STUDIES ON THE POSSIBILITY OF REALIZATION OF THE GEOGRAPHIC INFORMATION SYSTEM FOR FOREST PRIVATE OWNERS

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The activities concerning forest sector regardless the type of ownership are characterized by high complexity, taking into account biological peculiarities of woody species significant to forestry, the technical level of interventions and the current legislation.

The realization of the Geographic Information System and the corresponding data base for the forestry fund in the property of different administrative territorial units (ATU) is imperative in the context of sustainable management of forestry resources.

Also, the opportunity of the realization of the Geographic Information System resides from the fact that the private forestry fund can be differently managed, as a function of financial possibilities and current legal regulations.

For the realization of the presented goals appropriate technologies and software are recommended in order to fit terrestrial measurements.

The presented study case was performed in the forestry fund of ATU Chiuesti, Cluj county using the software MAPSYS to construct the Geographic Information System and data base. The obtained results will be used to administrate and manage sustain ably the forestry resources in the ownership of Chiuesti commune.

***Key words**: GIS, data base, legal regulations, MAPSYS software, ATU, private forestry fund*

The computer system is a complex technical and organizational people, equipment, rules (rules) and methods (algorithms), with the main functions the collection, validation, storage, display and data processing to obtain information.

There are several similar concepts:

-information system - a system in which processing is done manually or by mechanical means;

-data-processing system (data processing system) is the group of components of a system only specialized processing;

-information system (borrowed from French: Information + automatique = informatique) is reserved to describe a system in which processing is automatic, with electronic computer programs;

The term computer system means a system in which the collection, validation, storage, processing and displaying data and information is made mainly or exclusively using electronic computer.

Exploitation of forest and silviculture. It is interesting to show that the origin of what is considered the first GIS to state the need to identify the most appropriate location for cutting trees and for new forestry plantations. (Canada Geographic Information System, created in 1966 following the initiative of R. Tomlinson).

Indeed in many countries where the forest is an important economic and environmental factors have been developed and is used GIS applications for this area.

Specific problems can be solved using GIS are diverse:

Establishing optimum locations for cutting.

Among the factors considered are: age and tree density, tree species, land slope and soil type (to avoid the danger of erosion), ways of communication (transport of material can cut), flora and fauna (to avoid effects negative thereof);

Monitoring cuttings. Are registered areas where cuts were made determining the volume and quality of timber harvested;

Establishing optimum locations for plantations. Determination of areas affected by disease or insects and tracking the effects of treatments applied or the measures taken. There are recorded locations where there were tree diseases or insect pests have appeared.

Depending on the type of the condition found and taking into account factors that influence its evolution (which involves collecting and recording qualitative and quantitative data that characterize those factors) are projections of possible developments (determining which areas will be affected in the following period of time) and to determine appropriate treatment and action to be taken. After their completion are tracked with the help of GIS effects.

Record and monitor hunting. There are collected data on species, age of animals and birds, health, etc. geographically referenced ("linked" to a particular area). Also collect the data that characterizes natural and anthropogenic factors that influence their development, allowing developing forecasts.

Evidence, monitoring and prediction of fire. There are recorded data on fires in the past (Trigger mode, weather conditions that have emerged and developed, how evolution, etc..). Based on these data to determine whether a risk of triggering a fire to take appropriate measures to prevent.

Unlike other areas such as the changes are off survey and register them, usually do not involve complex measurements of high precision only if we deal with forests large areas where significant changes may occur during the relatively small (several weeks or even days). This situation should be added to the relatively low accuracy requirements (limits on the diffuse-order errors in position m does not affect the quality of information) and how difficult (terrain without vision) determine the main technologies for data collection to be remote sensing and photo small-scale air. For this reason most applications for GIS in forestry include (or be

accompanied by) the specific functions of digital imaging photogrammetric and remote sensing.

Also the fact that most phenomena are represented and analyzed raster data model is adopted to determine the area especially for applications developed with long ago.

MATHERIAL AND METHOD

This case study was conducted in the territorial administrative unit Chiuesti, Cluj County. Territorial-administrative forests are located in Cluj County.

Forest covered in this study ("Forest Village Chiuiesti") was formed by returning to the village in Cluj County Chiuiesti an area of 304.1 ha of former UP VIII Negrileşti, O.S. Beclean in the document of ownership, record of release in possession no. 217 of 15.11.2004, issued by the County Commission to establish ownership of land established by the prefect Order no. 187 of 11.04.2000, analyzing the proposals jointly under Law no. 18/1991, Law no. 169/1997 and of Law no. 1 / 2000.

Forest fund administration

After the nature of property forests are forest fund public property of administrative-territorial unit of the village Chiuiesti respectively. Administration is by common Chiuiesti - Hall Chiuiesti by Forest District Beclean in the contract signed between the owner and managing County Forest Administration Bistrita - Nasaud that Beclean Forest District.

Household unit consists of forests restored village CHIUIESTI is geographically located in in the Somesul Mare catchment area tributary Buia Brook and Brook Huta.

The forests are located in the eastern hilly area known as the Podisul Somes.

Research and study methods were used are: informing documentary, observational route, observation station, inventory, modeling, simulation, comparative swot analysis.

To achieve this we used the following case study on logistics: forest management plan, plans and maps forest management, cameras, GPS receivers, total stations, scanners, software for field data collection, data transfer programs, programs for data processing, software for archiving data and that obtaining and organizing the database and implicitly the information system's data processing - PC peripheral for obtaining final products in analog format.

Softuri. The volume of information received by any man of today is growing due to almost unlimited possibilities for managing and operating the preserve that information provided in digital form in relational databases. One can appreciate that a percentage of 85 percent in circulation databases containing one or more components related to geographical position of objects inventoried. If survey database can affirm that all information is related in any way the geographical position of real estate property defined by geographical boundaries of the survey unit.

Creating and exploiting a common Geographic Information System information with reference to spatial and graphical representation of objects located underground, surface or large benefits to users and administrators the information in the first place because of an operational data structures and well defined -- primary requirements for any information system. When all information is arranged by geo-referenced relational rules - in digital format - and are managed by a system of programs designed for that purpose opens up new possibilities of management and use increasingly large group of users.

Mapsys focuses powerful but easy to use functions of the digital generation and recovery plan, functions of geo-referencing and managing information with spatial reference. Effective exploitation of geo-data Mapsys created or imported from other systems is provided by standard GIS functions such as those of geo-referenced, collection attributes, topological overlay layers, creating user queries or generating buffer zone but the specific functions of topography cadastre by overlapping search or address. Defining the right of access to software functions, data and cataloging operations performed can allow a better protection and tracking data consistency.

Mapsys COM Interface offers the possibility of extending the functionality of the program by creating their own applications with available programming language functions and internal functions Mapsys. Optional module Mapsys Internet Map Server allows querying by authorized users of information from databases Mapsys works in a corporate intranet or the Internet. To generate graphical user has available data import functions of common formats, digitization / vectoring and graphics functions built. There are specialized functions for creating, searching, selection and modification of points, lines, curves, texts and symbols.

Multiple specialized functions for geometric graphs construction plans and cadastral surveying, generating transverse and longitudinal profiles. Plans scanned can be targeted, whether or unified and displayed in order of vectorial scop.

There are functions for digital printing plan to generate standard plan sheets, overlapping multiple plans or placement on the worksheet graphics windows open.

Functions of import / export permit transfer graphic and alphanumeric information in the most popular formats such as DXF or GIS, SQL, SHP, MIF, E00, etc..

Mapsys work units are called works. They contain all the information entered or set up at a time. Graphic functions creates type information point, line, arc, curve, text or symbol. Functions of objects generates topological space topological type with reference point, line or polygon. These objects are composed of graphics, object identifier and object attributes.

Topology. Mapsys is a Geographic Information System that enables the creation, management and exploitation of information with spatial reference. Maintaining them in a relational database requires very broad definition of categories of objects that meet the minimum conditions consistent graphics and positioning - *table1*.

Table 1

These objects are called topological objects and can be synthesized into three categories

No.	type topological objects	definition	conditions
1	point	identificator, coordinate point	-
2	line (arc)	identificator, coordinate points	Without interuptions
3	polygon	identificator, coordinate breaking points	To be a close outline to be defined univocal''

Table 2

Mapsys each type of object in a corresponding topological structure of a predefined database

No.	type topological objects	Base attribute	Type attribute
1	point	NRCAD, X,Y,Z	Text, Num, Num, Num
2	line (arc)	NRCAD, Length, Medium cota	Text, Num, Num
3	polygon	NRCAD, Surface, Perimeter, Medium cota	Text, Num, Num, Num

Structure given above is automatically created along with Mapsys topology generation for a class of graphical objects and alphanumeric contained a combination of graphics layers - table 2.

Standard structure can be extended by the user, by creating new fields, or creating tables or relational databases.

Administration. Topological information and related attributes are maintained in database management systems such as those specified above.

Working on multiple workstations specific update operations of a functional GIS system management functions is provided by the statements of work that can be distributed to workstations following that after its completion can integrate into the paper.

Query functions allow database creation, save and run complex SQL queries, displaying results of queries or creating thematic representations.

There are special functions of search graphics postal address, buffer zone generation, duplication and analysis plot (reparcelling), generate thematic representations.

Access. Access to functions and data can be restricted so that each registered user can access only those functions and data that have been granted by an authorized person named manager who has the authorization to access and modify all the functions and all data. Users are identified by name and password system.

Internet. Mapsys using Internet Map Server, the geo-information data is multiplied by the fact that they are made available to users where potential when they need them as soon as data manager and the clients are connected to the Internet. Type intranet users connect through a local network, setup and use functions are same as in the Internet.

Information supplied in the network are the usual Mapsys works located server may set a level of detail depending on the user. Mapsys works may be the original set - rapidly changing - or copies thereof. Thus there is a permanent control over the timeliness of the information provided.

Functions to acquire the user program is available Mapsys user guide in PDF format which you can copy the installation disc and such works that can be installed together with the software and found in the Samples subdirectory Mapsys installation directory (default \ Program files \ GEOTOP \ MapSys5).

Topology generation operation is the main step in building a Geographic Information System based on the definition of topological objects validated in terms of geometrical and logical. The operation is applied to all islands that the whole works. Topology function of topological objects in primary graphics (point, line, poly-line, text / survey number) is generating a primary table in Microsoft Access MDB database which will contain elements of work and identification number of topological objects.

Topology is always generated for the current layer but the primary graphics topological objects in the current layer can be on different layers will be specified by the user. More same graphics can be components of several types of topological objects.

This feature reduces redundancy graphics are not necessary to create new graphics elements when they overlap with an existing one.

The database can be edited to menu

Database window

To upgrade existing topology on one or more portions of work you can use the function Extract.

Table created. Default is set to name the current layer.

If additional attributes were added to the database by building topology is preserved only attributes (more) of those polygons which has been awarded a number

of Land, so before the definition of additional attributes to be added to each polygon cadastral number.

The button can be selected layers to be included layers of building elements for graphical objects and for assigning cadastral numbers. Selection is done by double-clicking the layer number. Layers that appear engraved are invisible. The name of a layer can be displayed if the number of places the cursor over it. After clicking the OK button if polygon topology is required to define the outline within which to construct polygons and surfaces will be calculated. Selected accounts must be in the current layer. Thus it is possible to calculate a block surfaces.

If desired calculation of total area is hit the right button mouse (ESC) without contour selection. After surgery displayed a report file that contains information about parameters and topology building results. Points that create non-closing errors are marked with a square and the lines are not part of two different polygons (one left and one on the right side of the line) will be selected.

Database. To define or display meta-data should be open database that contains meta-data. Meta database can be a database of a work Mapsys or a database neutral. You can define several meta database according to needs (content, data types or geographical position information). In the window that appears when calling the menu can specify the access path and name of the database metadata. Selecting the database file using the standard window is made with button.

RESULTS AND DISCUSSIONS

Technological flow covers the following steps: scanning papers, getting raster, raster orientation, raster vectoring, getting those vectors and polygons, to obtain thematic maps, determine the coordinates, are the basis of data - *figure 1*.

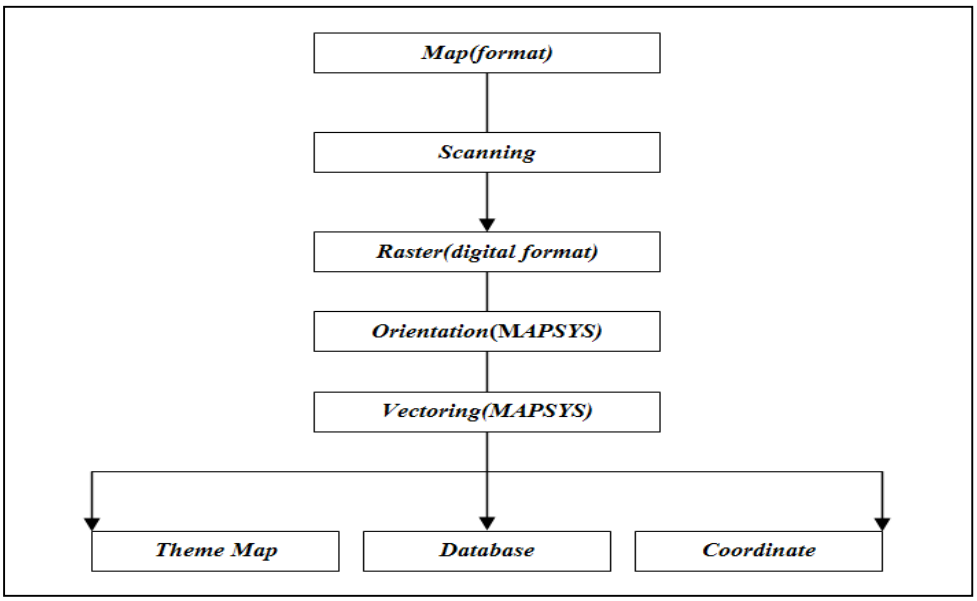

Figure 1 **Block diagram for obtaining related products using the program's GIS Map Sys 7.0**

In the *figures 2, 3, 4 and 5* are shown images of different stages of work related to the technological process of making geographical information system for case study analysis.

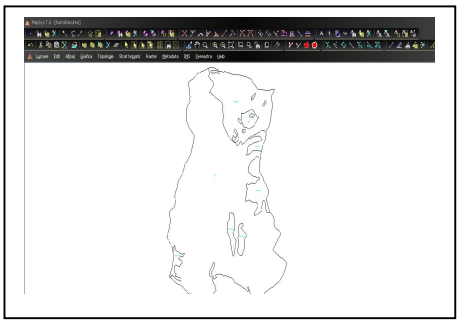

Figure 2 - **White Map**

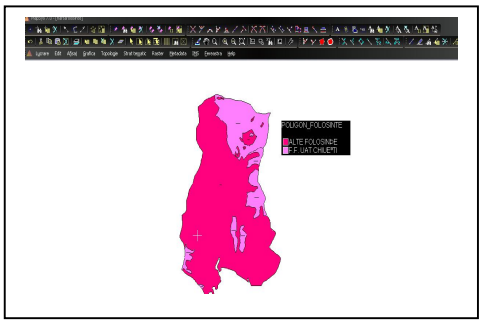

Figure 3 **Theme Map**

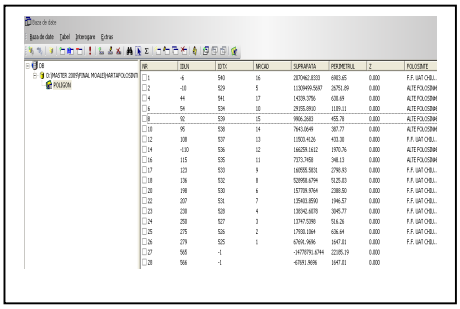

Figure 4 **Database realisation**

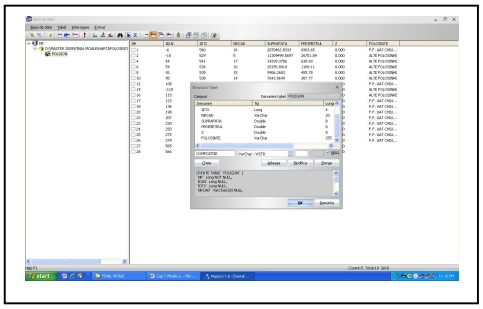

Figure 5 **Database modification**

CONCLUSIONS

Analyzing resultes, the graphics products offer a range of information on matters investigated as follows:

- area occupied by different stand;
- assessed forest units;
- structural elements of forest ecosystems, etc.;
- map theme is a product of great value for the decision.

Database realized gathers this information in tabular form which can be managed according to needs.

To achieve the final product quality on the information provided is necessary primary data collection and processing with an appropriate accuracy;

It is advisable to specify the exact coordinates of points defining satisfactory locations for observations in stationary and delimiting different areas that are of importance to the issues studied.

Coordinates of points of importance to the issues studied are recommended to be determined in the national reference (STEREO 70 for x and y and that for 1975 Marea Neagra allowances).

It is recommended to use materials known scale cartographic documentation to avoid some confusion that may occur.

Thematic maps related to habitat studied and that database space (BDS) is necessary direct cooperation with each sector specialist expert in order to complete these works with maximum efficiency.

In case of unclear situations if necessary will clarify any differences on the ground.

Thematic maps should be checked carefully for each expert on the field to not propagate due to operator error processing the data.

Complete graphics products will be done after the conclusion of the last field trips taking into account any changes that can make.

The database will design and organize so that to satisfy all needs to be taken considering the useful information that will be the entries in the database.

BIBLIOGRAPHY

1. Aronoff, Stan., 1989 - *Geographic Information Systems:* A Management Perspective, WDL Publlcatlons, Ottawa.
2. Bernhardsen, T.,1992 - *Geographic Information Systems,* Viak It and Norvegian Mapping Authority.
3. Boş, N., 1982 - *Fotogrametrie forestieră*, Universitatea din Braşov.
4. Boş, N., 2003 - *Cadastru general*, Editura ALL BECK, Bucureşti.
5. Boş, N., 2005 - *Cadastrul forestier, problemă de actualitate*, Revista pădurilor, nr.5/2005, - pag. 3 - 7, Bucureşti.
6. Boş, N., Chiţea, Gh., 2005 - *Ridicarea în plan a pădurilor din România în etapa actuală*, Revista pădurilor, nr.1/2005, pag. 28 - 31, Bucureşti.
7. Boş, N., Iacobescu, O., 2006 - *Topografie modernă*, Editura C H Bek, Bucureşti.
8. Brigss, Dave, Carver, Steve, Tomllnson, Steve,1994 - *Data Quality,* UNIGIS - Manchester Metropolitan University.
9. Chrisman, Nlcholas, 1998 - *Exploring Geographic Information Systems ESRI,* Redlands California
10. Clarke, Keith C.,1997- *Gettlng started wlth Geographic Information Systems,* Prentice-Hall, 1997.
11. Corcodel, Gh., Corcodel, Şt., Danci, I. M., Crainic, Gh. C., 2004 - *Fotogrametrie analogică*, Editura Universităţii din Oradea, Oradea.
12. Cornelius, Sarah, Heywood, Ian, 1995 - Spatial Operations *UNIGIS,* Manchester Metropolitan University.
13. Dangermond, J., 1983 - *Software Components Commonly Used in Geographic Information Systems,* ESRI, Redlands, California.
14. DeMers, M.N., 1997- *Fundamentals of Geographic Information Systems* John Wiley & Sons, Inc..
15. Dumitru, G., 2001 – Sisteme Geografice Informaţionale, Ed. Albastră.
16. Egenhofer, Max J. Frank, Andrew U.,1988 - *Object Oriented Modelling: A powerful tool for GIS Object Oriented Database Technology for GIS,* Seminar Workbook, NCGIA, Santa Barbara.

17. Hantman, Cari, S., Yuckerman, Steven C., 1991 - *The Use of Cartographic Metafiles in the Census Bureau's Publication Map Production System,* ACSM-ASPRS Fall Convention Technical Papers, ACSM, Bethesda, Maryland.
18. Hennon, Mesloh, Tracie, 1991 - *Effects of Earthquakes on Property Boundaries,* ACSM-ASPRS Fall Convention Technical Papers, ACSM, Bethesda, Maryland.
19. Jacobsen, K., 1992 - *Accuracy requirement Intergraph European Digital Photogrammetry.* Seminar, Hoofdorf.
20. Jordan, Lawrie, E., Sperry, Stephen L., Smith, Christine, 1991- *Statistical and Spaţial Modeling: Raster Processing for the 1990's ACSM-ASPRS,* Făli Convention Technical Papers, ACSM, Bethesda, Maryland.
21. Korte, George, B., 1997 - *The GIS Book,*On Word Press*,* New Mexico.
22. Light, D., 1993- *The National Aerial Photography Program as a geographic Information systern resource,* Photogrammetric Engineehng and Remote Sensing Nr.59(l).
23. Maguire, David, J. Goodchild, Michael, Rhind, David, W.,1991 - *Geographical Information Systems,* Longman Group, Essex.
24. McGuire, David, Worboys, Michael, Hearnshaw, Hilary, 1990 - *An Introduction to Obiect Oriented Geographical Information,* Systems Mapplng Awareness Nr.4, Part2.
25. Reeve, Derek, 1994- *Atribute Data and Database Theory UNIGIS,* Manchester Metropolitan University.
26. Abdulamit, Altan, Barbu, Cosmin, 2000 - *Fundamente GIS,* Editura *H*G*A*, Bucureşti.
27. Stenback, J.M., Travios, C.B., Congalton, R.G., 1987- *Aplicatioon of Remotely sensed Digital data and a GIS in Evaluating Deer Habitat Suitability on the Tehama Wlnter Range,* Proceedings of the GIS '87'Sym postum, ASPRS, Falls Church, Vlrginia.
28. Sabău, N.C., Crainic, Gh. C., 2006 - *Aplicaţii ale teledetecţiei în cadastru*, Editura Universităţii din Oradea.
29. Sabău, N.C., Crainic, Gh. C., 2006 - *Teledetecţie şi cadastru forestier,* Editura Universităţii din Oradea.
30. Tereşneu, C. C., 2007 - *Cercetări privind utilizarea sistemelor de informaţii geografice în amenajarea pădurilor de codru regulat*, Rezumatul tezei de doctorat, Universitate Transilvania din Braşov, Facultatea di Silvicultură şi Exploatări Forestiere, Braşov.
33. Tomlinson, R.F.,1987 - *Current and Potenţial uses of Geographical Information Systems* - the North American Experience International Jounal of Geographical Information Systems, Nr.l(3).
*34.*** - Amenajamentul silvic al pădurii Comunei Chiuieşti,* judeţul Cluj.
35. ***, 1986 – ESRI - *San Diego Regional Urban Information System Conceptual Design Study - System Concept and Implementation,* Program ESRI, Redlands, California.
36. ***, 1997 – ESRI - *Understanding GIS - ARC/Info Method, ESRI,* Redlands California.