

GEOINFORMATIONAL MAPPING - NEW DIRECTION OF CARTOGRAPHY AND CARTOGRAPHICAL EDUCATION

Irina K. Lourie
Moscow State University, Faculty of Geography, Department of Cartography and
Geoinformatics
Vorobjevy Gory, 119899, Moscow, Russia
E-mails: lurie@mail.ru
lourie@geogr.msu.ru

In paper a GIS-education conception is represented, worked out and realized in cartography and geoinformatics department of geographical faculty Lomonosov MSU. The peculiarities of geoinformational mapping and geoinformatics as educational disciplines and their reverberation in programs of proper educational courses are considered.

The cartography on contemporary stage exposes to essential transformations. Theoretic-methodological researches in domain of cartography and geoinformatics integration are embodied in practice. The new cartography branch - geoinformational mapping (GM) - evolved from that integration. In the same time new scientific directions - geoinformatics and GM - ourselves are developed intensively, actively co-operating with new spheres of activity and professional knowledges: science, technique, education, management, marketing and much other. This is just the motive of increasing interest to GIS and to geoinformational mapping.

All the above is especially reflected on fundamental preparation of specialists with higher cartographic education. A problem of geoinformation education (GIS-education) remains to face the specialists of different areas of knowledge, which have dealing with spatially-definite information and her cartographic conception. The maps persist today as most comfortable form of delivery of spatial information to consumer and obvious reflection of reality.

In last 10 years essential progress has been achieved in raising of the cartographic education system. A block of new educational disciplines and new specialization "Geoinformatics and geoinformational mapping" are brought in the university programs.

Formation and development GIS-education, elaboration of his conception, forming geoinformatics and GM as educational disciplines are by priority directions of activity in cartography and geoinformatics department already more ten years. The base of conception is a GIS-education model, which is founded on wide interaction with geographical-cartographical disciplines, with sciences of Earth and with socio-economic sciences. Necessary components of fundamental preparation of contemporary cartographers are theoretical and practical mastery by geoinformation technologies, by methods of creation and of use of GIS, by geoinformation methods of geographic researches and mapping.

Teaching in creation and in use of maps is one of most creative and difficult formalized processes of cognition. Development GM supposes interaction of cartographers with specialists, working in domains of geoinformatics, computer graphic arts, remote sensing. Taking possession of new methods a geoinformational mapping future specialists-cartographers must lean against laws of traditional mapping. Combination of traditional and computer technologies will allow to prepare the specialists, operating not only on authors prompting of program elaborations.

The educational discipline "Geoinformatics and geoinformational mapping", designed in cartography and geoinformatics department and timed on two educational years, includes the following courses:

- Introduction in geoinformatics

- Bases of geoinformational mapping
- Digital cartography
- Data Bases
- Digital photogrammetry
- Automated images interpretation
- Mathematical-cartographical modeling
- Geoinformatics

A most volume of hours is related on courses "Bases of geoinformational mapping" (86 hour.) and "Geoinformatics" (92 hour.).

The main task of course "Bases of geoinformation mapping" is the mastery by theoretical conceptions and practical skills of application of geoinformation technologies for creation and use of thematical and topographical computer maps. A program of course is guided by knowledges, obtained in courses: "Planning and compilation of maps ", "Cartographical design", "Cartographical method of research", "Higher mathematics and programming bases", "Introduction in geoinformatics". Practical works are realized on personal computers with application of comprehensible program packages (for example, MAG, MapViewer™, Mapinfo™, ArcView™).

A program of course "Base of geoinformational mapping" timed upon two semester and includes 5 basic parts:

- Basic regulations and tasks of geoinformational mapping
- Conception of geographic information; data models; data storing, capture, control and representation
- Methods of geoinformational mapping
- Methods of computer image processing for creation of thematic maps
- Use of commercial GIS-packages in GM

In first part most priority directions and perspectives geoinformatics and GM are considered in assotiation: the geographical tasks and spatially-definite information – modeling and creation of maps – program and technical tools.

Second part of course includes consideration of main data sources for geoinformation mapping, spatial data concept as model of reality and data models, description of devices and methods of digitizing, data formats and their transformation, conception of point, linear and polygonal objects on digital map and in databases.

Special attention spares to most important problems of spatial localization of cartographic information, to her accuracy (location and attribute), to data quality notions, errors propagation and errors control. In this part also data storage technologies and designing of cartographic bases are considered.

The methods of geoinformational mapping and enveloping the basic processes of designing and creation of map are studied in third part. The considerable part of it is devoted to study of GIS-technologies, providing a transition between co-ordinates systems, transformation of scales and projections, transforming of vector and raster representations. Admission of algorithmic procedures, directed to mapping process formalization, are considered including: automated maps creation, being of synthesized features, accorded construction of cartographic signs and determination of regulation of their placing on map (centroid, skeleton), areas count and determination of mutual regulation of point, linear and polygonal objects.

A theoretic-mathematical base for automation in cartography is creation of the mathematical-cartographic models. The methods of mathematical-cartographic modeling are

considered in separate course. In this part the conception questions of “geographic fields” are considered, these defined by set of spatial co-ordinates and scalar significances of geographic descriptions in points with these co-ordinates, on example of creation digital elevation models (DEM). Many widespread programs (packages Surfer, Idrisi, Erdas and oth.) have like procedures. The understanding of modeling *of continuous geographic objects and phenomena, represented by discrete information* is much more important technical possibilities of this modeling. Quality of continuous approach depends as from approximation degree, so and that, as far as in this discrete information is reflected geography. The methods of DEM construction are considered on examples of interpolation on distances (on regular net) function base and triangulation Delonay. The point’s selection methods for model construction are analysed. A series of practical works on construction DEM on contours are carried with application of programs packages MAG, MapViewer and Surfer.

Following major research direction in GM is questions of automatic generalization. Methods of “geometrical” generalization (for location data) and “rich in content” generalization (for attributive data) are considered. There are elements of lines generalization (simplification, smoothing out, shift, structuring, confluence, local processing), methods, founded on use of theory fractals; classification methods. Yet it is clear, that now only decision of generalization task is possible in interactive routine by editing of map representation on screen, use DBase and tools of expert subsystem of GIS.

A last block of third part is sacred to reproduction methods of cartographic representation - to layout of graphic inference, which counts for much for effective information perception by user and essentially wins attached to use of principles of cartography. Very frequently these questions attached to creation of maps and representations in GIS are ignored. Here theory and elements of colour sight and colour palettes, construction technology of maps electronic and computer and visualization of spatial data are considered.

Special part of course is devoted to technical and software of GIS-technologies in domain of use of remotely sensed data for GK and GIS, peculiarly for efficient and dynamic mapping. A algorithms are considered: computer image processing, directed to improvement their brightness and geometrical properties; implementation of representations synthesis operations, component analysis, count of vegetation index for creation of maps of different subjects; algorithms of supervised (nearest neighbour, maximum likelihood) and unsupervised (cluster) classification.

In last part of course structure and cartographic possibility widespread GIS-packages and their comparison are considered.

On decision of many aspect tasks of geoinformatics and geoinformation mapping is directed worked out on department of cartography and geoinformatics a educational geographic information system (GIS). The educational GIS for geographic researches and mapping is considered as specialized problem-oriented geoinformation system, mainly local level. A conception of this GIS is realized practically in first version educational GIS for territory of theaching ground of MSU in Moscow region – GIS “Satino”. On base this GIS a series of computer practical works were developed for decision of different type of geographic tasks with recommended ГИС-technologies.

The inculcation of methods and facilities of GIS and GM in education and creation educational GIS will allow realizing in geography principles and methods of distance teaching, the bases of which now successfully adapt in other, more “computering” areas of knowledge.