TECHNIQUES FOR THE COMPUTERIZED STORAGE OF CADASTRAL DATA IN DATABASES

Ioan IENCIU, Prof. dr. eng., „1 Decembrie 1918" University of Alba Iulia, Romania,iienciu@yahoo.com
Adrian CUZIC, MSc stud. eng., „1 Decembrie 1918" University of Alba Iulia, Romania, cuzicadrian@gmail.com
Andra – Maria OPRIȘ, MSc stud. eng., „1 Decembrie 1918" University of Alba Iulia, Romania, andraopris@icloud.com

***Abstract**:*
In the century of light and because of the increased speed of collecting, interpreting and storing large volumes of information, we have had to look for adequate storage solutions, both informational and practical. Thus, modern data storage techniques, of small size for increased portability or large size for permanent data storage, have emerged. In this paper, there will be presented storage techniques commonly used by daily users and storage techniques used by specialists in various fields, especially cadastre. Also, will be presented security and data protection strategies, as well as data storage methods.

***Keywords:** evolution, technology, database, information, cadastre*

1. Introduction

The century we live in is an explosion of information that guides the employee in making their service as fast and efficient as possible. Thus, the technological evolution has contributed greatly to the development of the cadastre and topography branches. [1]

Since the manual data recording has been explored, the usefulness of computer science has succeeded in the implementation and computerized use of data in databases. [2], [3]

Database or "data bank" in informatics terms, is a method of storing data on an external medium, having the ability to retrieve data or information.

2. Materials and Methods

For the field of study involved in the subject, cadastre and topography, the creation of a database implies the observation of some simple steps to achieve: [4], [5]

- Collecting, sorting and analyzing cadastral data involves, first of all, collecting the necessary information on the field, arranging the data that will be necessary for the operation process and analyzing them;
- Data storage and protection, entails saving the information for processing and protecting it by antivirus or sharing it with other data and information visible to all users;
- Effective use of data includes the use of information for the purpose for which it was created.

Returning to the first step involved in data computerization in databases, from a technical point of view, data collection can be performed on two branches: [6], [7]

- A sporadic cadastre, made at the request of each owner, on each building;

- Systematic cadastre, which is the measurement of all buildings, the identification of their owners and holders of real rights for an entire cadastral sector or a territorial administrative unit.

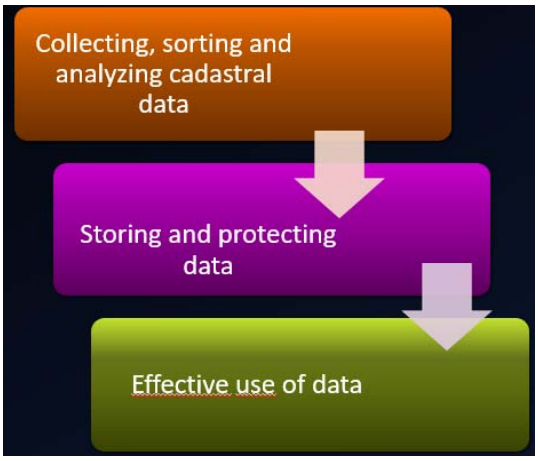

Fig.1 Creating a database

As far as the sorting of data is concerned, this operation involves the processing of either information individually or in mass, depending on the type of cadastre requested. The same methodology is to be applied to the third stage, namely data analysis [8], [9].

The second step, data storage facilitates three user options [10], [11]:

- Mobile storage media such as: USB - Universal Serial Bus for daily users and for users in the field of cadastre and topography can be taken as an example of the field book;
- Transition storage media, such as: PC - Personal Computer or laptop;
- Permanent storage media that is represented by servers.

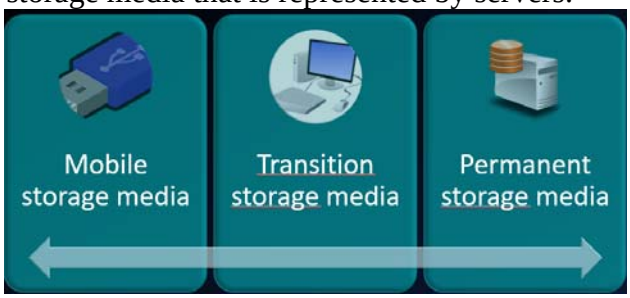

Fig.2 Data storage media

However, as any technological stream has its own age, storage techniques have also evolved from optical environments to hybrid media, as shown in Figure 3.

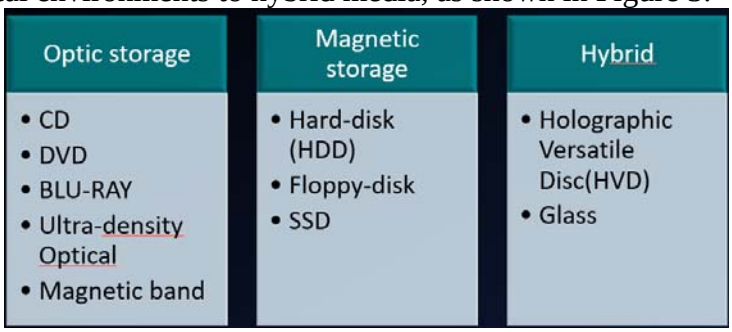

Fig.3 Storage technologies

3. Results and Discussion

After data collection, storage and processing, an important factor is saving information or data for a long time.

Thus, different systems can be chosen according to the needs of the beneficiary [12]:

- Refresh involving the process of copying data from a storage medium to another identical storage environment;
- Migration that is the transfer of data from a storage medium to a similar or different storage environment with more advanced technical capabilities, and when the migration process is performed, it is recommended to convert the files into new formats or extensions;
- Replication involving the creation of real-time or scheduled copies of the frequently used database;
- Emulation that involves creating a true copy of the database both physically and virtually;
- Metadata that refers to the technique of storing data with other data; by encrypting data using standards such as: American Standard Code for Information Interchange, Unicode and QR Code.

A viable strategy for storing information and data safely consists of using three concurrent minimum databases as it is shown in Figure 4.

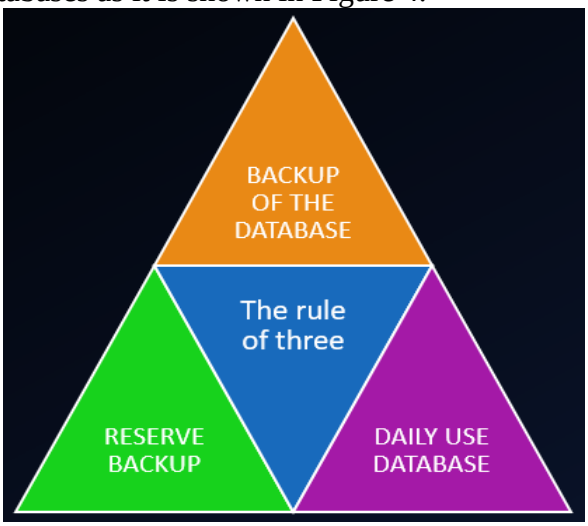

Fig. 4. Rule of three

As far as the transfer of information is concerned, it will be done linearly and step by step between the daily databases used, backup and reserved backup. It is preferably that each database is located in different locations, powered by different sources, and access to them will be as small as possible.

Like any valuable information, it is recommended to protect the databases by various methods and constraints on [13]:

- The human factor, by restricting the access to the database by methods of authentication and hierarchy;
- Technological factor, through data encryption and monitoring, and installation of security applications and the use of firewalls, all of which are periodically checked by security audits and data logging.

For enhanced data and data conservation, the database mirroring procedure can be used using two similar databases in parallel.

4. Conclusions

As a challenge, it is proposed to debate the theme "What would happen if the cadastral database of a country were destroyed?", in this case we were talking about the E-Terra database of the Romanian Cadastre and National Agency of Cadastre and Real Estate Publicity.

From our point of view, it is possible to use the technology of textual recognition of the printed books, resulting in the lost digitization.

This process can be simplified by converting existing digital ASCII or Unicode or QR Code files into printed format, and then using text recognition technology, such as the Google Lens feature in Google Photos, which is capable of faithful recognition of text on paper. Under these circumstances, the big challenges would be:

- the interpretation of the geometry of the building inscribed in the Land Book, because in the case of buildings with many contour points it would take a lot of pages of Metadata (ASCII, Unicode, QR Code);
- Implementing a script that has the ability to reproduce the building geometry.

5. References

1. *L. Oprea I. Ienciu, Automatizarea lucrărilor topo-geodezice, Didactica Series, „1 Decembrie 1918" University of Alba Iulia, 2014;*
2. *I. Ienciu, L. Oprea, Prelucrarea automată a datelor analitice şi grafice din topografie şi cadastru, Alba Iulia, 2009;*
3. *https://www.zetta.net/about/blog/history-data-storage-technology;*
4. *Oprea, L.; Ienciu, I.; Vorovencii, I.; Popescu, C.; Voicu, G. E., An Optimized Cadastral Registration System for Real Estate Property in Romania, 13th SGEM GeoConference on Informatics, Geoinformatics and Remote Sensing, SGEM2013 Conference Proceedings, Vol. 2, 2013, p. 33 – 40;*
5. *I. Ienciu, L. Oprea, C. Popescu, I. Vorovencii, G. E. Voicu, Survey Mapping of Romanian Forestland and its Update Through Low-Cost Applications, 13th SGEM GeoConference on Informatics, Geoinformatics And Remote Sensing, www.sgem.org, SGEM2013 Conference Proceedings, 2013, Vol. 2, p. 443 – 450;*
6. *Oprea, L., The Registration of Real Estate Through Systematic Cadastre, 17th International Multidisciplinary Scientific GeoConference SGEM 2017, SGEM2017 Conference Proceedings, Vol. 17, Issue 22, 2017, p. 681-688;*
7. *L. Oprea, I. Ienciu, G. Voicu, M. Tudoraşcu, Introducerea cadastrului general într-un teritoriu administrativ, Pangeea , No. 13, 2013, p. 48-52;*
8. *https://en.wikipedia.org/wiki/Computer_data_storage;*
9. *https://searchstorage.techtarget.com/opinion/Future-of-data-storage-technology-Transformational-trends-for-2018;*
10. *https://www.zdnet.com/article/the-best-emerging-storage-tech-of-2017/;*
11. *https://futurism.com/4-the-future-of-data-storage-is-in-the-dna-new-study-confirms/;*
12. *https://www.backblaze.com/blog/data-storage-technologies-of-the-future/;*
13. *L. Oprea, I. Ienciu, L. Dimen, D. Popa, G. E. Voicu - Optimizing the Legal Cadastral Registration of Land Books and Creating the Specific Database, Journal of Geodesy and Cadastre RevCAD nr. 11, 2011, p. 187 – 192.*