On Geographical and Temporal Data Production
Analysis
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Abstract

In this paper, one shows an important element of the education in geomantic and geographic sciences: The one education of the production of the spatiotemporal geographic information and the generation of system of information and its didactic. The capacity, which is given in the post-graduate tuition to the students and young researchers in the production of geographic information and the construction of real temporal and information geographic systems respond in a necessity. Possess a georeferenced and spatiotemporal information able to answer a demand in a societal and commercial which in many cases is absent. Answer this requirement which is the capacity to acquire the geographic information production methods and the build of geographic information system imposes to proceed to the education of three corpora’s put constantly in interaction: The remote sensing, the geographic information systems, the spatial statistics and the sampling techniques and the local geographic knowledge databases, the education being made in a constant interactivity. The remote sensing data being able to for example enrich, update or re-localize demographic databases aim and overturned. At the same time, it asks a question that is still too rarely approached or studied in the corpus education, which is the science of the geographic information. It poses the question of the semiology and the semantic transfer. It holds however a central positions in the production system of spatiotemporal information and knowledge about the territory.

Keywords: geographic information, didactic, spatiotemporal information system generation, semantic transfers, and mutual enrichment.
1. Introduction

Rather than to concentrate us on the questions of contents of the educations in the geographic information sciences (like production of the geographic information, remote sensing, geographic information systems, geodesy, etc.) we are going to focus on a certain number of problems that one meets generally in the GIS education in number of universities or in the French high schools. It seems today that the GIS education is more a problem of contents than methods of technique or tools at arrangement that is didactics. To speak about the most usual methods, as example the didactic methods of telelearnings via the Internet tend to become widespread whether it is in the French-speaking world that in the English-speaking area: Telelearning program of the university Agence universitaire de la francophonie in the direction of the French speaker Africa countries or of ex-Indochina, local project of education in universities as the Institut d'urbanisme de Paris Paris (University of Paris XIII), or still OpenGIS consortium, etc. All these didactic approaches have numerous advantages: Generalization of the GIS educations, distribution of GIS tools, bigger flexibility in the access to the knowledge, students evolving in their rhythm and according to their initial level, etc. However, if the GIS education can be from the strictly technical point of view standardized, it thematic and methodological contents cannot it. It is depend of the type of public scholarship, of country, of infrastructures, of needs, etc. And it is a neglect to which it seems that as well the university areas which professionals take into account still too little in the exempt or sold trainings.

2. Questions and Problems

2.1. Remarks versus technique

The question of the geographic information generation systems education holds more problem of redefining of the theoretical education contents, that is the method of the GIS education approach according to the country, the informational structures and geographic information's needs and the problems. It is on the base a problem of reflection on the education and its contents. The introduction of the temporal dimension associated at the geographic and spatiotemporal information production systems are only strengthening it.

The first problem of the GIS education likes its uniformity about is the got public, the country, needs, etc. If it is as we mentioned it higher possible to distribute a uniform technical education, the learning of the implementation and the use of informational geographic
production system, of structurization and analysis of the spatiotemporal information is appropriate for every discipline, every region, every country, etc. The problem of the use of the geographic information systems cannot be put in the same way: Absence, profusion of the geographic information, aptness, etc., specific needs … The choice and the range of the demands and the needs is wide. It also differs according to the socioeconomic characteristics of the country. In the Africa French-speaking countries in front of the absence of georeferenced and geographic data have tends to privilege the joint use of remote sensing and sampling technique method. In France where the plentiful geographic and socioeconomic data quality, the processes of relocation of inquiries is an important need. It is thus a question of adapting the education and contents to needs and to capacities of the private or public institutions.

2.2. Remote Sensing and Geographic Information Systems

The report between remote sensing and geographic information system is often little approached on the educations. The remote sensing is too often perceived as a supplementary information layer of geographic information system, rarely as an informative structure intrinsically specialized, exhaustive, enriching, improving the referenced and socio-spatial geographic database, while updating it. Wherever the interest is not to dissociate the remote sensing and geographic information systems educations, but to argue in term of spatiotemporal structurization information system.

The inverse reasoning is also valid. The exploitation of the remote sensing spatial and airborne data can appeal in to the GIS data to improve the results in the image processing and analysis, notably in the sociological and semantic questions of transfer.

If the education integrated by the remote sensing and GIS under the term of "systems of production, structurization and analysis of the spatiotemporal information" can turn out "more effective" by it containing, interactive and participative character in terms of applications, the dissociation between algorithms and application is still insufficient, even absentee in the educations, what brings often the students and the users adopt a direct, linear and binary thought of type "algorithms / results" or still "press buttons". Some “imagine” even in the use of the geographic information systems a direct link between algorithms used and the social information and produced. This report creates in the educations, even basic, the not consideration of the logics, the reasoning, the underlying concepts, the links between information, semiology, semantics and their meaning.
One of the lacks in the GIS education where from ensues the "algorithms / results" confusion and from the "press button" behavior, is taken into account the behavior of the human interpreter, that is the person which “promote”, brings and uses the concepts appropriate for it scientist discipline. It is necessary to add to it the difficulty that the students have to make the link between information, methods, concepts and geographic environment.

2.3. Measure, Signification and Geographic Information

To illustrate the necessity of concentrating a part of the educations on not the only technical aspect but on the human behavior and the choices of variables, information, data, let us take the example of remote sensing images. What choice should make the user to extract geographic information? To use the geometrical or spectral character of the satellite data? Both? Should one make way in a deductive way, in an inductive way according to the case? One will choose for example the use of the geometrical and / or textural "local" algorithms processing to identify different geographic objects that present the same spectral signature.

However the choice of the texture is relevant? According to the spatial level, a texture can be a structure and a texture can become a structure. The spatial remote sensing data presenting at the same moment structures and textures, one makes generally an image partition.

In this phase, the user stemming from physical sciences will analyze the image under its aspect biophysics; the coming user the data processing will privilege statistical methods and artificial intelligences. Now these logics are rarely taken into account in the didactic method. At the same time, for example, a biogeographer will tend to use visually the notions of associativity to recognize and identify the populating of forested sort species. They put as well a clean problem: The link between information, semiology, semantics, geographic information, object and interpretation.

2.4. From Semiology to Semantic

Another question which is not so enough approached during the education curricula, (however recurring question), concerns the semantic and semiological link which is possible to make from a satellite image, from GIS information layer or from and between data base. How to combine and organize georeferenced information layers, data bases among them and with others? By using which methods? How to conceptualize them, to conceive them with which algorithms, for which ends? The choice of techniques has arrangement is
certainly wide like the quantitative statistical methods, the methods of correlations, correspondences, ensembliste, etc. However, the qualitative modeling methods still remain however little employed and limit themselves to the use of the pre-topology to structure the interrelations and in rare cases morphogenetic to model the spatiotemporal dynamics and their interactions. It settles at the same moment the problem of the lack of tools and techniques adapted and conceptual choice, which is made in the nomenclature, the mode of structurization of geographic information, and semantic and semiological transfer which it is possible to do. This question is all the more important as it determines the report of the user to the territory, structures a certain thought on the geographic space, shows a certain representation of the geographic reality.

Whether it is in cartography or in remote sensing, the passage from image to the semiology, then in semantics or of semantics to the semiology is always made by an intermediary, one interface: The description or the act to describe. The link semiology / semantics link appears mostly in twists as express following the example of the population density or land use maps. Progress, improvements should be brought on the methodological and didactic plans to make the link in the GIS between semiology transfer from data bases (descriptive physical, spatial and mathematical), typologies and semantic objects which represent a social or a biophysics reality of the geographic space. The education of semantic or semiological transfer methods is handicapped by the absence of formal rules: Alphabet, vocabulary, grammar, etc.

3. Level, Reasoning and Time

3.1. Level, Reality and Measure

Another point which is little or not approached on the educations is the question of the link between level of measure (the spatial and the spectral resolutions), scale and spatial level. The change of scale is brought back in a metrics, what is not the case of the spatial level. One can make the link between scales, but not between spatial levels. A geographic appropriate structure for a spatial level can be represented in various scales.

In remote sensing, the question of scale and level of measure change is intrinsically connected to the grain of emulsion (analogical photography) or to the spatial resolution (digital images). One tends in education to focus too much on the pixel and its spectral signification, more than on the group pixels, that is on the structures. The report between levels of scale of representation, spatial level and spatial resolution is held in contempt
present and is not without putting problems. Indeed how create a coherent fitted nomenclature, from a system of measurement in which connections between high and low resolutions are weak.

3.2. The Problem of Time

Another aspect little approached on the courses is the question of the change detections and the methods of update. At the moment, it is limited to diachronical approaches. The use and the education of unambiguous methods as diachronic processing put severe problems: How to analyze changes, to model them? How to structure them and to integrate them into a geographic information system? Axioms, nomenclatures are comparables? Do they also represent objects? How to return a coherent nomenclature between two dates? A nomenclature which has quite chances to be different from date b the other one? The TERRUTI database is an example. The fact of keeping the same nomenclature returns the detection and the difficult location of changes.

The most common error is to compare what is not comparable. The most blatant example is the comparison of two satellite images taken in two different dates. Very often processing’s and analysis are made on data visible luminance and not brought back there true luminance.

3.3. Artificial Intelligence, Cognitive Sciences and GIS

One of the research areas which is privileged since the 1990s is to integrate into the educations researches of disciplines as cognitive sciences following example of computational vision, logical formalizations of the human reasoning and behaviors, engineering with the programming of new modes of data bases structuralization, etc. At the same time as the didactic progress and of knowledge that advances in these disciplines can bring, the GIS key issue is the techniques of analyses and spatial analyses integration in the school curricula.

The second likes the heterogeneousness background of the student University curricula. What sells door-to-door to adopt in the educations? It is forcing different between a geographer and an engineer. For the same series of questioning, the engineer will tend to follow this logic (Goldin, 1997): What is the scope and type of applications you work on? What is the most difficult GIS problem you recall having worked on? How did you solve it? How do you approach a new GIS problem? What techniques do you use for planning or design? Do you work out the whole analysis ahead of time? What if anything does you write...
down when you are working with the GIS? How do you organize your notes, if any? Do you think of GIS problems in terms of visual images? If so, can you describe them? What kinds of problems have you encountered or mistakes have you made? What kind of additional tools or assistance would help you solve problems or do your job better?

The answer proposed by the engineer can be similar to this one (Goldin, 1997): Protocol gathering: Experts in the domain of interest (e.g. the use of GIS) are observed while engaged in a task relevant to the domain. The subjects are asked to verbalize their intentions, strategies and thought processes as they work on the problem or task. Protocol analysis: The transcripts of experts' verbalizations are coded into content categories; results are subjected to frequency analysis and other forms of statistical comparison. Knowledge Modeling: Representational structures are inferred or synthesized based on the raw data from the content coding. These may include conceptual primitives, relations, and/or rules. Implementation: The representational structures resulting from the third step are incorporated into a software model of the task and domain. The knowledge, instantiated in working software, can be used to execute similar tasks in the domain, or assist human users in doing so.

4. Conclusion

Integration of remote sensing with other related technologies/ disciplines such as GIS, photogrammetry and computer science is also essential to acquire complete benefits of this technology. The central question remain: In which part of remote sensing image is the searched for information? This includes researchers who can develop new methodologies and applications, as well as technicians and practitioners who can apply proven techniques to specify problems. Visual interpretation skills are still important but to extract the vast amount of information contained in modern remotely sensed data, an array of other knowledge is needed: Knowledge of the characteristics, advantages and limitations of the characteristics, advantages and limitations of the many different data sources available; familiarity with digital image processing techniques and algorithms; basic competence in mathematics and statistical analysis; at least some knowledge of computer hardware and software; and of course and understanding of the physical or biological processes under examination (Goldin, 1997). The main problem is probably to redefine didactic and reasoning in the GIS education and training curricula for every cultural and geographical areas and disciplines.
References


