Advanced Research Seminar on Geoinformatics –

INPE 2016

Assignment #4 – An essay on "Space and Time in GIS: Events and Processes"

In this assignment, you will discuss the issues related to dynamic spatial ontologies, especially the ideas of 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 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.

Then, read Hacker's paper on "Events and objects in space and time". This is a paper on philosophy that extends and clarifies the idea that "objects exist, but events occur". Its purpose is to reinforce the message brought by Worboys and the other papers.

Galton's paper ("Fields and objects in space, time, and space-time") includes a 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 careful reading to grasp its ideas. Notice how Galton makes the contrast between "space + time" views and "space-time" ones.

Camara's presentation ("Geographical ontologies for land use and land cover change: distinguishing continuants from occurents") is intended to show how one can apply the concept of "events" in a geographical information system.

Based on these papers, please answer the following questions:

1. What are the four stages of in the development of spatio-temporal GIS, according to Worboys? What kind of model does he argue to be best for space-time representation in GIS?

2. What are the argument put forward by Hacker to say that "Julius Caesar existed, by his death did not exist"? Can you provide further examples (of your own) where there is a clear distinction between objects and events?

3. 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')?

4. The paper by Ferreira et al. ("An algebra for spatiotemporal data: From observations to events") which you read for the previous assignment, contains three concepts related to spatiotemporal data: *time series, trajectories* and *coverages*. What are the similarities and differences between the approaches of Galton ("*Fields and Objects in Space, Time and Spacetime*") 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'*)?

5. Considering the papers and the presentation by Camara, how would you design a GIS that can represent events and fulfills the criteria of Worboys for being a 4th generation GIS?