

Implementation of a Tool for Municipal Technical Cadastre

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Abstract— Currently updating the Municipal Technical Cadastre is one of the main discussions of Brazilian municipalities, due to base outdated and unreliable data mappings, municipalities seek for significant improvements with regard to registration, for better urban and social planning. This paper aims to present a tool for storage, update, query and visualization of registration information, a computerized database that provides efficiency for the Municipality of Itaqui-RS assisting in its municipal development.

Index Terms— Municipal Technical Cadastre, Registration Information Bulletin, Computerization.

I. INTRODUCTION

Currently local governments have sought to obtain a large number of information regarding its territorial jurisdiction, not just for taxation, but also to physical planning, land use planning, implementation services, among others. With the intention to assist the organization of this data in the early 70s comes the concept of Municipal Technical Cadastre (MTC), which is defined as a group of files containing records of urban real estate database, whose most immediate goals relate to physical planning and control of land use, the municipal revenues and the implementation of urban services.[1]

In recent decades, the CTM has been widely used with regard to the planning and organization of cities due to its ability to provide descriptive and geospatial information related to registered properties in the city hall systems.

However, most of the CTMs is not in accordance with the design standards. This fact led in 1994 to the study of a new cadastral system called *Cadastre 2014*, developed by the Commission 7 of the International Federation of Surveyors – IFS, with the purpose to enable a broader register and you can turn into a public inventory taking best answers in the registration area, allowing show the full legal status of the territory. Thus, completing the separation between cartographic and alphanumeric records, replacing the traditional modeling and mapping by mapping the entire digital information system. In addition, most Brazilian cities is significantly lag regarding the update registers and reliable maps. In general, when these records exist, they are outdated or have been drafted by poor cartographic technique and outdated with disorganized registration databases being usually filed by paper, which is great difficulties for fiscal

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policy and for proper urban planning [2]. Case similar to Itaqui, town in the region of the western border of Rio Grande do Sul. According to the Instituto Brasileiro de Geografia e Estatística (IBGE), the city has a population of 38,159 inhabitants in an area of 3,404.037 square kilometers and its main economic activities are agriculture with a predominance of rice and beef cattle.

The city features require updating and implementation of an efficient Municipal Multipurpose Technical Cadastre (MMTC). Because, according to the prefecture, the last registration was carried out in 1976, and last updated in 1993. However, over the years the information became outdated, causing difficulties for the municipal administration, with regard to municipal collection as well as in urban planning necessary for the welfare of citizens.

One of the biggest problems faced by Brazilian municipalities is the lack of technical expertise and infrastructure to carry out surveying, surveying and processing and integration of these data in an efficient database.

Considering the municipal cadastral reality and the opportunity to realize the integration between university and municipality, consolidated in a partnership between the (Federal University of Pampa – College Campus Itaqui-RS) and the Municipality for the implementation of updated cadastral the municipality base through extension project entitled “Support urban relisting and processing of geo-referenced information in the municipality of Itaqui-RS – GEOItaqui”). This project is one of the objectives to develop, next to City Hall, a registration system that meets current requirements and the master plan, based on concepts and existing resources.

The activities involve diagnostics, field work and office that can meet the technical and academic goals, enabling the target audience mastery of the methodologies used and the municipality the opportunity to promote future registration updates practically and efficiently.

According Fonseca [4] the main objective of the Municipal Technical Cadastre it is to give the City Hall a tool to guide, sustain and give support to decision-making, still being a fundamental and basic element for the municipal collection.

Gonçalves [5] also reports on the conditions in which they are the cadastral systems of Brazilian municipalities, especially when it comes to small and medium-sized cities, which are usually found outdated databases, disorganized and outdated, and the lack of qualified personnel.

In order to solve these problems, it is necessary to implement a computerized system cadastral plan. Using a database that supports all information and ensure the possibility of changing data [5].

To update a record, it is very important that the database structure is planned in a coherent and organized way, so there is no redundancy and data inconsistency. To an effective registration is necessary that all information meet the reality of the city, in order to provide convenience and flexibility for those who use this computerized system and also present, clearly, all the information necessary for the taxpayer citizen. For this, the form called Registration Information Bulletin (BIC), which is the official document where the data on the urban real estate are recorded, was studied carefully by officials responsible for sector municipal register and participants of the project GEOItaqui.

Thus, the present study aims to present a tool to register / search data obtained by BIC including geodetic and topographic information.

II. MUNICIPAL CADASTRE

The municipal cadastre currently used by the city hall is significantly exceeded. Since the search for the location of buildings and their general information is done by paper forms, ie, municipal registration data are stored in books containing hand drawn maps which hinders the consultation and agility in serving the public, taking up too much time for a simple search location of the property . In order to solve this problem, it proposes the computerized database, based on the BIC and georeferenced spatial data.

The tasks of the public administration are generally referenced by a geopolitical structure allocated by geocoded elements like: lots, playgrounds, squares, neighborhoods, among others. Thus the CTMM, becomes a major influence tool on urban policy, enabling preparation of plans and urban development projects fulfilling the obligations of the city status. [8]

For structuring the database is essential the knowledge BIC, which is divided into categories. The first is the identification of registration, block, lot, sub-lot section and area, among these the registration number is essential because it is through it that are related to the cadastral unit information with its spatial location in the database. The second consists of the owner's information, these essential tax procedures. The third category is that of terrain features such as: Lot occupation, assets, allocation, topography, soil conditions, among others. Finally, the fourth discriminate all physical elements present in the building and its dependencies, as well as their electrical and plumbing, walls, roof, window frames, etc.

With structured BIC began the database development process, which was developed in MySQL¹, to be free and to allow the registration of spatial data, and is compatible with most existing Web servers currently.

The main tables of the database are the owners of the lots and the buildings, which have the basic characteristics of each BIC. Apart from these, tables were created assist regarding the characteristics of the subjects in the BIC, for example, pedology, allocation, coatings (internal and external), among others, as entity-relationship diagram shown in Figure 1.

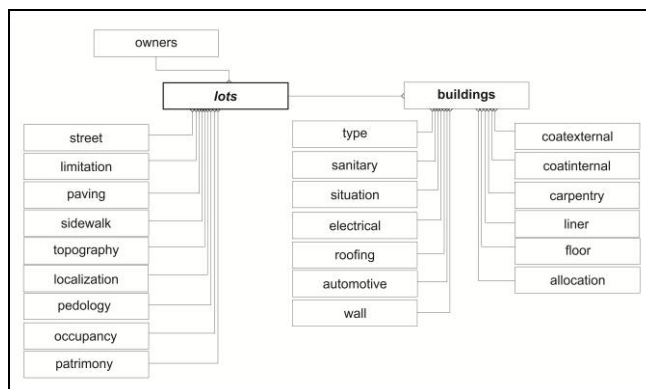


Figure 1: Entity-Relationship Diagram

After prepared the database, it started building a tool to register/data query. Which is being developed in PHP for Web access. Since, in addition to updating information, we intend to computerize the search engine information of urban real estate.

Then there will be a brief detailing tool in relation to the resources already developed.

A. Web Tool for Access to Join Municipal Technical Cadastre

The development tool for consulting the database of the Municipal Technical Cadastre, is being held in PHP using MySQL database, as mentioned above.

This tool is aimed at practical and efficient search of registration information submitted in order to allow support the activities carried out by registration sector city hall Itaqui-RS.

To start, the system has authentication interface, requiring a username and password for access to the tool's features. At this stage, they are still being implemented resources to provide greater security for data, such as restricting access by browser session, only a registered user and effectively authenticated may have access to records and reports. Also, are being provided by access levels, for example, a user with access to "view only" cannot perform the registration. As well as a user with administrator permissions, have full access to the data.

Right after *login*², the options menu appears. Currently contains the following: General Search; Search by CPF; Search by Registration; Register of Owners; Register in lots and Building Registration.

The following will present some images and respectively, description of each of the options available on the menu, starting with the entries.

There are three essential records related to a building, the owner's registration, the registration of the lot and the registration of the building. The owner registration was structured with basic information needed for user identification and possibility of contact with it, such as CPF (required element), home address and telephone contact.

This register was also organized to enable future implementation of access construction/parcel of the owner over the Internet.

The information in the owner's registration are also necessary to tax, since each building or plot is tied to a particular owner.

¹ MySQL is a relational database management system powerful and very fast. A database to store, search, sort and retrieve data efficiently. [9]

² User authentication.

The master batch, whose interface is shown in Figure 2, has general information related to lot, such the occupancy, property, limitation, paving, pavement structure, topography, localization and pedology.

Boletim de Informações Cadastrais: Cadastro de Lotes

Quadra: 89
 Num. Lote:
 Sub-Lote: 1
 Rua: DOM PEDRO II
 Numero:
 Loteamento:
 Ano:
 Ocupacao: Edificado/Andamento
 Patrimonio: Particular
 Limitacao: Inexistente
 Pavimentacao: Asfalto/Concreto
 Passeio: Arborizado
 Topografia: Plano
 Localizacao: Esquina
 Pedologia: Firme

Figure 2: Registration Lots

The fields are in *ComboBox*³ format, where the user can select one of the options in order to facilitate the registration process. The items that are dynamic and may be modified and/or new registrations, according to the needs of the City Hall.

Finished the owner of entries and lot, the last step is the registration of buildings present in the lot, the buildings registration interface is shown in Figure 3.

Boletim de Informações Cadastrais: Cadastro de Construções

Metricula:
 Dependencia: Não
 Lote-Sub: 117-1
 Lote:
 Tipo: Casa
 Sanitaria: Alto Padrao
 Situacao: Frente
 Eletrica: Embulida
 Cobertura: Laje
 Automotivo: Estacionamento
 Parede: Alvenaria
 Rev.Externo: Material a vista/Especial
 Rev.Interno: Material a vista/Especial
 Esquadria: Madeira Especial
 Forro: Laje Concreto
 Piso: Porcelanato
 Destinacao: Comercial

Figure 3: Registration of bBuildings

The buildings registration has specific data to be released for each building in this lot. The construction can be registered as the main or dependence. Each construction has characteristics to be described, such as condition, kind, electrical, format of the coverage, parking structure, coatings, among others. As well as in the register of plots, fields are in *ComboBox* format, allowing quick selection of the item.

In addition to the registration options, the system has already produced some queries, which will be presented below.

The first consultation, known as general search, allows the search of all the buildings registered in the system, generating a general report constructions. Data are presented for registration alphabetically owners.

Regarding the specific queries, the first to be explained is the search by registration, this option is required for the registration of a batch / construction that the system performs the search and returns related information. Figure 4 shows the result for a registration request.

Boletim de Informações Cadastrais: Consulta Matricula

Metricula: 11182
 Principal: 0
 Proprietario:
 Lote: 295
 Tipo: Casa
 Sanitaria: Simples
 Situacao: Frente
 Eletrica: Embutida
 Cobertura: Cimento Amianto 6 mm
 Automotivo: Sem
 Paredes: Alvenaria
 Externo: Plastica/PVA
 Interno: Plastica/PVA
 Esquadria: Madeira Comum
 Forro: Laje Concreto
 Piso: Cerâmica
 Destinacao: Residencial
 Limitacao: Muro
 Pavimentacao: Asfalto/Concreto
 Passeio: Arborizado
 Topografia: Plano
 Localizacao: Meio
 Pedologia: Firme
 Ocupacao: Edificado
 Patrimonio: Particular
 Rua: HUMBERTO CASTELO BRANCO

Figure 4: Result Search by Registration

In addition to the general information related to registration, the system allows you to search the table showing the land in question, just for that, click the Map button. With the help of Google Maps API, a point on the spatial location of the lot on the court appears. The option for the Google API was due to the possibility of free use the vast documentation provided by Google Inc. itself and allow the construction of polygonal regions in the map of the surface. An example of generated map is shown in Figure 5.



Figure 5: Batch Location using Google Maps API

In addition to the registration by appointment, you can also perform the query by owner from the CPF. This consultation, if the owner has more than one batch/registration registered in his name, will all be displayed. This query mode is similar to already submitted for registration, the difference is only in the requested information. When you enter a specific CPF, the system will display all enrollment registered of that owner. If detailed information about one of the registrations are necessary simply press the Check button. As can be seen in Figure 6.

Boletim de Informações Cadastrais: Consulta CPF

Metricula: 11182
 Rua:
 Num. Lote: 295
 Rua: HUMBERTO CASTELO BRANCO

Figure 6: Query by Owner - Result

By clicking on the check button displays the screen with the matricula registration data, as shown in Figure 4, presented above and in the same way you can click the Map button to plot location of the conference, using the *API Google Maps*.

³ *ComboBox* is a check box in which only one, among the available, can be selected.

These are some of the features already implemented in the tool, which are providing the basis for verification of the implementation needs of other entries/queries.

III. CONCLUSIONS

The constant technological advancement has allowed increasingly be possible to treat the information with the aid of computers. When you use these technological tools, it becomes possible to perform dynamic queries for existing data in records systems.

Consultations provide a significant amount of information which, if carried out on paper, would take much time or would be very difficult to perform.

Therefore, this study aimed to present the development of a tool for access to the Municipal Technical Cadastre, enabling a fast and agile consultation of the information contained in the Municipal Technical Cadastre order to assist in the development of the municipality of Itaqui-RS.

It is currently being carried out the registration of the information on the forms (paper) and their records are updated with the help of data collected "in the field".

It is worth noting that the project is still running and the tool change. For instance, are still being implemented by block and street by querying capabilities, they are also being studied polygonal building means (using the Google Maps API) for geospatial design Lot / building on the map.

Finally, this project has helped not only the City but also scholars of different courses on campus because it allows these have contact with the future job market. Offering the opportunity to combine theory and practice.

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