MAP PRODUCTION USING THE NATIONAL TOPOGRAPHIC DATA SYSTEM IN FINLAND

Veijo Pätynen
National Land Survey of Finland
Geographic Data Centre
Opastinsilta 12 C, P.O.Box 84
FIN-00521 Helsinki

Abstract

The National Topographic Data System consists of data compilation and updating methods, a Topographic Database containing the most detailed general topographic data with nationwide coverage and the standard products derived from this geographic database. The compilation of the data has been going on since 1992. The production of all topographic maps in scales 1:5,000 - 1:50,000 of the National Land Survey is based on the use of the data of the Topographic Database. Also smaller scale topographic maps will have features derived from this database.

This paper introduces shortly the idea of the Topographic Data System and the map products produced from the data of the Topographic Database.

1 The National Topographic Data System

The graphic Basic Map series 1:20,000 containing over 3700 printed map sheets was completed in 1975 and it extends the whole area of Finland, 337,000 km^2. Digitising of data started in the early 1970s by automating some steps in the fair drawing process. After that there has been separate digitising projects going on to collect data for different purposes, for example in the production of maps or digital elevation models.

The production of the topographic maps using traditional manual production methods was stopped in 1993. A new fully digital production line, The Topographic Data System was launched in 1992.

The National Topographic Data System consists of data compilation and updating methods, a Topographic Database containing the most detailed general topographic data with nationwide coverage and the standard products derived from this geographic database (Figure 1.). The compilation of the data in accuraries corresponding to scales 1:5,000 to 1:10,000 is now in progress and should be finished by the year 2000. The basic idea of the Topographic Data System is to collect data only once, not two or three times as it was done earlier. Data compilation is done in 12 regional offices of the National Land Survey and it is done in vector form with homemade MAAGIS software in VAX/VMS environment. The Topographic Data System consists of about 220 workstations and about thirty analytical stereoplotters and the number of persons working with the system is about 400 [1].

The updating of the database will be done every year with the help of existing databases of other authorities and every five to ten years based on aerial photogrammetry. The updating frequency of the traffic network, buildings and power lines is planned to be less than a year.

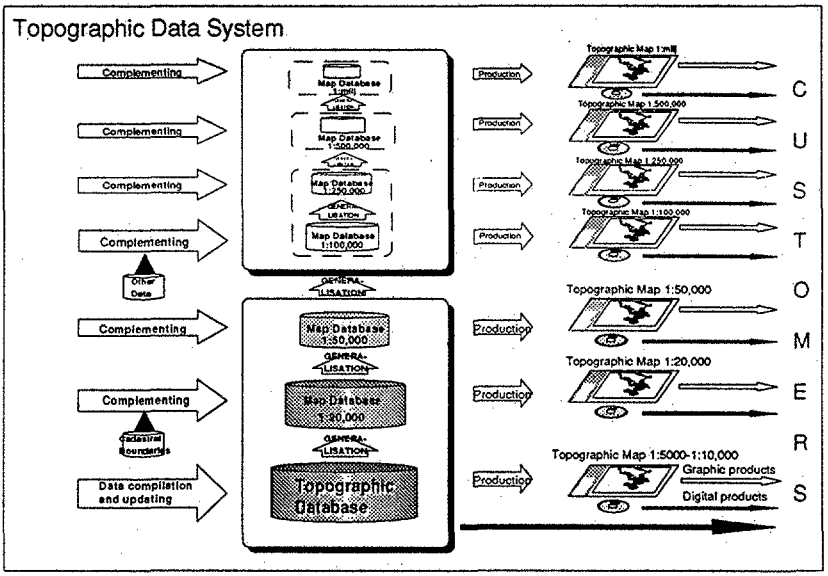

Figure 1. The Topographic Data System

The data model of the Topographic Database defines 119 feature classes, which are divided in eleven data groups. Basic data groups are buildings, transportation network, terrain and hydrography, power lines and elevation. Other data groups are administrative boundaries, protected features and special areas.

2 Map products

The Topographic Database is used as the basis for variety of standard products as well as products customised to users' needs. The quality of a product is derived from the Topographic Database in digital products. Cartographic quality is ensured by manual checking before the product is printed.

The production of the topographic maps of different scales must not necessarily be based on the idea that the data source of next smaller scale map is the previous larger scale map database. It is noticeable that the data can be classified to certain scale groups according to the level of generalisation of the geometry of objects. For example data from scales 1:5,000 to 1:50,000 can form one data set, scales from 1:100,000 to 1:250,000 form another and so on (Figure 1.). The production of topographic maps within these scale groups can be organized so that the geometry of the objects is mainly the same. Generalisation can be based for example on selection. Updating of the map databases will be easier in that way.

The following products will be standard output from the Topographic Data System. The ideas mentioned above are used in the production of these topographic maps.

2.1 The Basic Map 1:20,000

The Basic Map 1:20,000 has been the main topographic map product of the National Land Survey. Along with the finishing of the production of the previous map version produced with traditional method a new product derived from the Topographic Database with new cartographic representation and front page was published. The area of one map sheet is 10 x 10 km^2, so the whole series would consists over 3700 map sheets. All of the maps will not be printed. That will depend on the expected demand of the customers.

The scale of the Basic Map is close to the scale used in data compilation. So the process in the production of this map is quite straight. Most of the data is derived from the Topographic Database. Small buildings are slightly generalised. Real-estate boundaries are copied from the Digital Cadastral Boundary Map. Only some small cartographic editions are done in order to enable flexible updating. The frame of the map is created automatically and edited on graphic workstation.

A plot for verification is created using vector-PostScript tool of MAAGIS software. The cartographic representation of the plot is the same as printed map. So it is not neccessary to make any high quality copies, for example cromalin for proof-reading

Litographic operations and colour separation is done using MAAGIS PostScript tool [2]. The map is printed using four process colours (CMYK).

2.2 The Topographic Map 1:50,000

A computerized process containing data compilation to produce the Topographic Map 1:50,000 was in production 1989-1993. A new production line based on the use of the data of the Topographic Database was introduced in 1993. Cartographic representation of this map is almost the same but the front page is new.

Generalisation of the map features is performed automatically and interactively. The main idea is to maintain the geometry of the objects of this map database same as it is with the Topographic Database as far as possible. So the main generalisation method used is selection but also collapse and displacement is used. Roads, contours and terrain areas are generalised automatically using selection. Generalisation of buildings is done automatically using collapse. After automatic generalisation interactive generalisation and cartographic editions are performed on graphic workstation. The frame of the map is created automatically and edited on graphic workstation.

The area of a map sheet is 40 x 30 km^2, so the whole series will consists about 350 map sheets. The whole country will be covered with this topographic map. Intergraph map publishing system is currently used for litographic operations and colour separation. Vector-PostScript method will be introduced later this year. The map is printed using five process colours (CMYK + Brown).

2.3 The Photo Map 1:5,000 - 1:10,000

The Photo Map is a new product in the series of topographic maps of the National Land Survey. This map will consist of digital orthofoto, features from stereoplotting, real-estate boundaries and geographical names. This product will be either a colour plot or a printed map on customers demand.

The area of a map sheet is 2.5 x 2.5 km^2 or 5 x 5 km^2 depending on the scale. MAAGIS vector-PostScript tool is used to produce a plot or a printed map.

2.4 Small scale topographic maps

Small scale products will also use some data from the Topographic Database. There will be products covering one municipality in scale 1:50,000 to 1:100,000 and products in scale 1:250,000 to 1:500,000 to cover countries. These products will also have data from other sources but the data derived from the Topographic Database will be updated enclosed with it. Satellite data has significant role in the production of small scale topographic maps. Production lines of these maps are still under development.

2.5 Digital products

Digital products are either in vector format or raster format and the media can be, for example, CD-ROM. The use of Internet will open new possibilities for the distribution of digital products to the customers.

3 Updating of the map databases

As mentioned before the updating of the Topographic Database will be done every year and every five to ten years. Updating process of the Topographic Data System contains a subprocess to search differences of objects between two versions of the Topographic Database. This method can be used within the updating process of map databases as well (Figure 2).

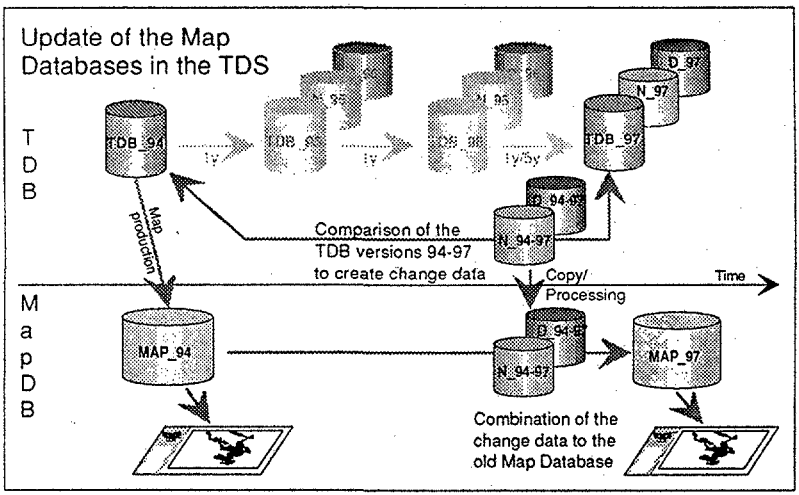

Figure 2. Updating of the map databases

Previous map database MAP_94 is derived from the Topographic Database version, called TDB_94. New version of the map MAP_97 is decided to be produced using the data of the current version of the Topographic Database, called TDB_97. Instead of deriving the new map database using the same map production process that was used to create MAP_94, differencess of the objects are searched by

comparing the Topographic Database versions TDB_94 and TDB_97. Change data is produced in two data sets; new objects to be inserted (N_94-97) and old objects to be deleted (D_94-97). Updated map database MAP_97 is created by combining the change data to the previous map database MAP_94. The change data can be used straight or all the modifications performed in the map production process can also be executed. It may be possible to use automatic methods in this process.

4 Conclusions

The change from the traditional graphical production of topographic maps to digital has been profound. Whole ideology of map production has changed, as well as processes and tools . The training of the personnel working with the Topographic Data System has taken three years and it is still going on [3].

The need of the digital spatial data is increasing all the time. At the same time the demand for more economical and flexible production has become more important. The solution of the National Land Survey of Finland for these demands has been the Topographic Data System.

References

[1] Jakobsson, A, 1995, The Topographic Data System - A New Way to Compile and Update Topographic Information. To be presented at ICA Congress in Barcelona. Helsinki.

[2] Leskinen, T, 1995, Publishing Topographic Maps using PostScript Page Description Language. To be presented at ICA Congress in Barcelona. Helsinki.

[3] Pietikäinen, M, 1995, Continuous Education as part of the Topographic Data System in Finland. To be presented at ICA Congress in Barcelona. Helsinki.