



The Vespucci Initiative
for the Advancement of Geographic Information Science
7th Annual Summer Institute on Geographic Information Science

Florence (Firenze), Italy: 29 June to 3 July 2009
***“Cognitive Processing and Representations
of Place, Space, and Time”***

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Abstract

We discuss concepts, theories, and empirical research on representations of place, space, and time, and their cognitive processing by people and other cognitive entities. Representation is a fundamental concept in the study of cognition and geographic information, and in many other areas. It refers to a mapping or correspondence between two patterns, instantiated in physical objects, energy fields, and so on. The representing entity is a spatio-temporal pattern that has a partial “stands-for” relationship with the content of another pattern, the referent entity. Our focus is on both internal and external representations, and their interrelationships. Internal representations are mental entities such as perceptual and memory images, propositional structures, image schemata, and so on. External representations are symbolic or information entities such as maps, diagrams, words, equations, and so on. In addition to a general discussion of the ontology of representation, we will explore relevant properties of representations for the study of cognition in geographic information science and spatial cognition. These include the content of representations, their structure or form, their processing, and their function. For example, we will consider in detail the role of schematic abstraction and iconic resemblance in the processing of external representations. Our readings and discussions will come from multiple disciplinary perspectives, especially computer science, geography and cartography, linguistics, philosophy, and psychology. The Institute’s format will include lectures, extensive discussions, readings, and hands-on activities.

Course Outline

I. June 29 (Mon)

- A. Introduction to Representation
 - 1. what is representation
 - 2. types of representation
 - a. external (pictorial, cartographic, numerical, verbal)
 - b. cognitive (mental or internal)
 - 3. semiotic theory
- B. Place, Space, and Time
 - 1. history
 - 2. disciplines

II. June 30 (Tue)

- A. Cognitive Representation
 - 1. what are they and what are their properties?
 - 2. varieties of mental representations
 - 3. concepts and categories
 - 4. imagery and imagery debate
- B. How We Study Cognitive Representation

III. July 1 (Wed)

- A. Spatial, Temporal, and Geographic Information in
 - 1. natural languages
 - 2. formal languages
- B. Geographic Ontology

IV. July 2 (Thu)

- A. Spatial and Temporal Reasoning
 - 1. types and properties of reasoning
 - 2. spatial relations
 - 3. conceptual neighborhood
 - 4. evaluation criteria for reasoning
- B. Vagueness, Uncertainty, and Abstraction
 - 1. accuracy and precision
 - 2. absolute vs. relative
 - 3. levels of geometry

4. concreteness and abstraction
5. schematic representations and generalization
6. quantitative vs. qualitative information
7. adequacy, completeness
8. open vs. closed worlds

V. July 3 (Fri)

- A. Implications for GIS: Theoretical Overview
- B. Implications for GIS: Examples

VI. Activities/Exercises:

- A. Externalizing Cognitive Maps
 1. sketch map of their hometown
 2. distance and direction estimates on Vespucci grounds
- B. Determining Spatial Ontologies
 1. given large list of spatial terms (in English), perform Q-sort and analyze via cluster analysis or similar technique
 2. perform on a smaller list translated into all of the conference attendee languages so we can do cross-cultural comparison
- C. determining temporal ontologies