Advanced Research Seminar on Geoinformatics –

INPE 2016

Assignment #5 – An essay on "Core Concepts of Geoinformatics"

In this assignment, you will review what you have learned in the course and try to develop your own ideas on the questions raised.

You will first read three very different, yet complementary papers. These papers aim to present a comprehensive approach to the fundamental methods of Geoinformatics and GIScience, yet they differ in the approaches taken by the authors. By comparing these different views with the papers presented earlier, which focus on specific issues ("objects", "fields", "events", and so on), one can get a more critical perception of the concepts used in our discipline.

In the paper "Core Concepts of GIScience", Kuhn provides a rationale for a list of concepts that he considers all students, practitioners and researchers in GIS should be familiar and comfortable with. Please read his paper carefully, comparing each concept that Kuhn presents with the views that have been presented by other authors you have read.

The second paper is by Frank, where he aims to answer a different, but related questions: "how do we represent geospatial information?". The question is actually framed differently, because he develops a step-by-step approach about how we build information systems by codifying reality.

The third paper is by Goodchild et al., where they introduce the idea of "geo-atoms" as the fundamental building block of geographical information, and then proceed to discuss the different spatial representations of fields, and then introduce the concepts of "bona fide geo-objects" and "f-objects".

Based on these papers, please answer the following questions:

1. What are the core concepts of GIS, according to Kuhn? What are the key concepts of GIS, according to you? What is missing in Kuhn's concepts and why? If you had to reduce the number of core concepts from 10 to 7, which ones would you chose and why?

2. Which of the Kuhn core concepts were covered in the "Introduction to Geoinformatics" course? For each of the core concepts covered in our course, what are the differences between the discussions and the papers we read in the course and Kuhn's views?

3. What is the role that Frank assign to *fields* in his ontology? Is this different from what Couclelis ("People cultivate.."), Galton ("Fields and Objects.."), Câmara et al. ("Fields…) and Kuhn ("Core Concepts…") do? What are the differences in each case?

4. Compare Frank's tiers 0 ("Physical Space-Time Fields") and tier 1 ("Observations") with the approach taken by Ferreira et al., that consider observations to be building blocks of fields. Why does Frank first talks about "*physical space-time fields*" and then about "*observations*" and Ferreira et al. talk about "*observations*" as building blocks of "*fields*"?

5. In section 1.9, Frank presents his concept of "physical objects" ("Tier 2: Representation – World of Individual Objects") and in section 1.10 he presents institutional objects ("Tier 3: Socially Constructed Reality"). Compare Frank's two-tier approach to Smith and Mark's outright division between "fiat" and "bona fide" objects. What are the pros and cons of each approach?

6. Frank describes "object lifestyles" in his work (section 1.9.5). To what stage of GIS does this concept correspond to, according to Worboys's view of GIS evolution?

7. In section 1.11, Frank introduces a new tier of ontology ("Tier 4: Modeling Cognitive Agents"). Do you consider that this tier adds relevant information to the previous discussions? If so, what is missing? Could Frank have included other tiers?

8. What other authors you have read adopt the concept of "geo-atoms" by Goodchild et al.? Do they use the concept in the same way as Goodchild et al. did?

9. Occam's razor is much used in Science to state that "among competing hypotheses, the one with the fewest assumptions should be selected". The paper by Goodchild et al. introduces concepts which are not present in the other papers (*bona fide geo-objects, field-objects, object-fields, metamaps*). In your view, do these concepts introduce fundamental new ideas compared with the traditional concepts of *objects, fields, and events*? Justify your answer.

10. When dealing with time, what are the concepts that Goodchild et al. use? Is their view different from the distinction between "continuants" and "occurents" presented by Worboys and Galton? What view do you prefer and why?