THE CONCEPT OF "RESTRICTIVE FLEXIBILITY" IN THE “ÖROK ATLAS ONLINE”

Georg Gartner¹, Karel Kriz², Christian Spanring³, Alexander Pucher³

¹ Department of Geoinformation and Cartography, Vienna University of Technology, georg.gartner@tuwien.ac.at
² Department of Geography and Regional Sciences, University Vienna, [kriz|pucher]@atlas.gis.univie.ac.at
³ Austrian Institute of Regional Planning, spanring@oir.at

Abstract

As a result of a cooperation of the University of Vienna, the Vienna University of Technology and the Austrian Institute of Regional Planning the conception and realization of an online Atlas of Austria is currently undertaken. The aim of the project “Atlas Information System Austria” (AIS) is the access to cartographic presentations of various statistical data as well as the analysis and the exploration of data sets via maps. Beneath technical challenges in terms of the development of a “robust” online system the challenges are primarily to be seen in the context of cartographic communication processes, including design aspects of web maps, interactivity functions and the user guidance. The concept of the “restrictive flexibility”, which is used in this project, applies the idea of exploring the content and functions of a system by a user in a “serendipitous” way, although the “serendipity” is engineered (Cartwright 2004). By designing a cartographic information system like an atlas, the system designers take responsibility also for restrictions in terms of what is not accessible or useful. If a particular map user for instance is aiming on combining data sets, which either are not cartographically visualizable or semantically combinable, the flexibility of the map user is restricted. As a result of this ongoing project not only theoretical concepts are developed but also a prototype version of the Austrian Atlas Information System, where the theoretical concepts are applied and evaluated.

1 Introduction

The Austrian Conference on Spatial Planning (ÖROK) is the sponsor of a multidisciplinary two year research program entitled “Austrian Atlas Information System Online”. As project partners the Institute of Geography of the University Vienna, the Institute of Geoinformation and Cartography of the University of Technology in Vienna and the Austrian Institute of Regional Planning have formed a consortium. In this co-operative effort the purpose is to create a series of maps for print and to develop an interactive online atlas using geo and statistical data from various partners on the federal and state level. By developing an online Atlas it is necessary to consider the former print-only “ÖROK Atlas” in terms of design issues and theme selection.

2 The “ÖROK” and the “ÖROK Atlas”

2.1 The “ÖROK”

The Austrian Conference on Spatial Planning (ÖROK) is an organisation set up by the federal, the regional and the local governmental administrations of Austria to coordinate spatial planning at the national level. The executive body at the political level, under the chairmanship of the Federal Chancellor, includes all the federal ministers and state governors, together with the presidents of the Austrian Union of Towns and the Austrian Union of Communities and with the presidents of the social and economic partners participating as advisors.

A Commission of Deputies as well as several committees and working groups have been set up at the administrative level to accomplish ÖROK’s tasks. They are formed by the Senior Officials of the territorial authorities and the social and economic partners. The ÖROK office was established at the Federal Chancellery for operational activities.

Within the context of European regional and spatial development policies, ÖROK plays an important role as the coordinating body between the internal and the European level. A few examples for these activities:

- Definition of areas eligible for Structural Funds & of the Regional Aid Map acc. to article 87 of the ECTreaty for the period 2000 – 2006;
Co-ordination of the Austrian regional Structural Funds Programmes (objective 1 and 2 as well as LEADER+ and URBAN II), e. g.:
- Exchange of information and experience between the involved programme partners (managing and paying authorities, etc.)
- Secretariat for all Monitoring Committees
- Evaluations (“KAP-EVA”);

Preparation for the Structural Funds programmes 2007-13

European Spatial Development Policy:
- National Contact Point for the ESPON-programme (European Spatial Planning Observation Network);
- National Contact Point for the INTERREG IIIB programmes Alpine Space and CADSES.

One of ÖROK’s principal tasks is to publish the “Austrian Spatial Development Concept” which is revised generally every ten years. The most recent Austrian Spatial Development Concept 2001 (“ÖREK 2001”) was published in September 2002. Based on this concept, embedded in projects there are ongoing studies and research on spatial development policy in Austria which are issued in a special publication series. Since autumn 2003, ÖROK serves as a platform of the territorial authorities for the formulation and implementation of an Austrian policy on spatial data infrastructure (ÖROK 2003, Riedl 2003).

Beneath the major ÖROK’s products are:
- Periodical reports on the spatially relevant activities of the Bund, Länder and Gemeinden (“Report on Spatial Planning”)
- ÖROK recommendations
- ÖROK Atlas on spatial development in Austria

2.2 From “ÖROK Atlas” to “Atlas Information System Austria”

Since more than 20 years the ÖROK publishes series of maps as the “ÖROK Atlas”. Goal of this cartographic product is the presentation of spatial development in Austria. Relevant and current issues are selected by regional planning experts and presented in maps and other “easy-to-understand” presentation forms. Annually between 10 and 15 maps including explanation text, tables and diagrams have been and still are published and are distributed to more than 3500 interested subscribers, including schools, political experts or administration offices (Spanring 2005).

As a result of the availability of innovative technologies and the usage of new media the further development of the existing instrument “ÖROK Atlas” into new communication- and distribution forms, including web techniques, has been identified as an increasing goal by the “ÖROK”. As a result of a series of workshops, presentations and intensive discussions a project consortium, consisting of the Institute of Geography of the University Vienna, the Institute of Geoinformation and Cartography of the University of Technology in Vienna and the Austrian Institute of Regional Planning, has been formed. As a result of the consortium’s ideas and the stakeholders needs the concept of a “ÖROK Atlas Online”, now to be called “Atlas Information System Austria” has been formed.

In this concept the main goal can be described as applying current technical possibilities to the distribution, presentation and exploration of statistical and geo data of Austria by means of an online cartographic information system. As a requirement the current political initiative of a corresponding geo-data policy within all administration units of Austria “Geodatenpolitik Österreich”) shall be monitored and integrated if possible.

Due to the complexity of the requirements and the experiences with similar projects three core issues to be dealt with from a theoretical and scientific perspective have been identified:
- Methodical Concept
- Cartographical Concept
- System Architecture

Within the methodical concept various definitions are done. As a matter of fact, an Atlas Information System has to consider specific user groups. Within the AIS the following user groups are identified as target groups:
- Political Administration and Decision Makers
- Schools and Education Institutes
- Scientific Community and Experts
- General Public
With the first version of the AIS-prototype especially the requirements and needs of the existing “ÖROK Atlas”-subscribers and partners are addressed. Therefore two questionnaires have been concepted. The results are used for the adaptation of the methodical and cartographic concepts.

In terms of contents the issues to be covered are fixed due to existing “ÖROK”-priorities, including themes of
- Population
- Employment
- Agriculture
- Economy
- Tourism
- Education and Science
- Housing
- Traffic
- Energy and Ressources
- Environment
- Health Care and Social Development
- Cultural Heritage

These contents are represented by means of maps, texts, diagrams and tables, referring to various spatial geometries, including regions, counties, communities as well as other spatial divisions. As the spatial reference geometries are a core element of every atlas information system, their quality is of high interest. Therefore various data sources have to be evaluated due to their suitability, availability, costs and copyright. The result of this evaluation will be directly communicated to the stakeholder and is meant as an important input for the discussion on a homogenous Austrian geodata policy.

The main functional components of the AIS including
- Information modelling and presentation
- Monitoring Tools
- Analysis and Exploration Tools

are concepted in the Cartographic Concept, which is based on the System Architecture.

3 The Cartographic Concept

The user of AIS may choose between three types of geoinformation which can be handled by using interactive processes.

- In a cartographic information system like AIS topographic information are necessarily co-ordinated to components of map elements. Therefore topographic information are determined according to the accuracy of their geometry as well as in the semantics of their objects by the map scale used. In a final version, three map scales are used in the concept for topographic information. The first represents Austria in total, the second corresponds to a regional view of the federal states of Austria and, finally, the local level covers individual districts.
- Geoinformation that can be related to socio-economic phenomena are called thematic information and are usually data that are referred to certain positions, line segments or polygons. The visualization of these data results in thematic maps or cartograms.
- All information that do not use cartographic means for visualization can be summarised under the term ‘additional components’. This is primarily information such as text, diagrams etc. which are attached to specially marked symbols, lines or areas in the different scales of topographic maps.

3.1 Concepts of Cartographic Design at Screen Displays

The presentation of cartographic information on computer displays suffers from certain restrictions. First of all, the resolution of typical screens is still very poor for cartographic needs. Some cartographers suggest developing new graphic designs for maps to compensate for these visualization restrictions. If the resolution of computer screens would be equal to that of printed maps, nobody would be interested in inventing an unattractive and simple design for maps. A further handicap for cartographic visualization is the dimension of the screen because even large monitors can only show small sections of large maps.
Therefore it is a fundamental issue whether the legibility of cartographic information should be ensured in any case of cartographic information transfer (Bür 1997, Kelnhofer 1996, Ditz 1997). If this should be the case, the cartographic information transfer has to be divided in different information levels, which enable the user to choose between survey and local information. Of course, this navigation system has to support the user to get the desired information. A contrary position in the cartographic information transfer would be the presentation of cartographic information without taking legibility into account. In such a case only one cartographic information level is available and the user has to specify those sections on the display where a zoom-in should be done, although the survey information are often scarcely legible.

For the AIS, the editorial staff decided that legibility of cartographic information is of such an importance that the cartographic design of screen maps always has to take this fact into account. In connection with these considerations a further decision has to be seen, namely, to use the same graphic design for the interactive screen maps as for the printed maps. The reason for this decision was to provide a familiar map ‘look’ for the user on the display as well. These decision, to come up with an ensured legibility of maps on screens, can be seen as a restriction in terms of an information system, but is meant as a the enabling of flexibility of map users to perceive the presented information without any additional action.

3.2 Cartographic Databases of the AIS

Because the basic map geometry is used for the production of maps on paper and for the interactive atlas, the cartographic information are ‘attached’ to certain map scales. The main scale for topographic and thematic maps is 1:1,000,000. For special tasks, different scales will be evaluated.

The map elements at the map scales mentioned shall be derived in the final stages of the project from different data sources, including such of federal and regional surveying agencies. For the development of a prototype version of the system some existing data sources of the Austrian Institute of Regional Planning and the Department of Geography and Regional Science of the University Vienna are used. As a matter of fact, these different map data, being originally modelled for specific purposes, have to be harmonized and modelled to the requirements of AIS, including guaranteed legibility on screen displays. This harmonization process is being done partly semi-automatic, including feature detecting, line simplification and feature matching processes.

In principle it is necessary to create a particular map manuscript for each map scale because the change of scale by enlargement or reduction causes cartographic generalisation effects, that cannot be handled by a cartographic information system. Cartographic generalisation is the reason that it is not possible to create a common data model for all map scales. It has been decided to focus especially on one scale for the first prototype version.

The unique aspect of a cartographic database is that graphic attributes (symbol sizes, line widths, etc.) are integral components in a database because they fundamentally define the map geometry. So it can be said that the database of a certain map scale represents a self-contained system. By comparing the graphic output of cartographic databases of different map scales, visual similarities can be stated. Nevertheless there are only weak topological and semantic interdependencies between those databases.

3.3 Presentation and Interactions in the AIS

For the AIS a combination of vector and raster data has been chosen. Raster data are used for displaying background information and vector data are applied for interactive identifications of already symbolized cartographic information or for cartographic visualizations of database queries. The user of the AIS is under the impression that all interactions are done in the symbolised raster image. Because the symbolised raster data images of the AIS are based upon the geometry of vector data, a total coincidence in the visualization of both types of data can be achieved. This is of great importance because the user can select components of map elements in the raster image and these selected components can be indicated at the screen in another colour, in identical or changed symbolisation and so on without causing graphic visualization conflicts.

The interactions in AIS can be subdivided by starting from components of map elements and using database queries. In the first case, the result of the query is a textual information. In the second case cartographic information, that has to be symbolised. In the AIS, all components of map elements of topographic maps are organised interactively and include
the so-called hidden information in the database. The great advantage of such a concept is that in spite of the small scale, map information can be visualised on user demand, which never could be realised at this scale at the same time. The disadvantage is that only one query can be visualised within the background information, otherwise the legibility of map information could be affected.

4 The Concept of “Restrictive Flexibility”

In the AIS only thematic information which refer to existing map geometry can be treated interactively and visualised on the screen. The so-called monovariable query yields only one parameter for visualization, while the so-called polyvariable query usually results in a set of parameters that have to be integrated into complex cartographic symbols. In the domain of thematic data representation, the users become cartographers, more or less, because they influence the result of cartographic data transfer to a considerable extent. The risk of proceeding in this way is that user-defined cartographic data representations may possibly be unattractive, illegible and cannot fulfill their information task. Starting from the assumption that system users usually are not interested in undertaking several experiments or in using different kinds of symbol sizes, line widths, patterns and so on until they have achieved an acceptable map, a so-called system control should support the efforts of system users in the process of map making. If, for instance, a simple cartogram has to be created, the system control checks the presumptive symbol sizes of maximum and minimum values for proportional symbols in accordance with those areas where the symbols will be situated. The result of this checking process is an individual scale for proportional symbols for a certain data set. Therefore the system user can be sure that this map creation process will always create a legible map.

A further problem in the visualization of thematic data is the map scale of the cartographic representation itself. In the AIS, a database query is usually linked to the representation of nearly 2,500 communities, which have to be visualized on the screen. Without doubt, graduated symbols cannot be an optimal solution for characterising different value steps because such a data transfer is surely not legible. So, in the first step of the visualization process, only an overview of Austria is given, without using an equivalent symbolisation. In other words, the database query can only be visualised by using an ordinal or nominal scale level. In the next step the user defines the region of interest whereby the map scale will be changed and the actual cartographic symbolisation can be displayed. The problem of this two-step method is that system users possibly may lose the spatial interdependencies of the represented data because they can only see a small section of the whole map. Of course, the system user can apply scroll functions to change the displayed map sections but this possibility cannot really compensate for the overview available when using a printed map.

Within the information presentation function the atlas user will be able to explore maps due to pre-definitions, where the legibility is ensured. The concept of restrictive flexibility can therefore be summarized as the concept, which is applied to an Atlas Information System, and which makes sure on different levels (Interface, Map, Interactive Functions), that an user can access and explore maps and interactivity tools within restrictions, being defined by the system designer, but within the defined restrictions in a flexible and serendipitous way. As next steps of the ongoing project the restrictions and the area of flexibilty for the specific maps, functions and interfaces will be defined and evaluated.

5 Conclusion

For the first time in the history of cartography the once passive user of a map becomes an active ‘manager’ in geographic information acquisition. Cartographers have to define anew their role in spatial information transmission and cartographic visualization process, because they do not hand over a final product to the map user as has been the case. Now cartographers prepare more or less complex information systems and they hope that the user will be able to get the information that he desires. Within such information system design the authors propose the definition of restrictions and areas of flexibility for the system users. This is meant as a step forward to more useful and tailored information systems, where not every user has to explore every functional cul-de-sac, but the system designers have tailored the system usage due to their scientific and empirical background. Within the “Atlas Information System Austria”, as an online version of the traditional print-only Atlas “ÖROK Atlas”, selected aspects of this concept in terms of user interfaces, map presentations and interactivity functions will be applied and evaluated.

References


