TOPOGRAPHIC-GEODESIC METHODS IN ACHIEVING AND PROCESSING THE DATA NECESSARY TO CREATE A DATABASE FOR IMPLEMENTING GIS IN THE DOMAIN OF CIVIL, INDUSTRIAL AND AGRICULTURAL CONSTRUCTIONS CONTEXT

METODE TOPO-GEODEZICE DE ACHIZIŢIE ŞI PRELUCRARE A DATELOR NECESARE CREĂRII UNEI BAZE DE DATE PENTRU IMPLEMENTAREA GIS ÎN DOMENIUL CONSTRUCŢIILOR CIVILE, INDUSTRIALE ŞI AGRICOLE

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Abstract: *This paper present the topographic-geodesic methods of acquisition and processing necessary data of a GIS implementation in civil engineering works, quotient and important of a creation database for Urban GIS. In developed countries it was understand the importance of adopting these new techniques, but in our country, it was observed that is necessary to unify all the forces that achieve and promote the informatics system in the local public administration to persuade the decision factors of the advantages utilization of informatics, starting from the opportunity of using the applications and from the qualitative and quantitative advantages that will be obtained after the exploitation of such systems.*

Rezumat: *Această lucrare prezintă metodele topo-geodezice de achiziţie şi prelucrare a datelor necesare implementării unui Sistem Informatic în lucrările de inginerie civilă, cât şi importanţa creării unei baze de date pentru Sistemul Informatic Urban. În ţările dezvoltate s-a înţeles importanţa adoptării acestor tehnici noi, dar în ţara noastră, s-a constatat că este necesar să se unească toate forţele care realizează şi promovează sistemul informatic în administraţia publică locală pentru a convinge factorii de decizie de avantajele utilizării informaticii, pornindu-se de la oportunitatea folosirii aplicaţiilor şi de la avantajele calitative şi cantitative care se vor obţine după exploatarea unor astfel de sisteme.*

Key words**:** *Geografic Informatic Systems (GIS), data base, collecting data*
Cuvinte cheie: *Sistem Informatic Geografic, baze de date, culegerea datelor*

INTODUCTION

Geografic **I**nformatic **S**ystems, in principle are systems of data administration that integrates and stores collected data from different sources, as well as posting of spatial data from the real world, in a certain way proper to a certain scope (Source Huxhold, An Intro to URBAN GIS, 1991).

A GIS project supposes, in general, to follow some steps, respectively: collecting, storeing, analyzing, and interogation of data basis. Any GIS system permits the integration of collected data in different periods of time, at different scales, using different collecting data.

Implementing GIS systems brings a semnificative improvement by using common data basis of those involved in the decisional process and in the same time it assures an efficient way for the communications of the problems and solutions to the citizens and other interested parts.

Data and informations specific to an Informatic System for the works of civil engineering are collected starting from base imobilire cadastre that is pursuiting with the technical inventory of immobile of a locality. The technical inventory of the lands reffers to

their total surface, usable cathegory and destination, but the technical inventory of the constructions takes into consideration their measurement, the constructed surface at the ground, number of levels, technical elements of the construction, the endowment withe technical-edilitary installations and the year in which was executed the construction.

Another base element for data aquisition it costitutes the current immobiliary cadastre that has the same content as the based cadastre and it is executed continuously in the scope of recording all the changes appeared on buildings and lands, with or without constructions.

TOPO-GEODESIC METHODS OF AQUISITION AND PROCESSING THE DATA NECESSARY TO IMPLEMENT A GIS

The aquisition of data necessary to create a complete data base is made by topo-geodesic data. Automatisation of topographic and cadastre works lead at obtainning data under digital form.

The main technological phases reffers at the collecting, processing and writting topo-cadastral data. The automatic system permits the organisation of data in independent files with the describing of all the informations concerning the digital plan and with the data necessary to lay down the cadastral registers. All thsese files are bonded together having the scope to form, finally a database.

Collecting the topographical data necessary to create a data base for a GIS is a complex activity ehich can be achieved through the following methods:

- *By scanning and vectorisation manuallly*, semi-automatically and automatically, in the case of existance of some carthographic material that corresponds to the proposed purpose. To copy the analogical maps into computers there is used the scanner (a device capable to copy optically the images). Following the process of scanning it is obtained a screening image and it can be passed to the process of vectorisation. In the case of automatic vectorisation the software takes over the screening image and transforms the represented entities intp vectorial entities. This method is rarely used.

If we use the manual vectorisation, than the screening image is imported into the software, but this software will be used as a simple visual reference to draw vectorially the entities represented on this.

- *By digitisation of the existent plans*, if these correspond to the proposed purpose;
- *By processing the digital data* if these exist;
- *By topo-geodesical methods and especailly measurements* executed with *GPS*, with *total stations*, through *photogrametric* exploitation and the *exploitation of teledetection* records.

GPS (Global Positioning System) is a sofisticated technology based on system of satellites through which it can be determined the position of points on the surface of Earth. The principle is the following: the satellite emits a codification signal on an established location, but the receiver reveive the signal, decodificates it, processes the informations and it determines its position. Comparatively with the classical methods, the sytem assures a centimetric position, sometimes millimetrically in plan and a little bit weaker on levels.

With the help of total station there are assured the measurements and comand recording of topographical elements, most of them having incorporated their own programmes for solving some current problems directly on the site. The total station as representative instrument of modern topography is a tahimeter having electonic structures and commands. It is used mostly because of its efficaciousness, safty and precision superior to classical tahimeters.

Photogrametry can be considered a new technique in site measurements in the way that the position of some details can be obtained directly on special photographs, metrical, called photogrames, executed in certain conditions, from the plain (called aerial photogrames) or from the ground level (terestrial photogrames). Photogrammetric methods have the advantage of producing a unitary and actually representation of site data.

Teledetection uses satellite images obtained from the satelites specialised that photographs the earth shell, as well for technologies of catching, processing and analyzing aof these images.

The support network is accomplished with the help of GPS technology but thickenning network, surveying network and all the detailed points are measured with the total station. Altimeter network is measured with automatic levelling indicators.

Data collected from the site shall be transferred with the help of special programmes, in computers of PC type in order to be processed.

The base principle of automatic processing of data consits in their uniformity and continuity, starting with the site phase, meaning details surveying.

Compensation calculus of measurements is made using special programmes (TopoSys). To use site data, these have to be converted in recognised formats and accepted by these software. The programmes are conceived with a wide range of projections used all over the worls, such as to be permitted different calculus and tranformations of geographical, geocentrical and rectangular coordinates. That's why it is possible the execution of some particular projection systems. These assure the reduction of measured sizes and it accomplishes all the ussual calculus from topography and cadastre and assure the rigorously compensation of sizes through different procedures.

After this compensation phase of measurements it is obtained a file containning the final coordinates of detail points. This file can be processed automatically in order to obtain a plan with a programme that accomplishes the identification, sorting and creation of distinct objects considering the their site surveying order but also the codes used by the operator in the site phase.

All these data, no matter of collecting and processing method have to be brought in the data base with the same characteristics, meaning format and tematic attributes.

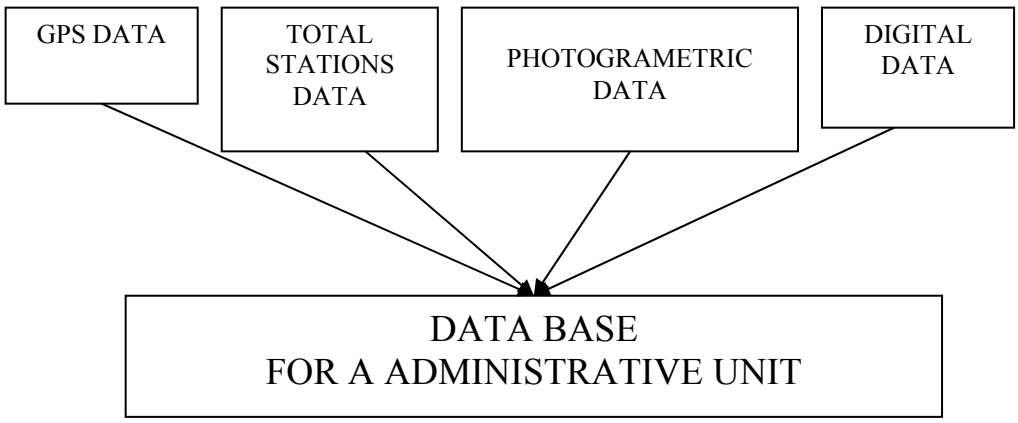

Figure1. Collection of necessary information in order to create a data base

The accomplishment ofa a data base is made in many phases and it contains informations depending on the proposed purpose.

Database for buildings furnishes informations concerning:

1. *destination of the buildings*, is recorded only if the initial destination differes from the actual one and if this is known;

2. *actual usage of the buildings*, is established estimatively, depending on the weight that it occupies in the developed surface of building unit;

3. *number of floors*, is established for the buildings with one or more levels and it is noted with written numbers, as exponent of mapping parameter;

4. *number of underground floors*, is recorded if they don't have other technical destination and if they are not habitable. They are identified by "S" symbol, noted as exponent of mapping parameter;

5. *strength of the structure*, is recorded by mapping parameters as follows:

A- for buildings with durable masonary, reinforced concrete or metallic structure and reinforced concrete plate;

B- for buildings with bearing walls without structural strenght and reinforced concrete or wood plates;

C- for buildings made of wood, having reinforced concrete or stone foundations;

D- for buildings made of straws, earth or loam bricks.

6. *foundation type*, is recorded in all the cases depending on the main material used at the constructuin, as it follows: B- concrete, P- pile, R- mat foundations, L- wood;

7. *walls type*, is recorded taking into account the construction material:

CP- reinforced concrete frames;
D – mixed diaphragm;
Z – masonary;
L – wood;
PM- big panels of reinforced concrete;
P- straws and loam bricks;
A – others.

8. *roof type*, or roof sheeting, which can be made from:

AZ – asbestos;
B – bituminous;
OL- shingles;
Ş- clapboard;
T- tile;
TB – sheet-metal;
A – others.

9. *heating type*, is recorded for each unit of the building, inaccordance with the used combustible or source: wood, gas, black oil, termofication, electrical energy;

10. *edilitary ebdowments of the building*, is recorded for each unit building and parcel, as follows: water, sewerage, electrical energy, natural gases, termofication and telephony;

11. *buiding state*, is appreciated in report to building ancientness, technical endowment, confort state, improvement state and interior and exterior renderings.

12. *constuction year*, is establised by the property paper, construction year, imposed certificate from the Financial Administration, written witness of the owner or verbal witnesses of the neighbours;

13. *type of property*, is established in report with the titular of property right , on the base of papers he owns it, for each unit of the building partially;

14. *administration type*;

15. *capacity type*, is reffering to the number of habitant rooms;

16. *number of families and persons* that live in each unit building.

The database for lands reffers to:

1. district number (of cadastral sector);
2. parcel number;
3. sub-parcels number;
4. owner or possesor;
5. right of owning or possession;
6. habitation category;
7. edilitary endowment of the parcel;
8. total surface of the parcel.
9. Any database has to fulfill the following functions:
10. function of defineing the data;
11. funtion of usage the data;
12. function of administration the programmes;
13. function of manageing;
14. funcția of usage the database.

The object of informatic system is to provide information concerning the inventary of land situation in the scope of organisation of specific activities.

Conception of a databes of civil engineering works comprises an assembly that automatisate the collecting, processing, administration, displaying and reactualisationof informations.

The quality of informations from a informatic system depends on a series of factors concerning system characteristics, level of education of usable personnel, quality and way of collecting the data, processing, analysing and actualisation of informations.

CONCLUSIONS

Having available a computerised processing system, the concept of collection and processing geodesic-topographic data can be modified correspondingly to the facilities offered by it, passing at the usage of methods and collecting procedures and modern processing of the data

In prospect to accomplish the database, no matter of ways and manners of performing the site measurements, it matters in the end the obtainning of coordinates for the points that defines vectorial graphs and the eventual additional information.

Technologisation grade and the development of logistic and informatic support lead to the creation of some real and precise databases that in the end will generate a qualitatively informatic system.

In the actual cvontext, concerning the adhesion of Romania to European Union structures becomes more obviously the necessity of creating and servicing of such informatic system that can be managed by the local public administration of a greater number of data in a real time and with more reduced costs.

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