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DEMONSTRATIONS

DEMONSTRATION OF GEOSTAT DATA AND SERVICES

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CONTRIBUTED PAPER

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I. INTRODUCTION

1. The Spatial Data Section of the Swiss Federal Statistical Office has developed a number of GIS-related projects and applications in the recent years. Three of them, both covering their different, very specific fields, shall be described very briefly in the subsequent chapters and will be presented "live" during the workshop in Ottawa. They do not only differ in their contents and thematic scope, but they represent three entirely different technical solutions as well. While one of the examples has been fully developed in-house, the others were handled partly as outsourced information technology projects, and were thus realised with the support of outside knowledge and personal resources. The three applications in focus are the following:

- Live demonstration of GEOSTAT data and services
- Administration program for consistency and accuracy checking of geocoded building coordinates
- Metadata of publicly available GIS data in Switzerland

II. LIVE DEMONSTRATION OF GEOSTAT DATA AND SERVICES

2. Being the Swiss Federal Administration's Service for Spatial Data, Geostat is frequently involved in public relation activities and is often receiving visitors eager to obtain more detailed insight in the operation of GEOSTAT, about the various GIS data available and about potential applications and uses of this data. Their interest includes information on the main technological and methodical concepts of GIS and spatial statistics as well as on the not always obvious benefits that may be gained using GIS technology and Geostat data for their specific work environments and fields of interest. In order to allow us to present attractive information in this context in a visually pleasing way, already in 1993 a demonstration application was produced. This application was expanded and enhanced since then, but never completely updated to reflect newer technological advances and the entirety of the presently available data and analysis tools. A major obstacle for a wider use of the old demo is its dependence on ESRI's ARC/INFO software (including its GRID module). As a practical consequence, the demo only runs on fully equipped UNIX work stations which are, obviously, costly, difficult to manage and to combine with peripheral devices (such as video beamers). Any presentation of this demo outside of Geostat's office environment is a special logistic challenge, involving transport problems and a lengthy and somewhat risky setup operation.

3. For several reasons, therefore, it was decided about a year ago, to completely overhaul, enhance and expand the old demo. The objective was to end up with an entirely new application that reflects the actual technological advancements and user interface standards (multimedia, internet etc.), the now available "light versions" of GIS such as ArcView. Another important requirement for the application was to run on any standard PC under the Windows NT or Windows 95 operating system. The Swiss company Basler + Partner was commissioned to develop this new demonstration application, and it has delivered a fully functional first version a few weeks ago. The latest version of this prototype will be shown in Ottawa, combined with a rich data subset from GEOSTAT. A final demo version will be installed in the Swiss Federal Statistical Office's new building in Neuchâtel in the coming weeks, and it will be publicly available for consultation and reference within the Office's so-called "Espace public". This is a public mulitmedia area at the building's entry level, associated with the Statistical Office's library, and equipped with a large format monitor and two dozens Windows NT workstations of the latest generation.

4. The new GEOSTAT demonstration application is designed as a multilingual program which initially will be available in German and French. Additional languages (Italian, English) may be added at a later time. The application consists of a shell which gives the user access to each of the following five main application modules:

- ***Data catalogue:*** Presentation of the available GEOSTAT GIS data sets according to thematic groups (such as land use statistics, population censuses etc.) This module allows labelling, object identification, and panning over the entire area of Switzerland at a few fixed, preset zoom levels (depending on the selected data examples). The module also allows access to meta information for the selected (active) data sets.
- ***Direct and combined data access:*** Any GEOSTAT data sets can be visualized in arbitrary combinations and at any desired zoom level or image scale. As in the above module, an appropriate data legend is automatically generated and displayed on screen. The presented information may be automatically adjusted to the chosen map scale (e.g. raster map data of different original map scales). A wide variety of pan and zoom options is available, including fixed, numbered map scales, scaling to specific output paper sizes, selection of administrative units to be displayed etc. Again, objects can be identified and features labelled, but this module also allows to select or change the graphic representation of certain map elements (colors, line widths etc.).
- ***Data applications or projects:*** Here, certain projects and applications using GEOSTAT data are explained and presented to the viewer. They both include real applications which were developed by customers or, at their request, by the GEOSTAT team in recent years, but also hypothetical and more theoretical examples that aim to demonstrate the data potential for future applications. This module does not rely on live data, but on previously configured and prepared images and results. It basically follows the slide-show model, allowing a certain amount of interactivity and non-linear movement.
- ***GIS tutorial:*** This is the educational module providing background and technical information on certain GIS concepts, terms and methods. These may include e.g. data types (raster, vector; point, line, areas), layers and catalogues, scale and scale dependencies, geometry and topology and related operations, buffering, networking, 3D modelling etc. Technically, the module follows the same guidelines as the above module.
- ***Shell for additional, special applications:*** A variety of small, usually in-house developed applications or demos must be accessible from the main demo's user shell. These include a HTML browser (providing access to the internet), Adobe Acrobat Reader (to access PDF files), VRML viewer, access to slide shows, ArcView projects, ArcExplorer data etc.

5. Technically, the shell and basic user interface of the demo application is developed using *Visual Basic*, while the two first listed modules rely on *ArcView 3.0* to be installed on the PC the demo is used. Visual Basic is also used to define the graphical user interface for the ArcView modules, ensuring a consistent operation, styling and interface for all the five modules. In other words, ArcView basically delivers the entire GIS and interactive mapping functionality of the modules, but is entirely controlled through DDE from the superimposed VB interface.

6. The mentioned first two modules provide GIS functionality like panning, zooming, labeling, identifying objects, scale-dependent visualization, dynamic legend generation etc. which ArcView covers at minimal cost (considering development and licenses used). Our evaluation revealed that the same effects and functionality could not have achieved with ESRI's MapObjects. Firstly, the presently available version of MapObjects does not directly support the ARC/INFO GRID format nor (semi-)transparent overlays of grids and images. Secondly, to reprogram all the requested functionalities automatically built in and provided by ArcView would have required a major investment and, therefore, was found not to be a cost-effective solution.

7. The "slide show modules", data applications and GIS tutorial, are entirely developed with the low-level authoring system DemoShield. They are delivered and used as compiled (player) applications and, therefore, do not necessitate any additional software costs besides of one single developer's version license.

III. GEOCODING APPLICATION PLAUSI97

8. An important part of the geocoding of buildings as census objects of population and housing as well as business and enterprises censuses consists of checking the consistency, accuracy and plausibility of the centroid coordinates manually digitized or received from existing registers. Our experience from the national census 1990 showed that besides of a few fairly simple automatic tests (such as comparing these coordinates with the administrative areas they are supposed to belong to) this is most effectively done by visual comparison on the basis of the latest editions of the topographical map sheets of Switzerland. While this job involved the superimposition of plotted building coordinates on top of paper maps and their comparison with the help of light tables, the technological advancements since then make this method appear archaic and inefficient. Instead, doing virtually the same but using electronic data and computer monitors promises a higher accuracy and a significantly increased productivity.

9. The major objective in a request from the SFSO's geocoding team for a specific application was, therefore, to enable them to display the building coordinates on top of the scanned topographic map sheets in order to check their position. Depending on the findings of an operator, the status of each coordinate (or entire group of coordinates) could be set to specific values (such as for verified and OK, to be checked, to be newly digitized etc.). To allow efficient work and to display additional information, the application had to provide flexible color-coding of the building coordinates according to their status or according to the associated street address. The application was also to perform the same automatic consistency checks as in 1990 and to mark and display any coordinates not complying to the expected rules. In addition, an operator must have flexible access to a multitude of attributive information for each building (such as exact street address, cadastral and insurance numbers, number of households and storeys, construction period, category of utilization etc.).

10. Based on a reasonably detailed description of the desired and required functionality, of the various data and information available for comparison and display, a task force of experts from the Spatial Data Section came to the conclusion, that a complete in-house development appeared possible with the available personal resources and seemed to be the most feasible and cost-effective solution. Based on these criteria and requirements as well as the data, the knowhow and hard- and software available in the Section, ESRI's custom controls MapObjects prooved to be the optimal development tool. While its hardware and operating system demands necessitated an upgrade of several PCs, this investment was lower and felt to be more longterm-beneficial compared to a more expensive software solution (such as an ArcView-based alternative, e.g.). In addition to MapObjects, Visual Basic 5.0 and Microsoft Access 7.0 were also used in order to generate user interface elements and to provide an adequate data management basis.

11. Besides of manually, based on the visual comparison with the raster base map, confirming building coordinates, the application automates a series of routine checks, namely:

- coordinates outside of the administrative boundaries of the associated commune.
- multiple buildings in the database for one building in reality, i.e. coordinates separated 4 m and less from each other.
- coordinates rounded to hectare values (100 m) which are remains of an older, more generalized data capture.

12. In addition, PLAUSI97 allows to shift building coordinates manually or graphically, always on top of the respective raster base map. This feature eliminates frequently the necessity to redigitalize coordinates on top of paper maps whose registration on a digitizing table is time-consuming as well as an additional source of errors.

IV. METADATA OF PUBLICLY AVAILABLE SWISS GIS DATA

13. The Swiss Informatics Conference (CSI/SIK) is an advisory institution of the federal and cantonal governments in Switzerland where each of the 26 cantons delegates two, and the federal government ten representatives. In several (smaller) working groups special problems and actual projects or subjects are covered in more detail. These groups, one of which is dedicated to the subject of GIS, contribute significantly to the exchange of information and experience and to the decision taking process regarding technical and methodical solutions, coordination and standardization.

14. Already a few years ago and based on a survey undertaken in 1991, it was recognized that there is a serious lack of synoptical, easy to consult and to compile information about all the available digital and geocoded spatial data available with governmental offices and associated institutions in Switzerland. Therefore, the GIS working group decided to invest in a major effort in order to compile such a comprehensive data inventory and to provide a tool to collect, disseminate and evaluate this information. With two representatives, the Swiss Federal Statistical Office contributed significantly to this endeavour, and GEOSTAT volunteered to function as secretariat and central administrative office for the recently established SIK GIS data inventory.

15. For the data collection and administration, a simple but fairly sophisticated tool was developed using the DOS-based Clipper data base development environment. The resulting application basically runs on any DOS-based PC and does not demand the latest or most powerful machines. The down side of this, however, is an outdated user interface and an operation which is – for operators used to and spoilt from Windows applications and conveniences – often less than intuitive and tedious.

16. During 1997 the first, initial data collection was organized. 17 from the 26 Swiss cantons have productively collaborated and seriously documented the GIS data available within their administration. Complemented by 11 federal offices, the final result comprises more than 650 comprehensively described GIS data sets. Additionally, the inventory informs on nearly 100 institutional addresses and around 400 contact persons interested in and dealing in one way or another with GIS data. This wealth of information is disseminated together with a consulting application to anybody interested in it, at no charge.

17. Due to the limitations of the inventory application and confirmed by user feedback and criticism, the working group recognized that additional means must be provided in order to promote the achieved results and make them available to a larger audience. Therefore, the Spatial Data Section of the Swiss Federal Statistical Office exported and converted the entire contents of the inventory into HTML format. After designing a multitude of Web pages in the past months, a prototype Web version of the inventory is available now for consultation. While it needs to be further complemented and expanded in order to guarantee an easy, intuitive and flexible access to all the data contained, a final and fully functional version is expected to be online by the end of the year. Whether and how this will be further developed into an internet solution allowing not only data consultation, but data capture and updating as well, is being discussed and evaluated within the working group.

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