Introduction to Geoinformatics – IFGI-Munster SS 2015

Assignment #5 – An essay on "Space and Time in GIS: Events and Processes"

In this assignment, you will discuss the issues related to events. The concepts of events and processes are relatively new to geoinformatics, since the emphasis of the discipline has traditionally been on static, two dimensional representations.

First, read Hornsby and Egenhofer's paper ("Identity-based change") that proposes a method to represent discrete changes in geographical objects.

Then, read the first three sections of Worboys' paper ("Event-oriented approaches to geographic phenomena"), that present a good overview of the evolution of theoretical approaches to representation of events and processes in geographical space. For the purposes of this essay, you can skip sections 4-6 of the paper.

Galton's paper ("Fields and Objects in Space, Time, and Space-time") includes a necessary discussion on models that focus on individual objects ("endurants") and those that focus on what happens to these objects (events of "perdurants"). Galton's paper is full of concepts, and requires at least careful three readings to grasp its ideas. Notice how Galton makes the contrast between "space + time" views and "space-time" ones.

Follow Galton with the Ferreira et al. paper ("An algebra for spatiotemporal data: from observations to events"). This is a system-oriented view that attempts to provide a spatio-temporal model based on the "space + time" perspective, where space and time are considered as separate dimensions.

Based on these four papers, write an essay on geographical ontologies (400-1000 words). Please present your vision of the topic and also consider the following issues:

1. What is the major contribution of Hornsby and Egenhofer's paper? What are the limitations of their approach? What kinds of geographical changes can and cannot be described by their model?

2. What are the four stages of in the development of ST GIS, according to Worboys? In which stage does Worboys place Hornsby and Egenhofer's model? What kind of model does he argue to be best for space-time representation in GIS?

3. What are the similarities and differences between Worboys and Galton?

4. Do you agree with Galton when he says: "in the real world we find many phenomena of sufficient spatio-temporal complexity that it is not easy to shoehorn them into a simple object/event dichotomy"? What are the consequences of this view to approaches such as those proposed by Horsby and Egenhofer?

5. To derive his concepts of 'snapshots' and ' histories', does Galton use a 'three-plus-one' dimensional approach ('space with time') or a strictly four-dimensional approaches ('space-time')?

6. What distinguishes the model from Ferreira et al. from the other papers? Can the model of Ferreira et al. represent the kind of change described by Horsby and Egenhofer?

7. What are the similarities and differences between the approaches of Galton and Ferreira et al.? Is the model proposed by Ferreira et al. capable of expressing the concepts of Galton ('snapshot', 'history', 'state', 'config', 'life', 'effect')?

8. Which of the four models proposed in the above papers is more amenable for implementation on a GIS? Why?