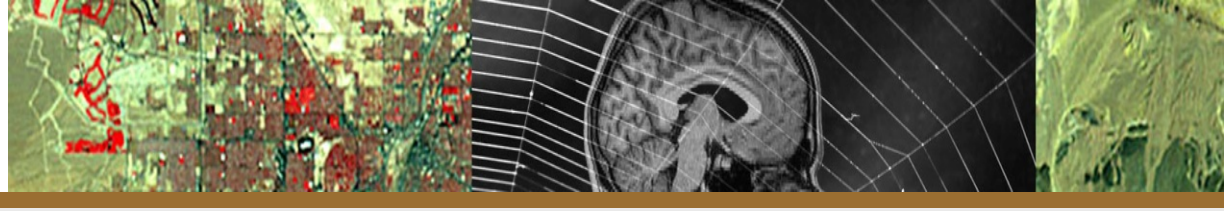
Example Problems in the Social Sciences Requiring Spatial Concepts & Spatio-temporal Reasoning

- GIS overlays of neighborhood population characteristics, levels of toxic emissions, & proximity to noxious facilities (e.g., a waste incinerator) may be used to evaluate evidence of social or environmental injustice.
- Analysis of spatial dependence in cross-sectional data can reveal insights into the spatial scale of causal mechanisms in domains as diverse as crime, housing markets, & job access. For example, how do car burglaries & acts of criminal violence relate to distances from clusters of liquor or drug outlets?
- Researchers may reflect on correlations of individual activity behavior (from space-time diaries) with levels of obesity and the presence of park space or land use structures that encourage walking.
- Spatial dependencies in party voting tendencies at the precinct level may reflect the sense of shared community expectations & the spatial patterns of interpersonal networks.
- Indices of segregation among ethnic & racial groups based on small-area data (e.g., census block groups) may change over time to reflect trends in social mobility, immigration, or other factors.



Concluding Questions

- How can the science of spatial cognition inform spatial thinking & spatial analysis in context-dependent social science disciplines?
- Can studies in spatial cognition contribute to understanding of spatial processes in a complex contextually framed social science undergraduate education?
- How can basic spatial intelligence & learning at K-12 facilitate applications & learning of geo-spatial concepts in the social sciences?
- How can/should the methodology of experimental measurement be applied in situations requiring simultaneous application of multiple spatial concepts?



Thank You

Please check the following web sites for information on applications of spatial thinking in the social sciences:

www.spatial.ucsb.edu

Center for Spatially Integrated Social Science

www.csiss.org

www.csiss.org/SPACE

www.csiss.org/GISPopSci