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ARCHITECTURAL HERITAGE ON GIS SUPPORT. KNOWLEDGE AND DISSEMINATION

ARHITEKTURNA DEDIŠČINA IN GIS SISTEMI: PRIMER CÁCERES

izvleček

Pri raziskovanju tega področja obstaja mnogo virov tako grafičnih kot pisnih, mnogi so dostopni prek svetovnega spleta. Odprt dostop do teh spletnih prostorskih baz omogoča javnosti in strokovnjakom, da dostopajo do teh vsebin. Težava nastane pri ažunosti teh vsebin, saj so pogoste napake in odstopanja. Sorodno problematiko srečujemo tudi pri dokumentacij arhitekturne dediščine. Z uporabo fotografske dokumentacije in grafičnih podlag lahko z uporabo primernih programskih orodij upodobimo prostorske modele.

Z uporabo IT tehnologije so ti podatki dosegljivi dobesedno na dlani (mobilniki, tablice), sočasno pa se lahko baze podatkov dopolnjujejo s podatki iz teh naprav. Diseminacija podatkov potek prek različnih orodij (odjemniki e pošte, oblačna tehnologija, strežniške knjižnice, spletni dnevniki). Avtorji opozarjamo na slabosti izbora teh podatkov, kvalitete podatkov in klasifikacije. Tu gre za sistemski pristop, ki ga avtorji predstavljamo v članku. Zajem podatkov smo izvedli z metodami fotografiranja, inventarizacije in datacije v času. Podatke smo rangirali tudi z vnosom geografske lokacije. Strnjena baza podatkov je dostopna kot GIS baza, kar omogoča njeno uporabo v praksi in pri drugih raziskavah.

Avtorji smo na opisani način izvedli delo na primeru Cáceres, ki je del UNESCO baze (1986). Pri tem smo avtorji naleteli na mnoge ovire, ki smo jih uspešno presegli. Včasih smo morali uporabiti preproste tehnike snemanja podatkov.

abstract

There are so many literary and graphic resources available on the network that is impossible to get in touch with all of them. The free access to the computer sources, disseminated in different places and supports, facilitates an increasingly amount of information. This huge quantity of stuff does not correspond to its accuracy or precision. In reference to the graphic documentation of the architectonic heritage, something similar occurs. Nowadays we can have photographs or plans of any corner in the world, so we could rebuild in 3D the most visited highlights in our planet. This fact has been facilitated by the IT (Information Technologies), not only in the data collection by means of cameras or other devices as phones or tablets, but in its dissemination on the internet by means of webs and blogs. Two different lacks can also be found. On one hand, the source treatment from the data collection to the exhibition and on the other hand, its hierarchy or classification, so quality information can be reached. Both aims are proposed in this work. On one side, a systematic treatment of the documentation, being transferred to a unified database. On the other side, the exhibition, by means of a data basis in GIS support. As a sample the experience started in Caceres, declared World Heritage Site by UNESCO in 1986, is shown. Achieving this objective was a fact, thanks to adding efforts, having arguments and agreements, which was clearly difficult to get.

One place, thousands of images

A high amount of documentation like photos and drawings can be discovered when visiting Cáceres or any other place in the world. The will of being immortalized in a photo beside an inherited place produces an avalanche of documentation with similar contents, although with particular points of view. The repetition of the same image aimed to different receivers gathers a huge volume of reports of difficult deal. This high amount of documentation is due to the fact of the desire of having an important place photographed with one of us in front.

The situation showed in San Jorge Square in Caceres (figure 1), a downtown place of a city of nearly one hundred thousand inhabitants, is repeated in the most visited places in the world or in those that appear in the tourist guides, as Plecnik's Church of Saint Michael on the outskirts of Ljubljana, in the South of the city, e.g. Meeting people who are peacefully watching the church in order to have their own views while their car has just stopped for scarcely five minutes, is quite common. The fact was the same as that besides Tower of Pisa, the Colosseo in Rome or the Zero Zone in New York. These are some of much visited examples. The inflow of visitors to those places can be considered enormous, which does not occur with Saint Michael Church in Ljubljana or San Jorge Square in Caceres, though the phenomenon is quite similar.

Technical documentation

In reference to the most important aim of this work, we are referring not only to the photographs, nowadays reachable by any tourist, but to a certain more technical and heritage documentation coming from either professional or academic researches. Forgetting neither the most recent and advanced data collection techniques, the images from digital photography nor the point clouds got by laser scanner is not advisable. These techniques can produce very real models. In fact all that material, as it contains a lot

Slika 1: Sekvence gibaja ljudi na trgu San Jorge (Cáceres).
*Figure 1: Different moments at San Jorge Square (Cáceres).*

of data, must be manipulated and simplified before being offered to the general public, as the applications Google Maps for mobile in 3D, where over 100 cities around the world and their buildings can be seen in 3D.

Among these available graphic and specialized papers, the building plans, floor plans, elevations and sections can be studied or as in the past it was used to know as iconography, scenography and orthography [Gentil, 1998]. Getting plans to project buildings continues being necessary. The minimum contents are defined in Spain in the Technical Building Code since 2006 [http://www.codigotecnico.org/web/], summarizing some previous and always developing regulations.

When the level of information is defined, we choose the ground floor or street level floor to be elaborated and disseminated. Among the reasons for this election is the special synthesis that is got with the ground floor as Anton Ulrich has written:"Ground-plan is an explicit presentation of the solution for a building which shows its actual contents (…) It still enables us to vividly visualize an edifice in terms of logical interrelation of space within an organic wholeness that will serve for some specific purpose an fulfill the requirements of that edifice." [Ulrich. 2003:6]

Regarding the plan documentation, more concise due to the need of a process of selection and development of metrical elements, a lot of reports are produced. On one hand, the property of the building can conserve original plans, even from different periods. On the other hand, technicians participant in following remodeling, prepare appropriate documentation for licenses in order tto the restoration of the whole building. And licenses for partial restorations, e.g., due to the change of management in the business placed on the ground floor. In the case of asking for a capital grant, a plan adapted to the official announcement will be made. And if it is a classified building, the local government, or the administrative organization which may concern, will keep a cataloging card in the especial plan of protection. This could be added by the documentation from the cultural organization we are dealing with, in its different levels [Special Plan Caceres: Rodríguez, S. (1985).]. To finish with, the construction plans made as teaching works in the colleges should be added, registered as End of Degree Projects, End of Master Projects or even Doctoral Theses. This is to show that different plans are generated for the same building, often at the same time.

But technical projects are also kept in the town halls, buildings of the province or regional government or even in the buildings of the government of the country. And this scattering could be a problem. Or should be an opportunity. Getting from this point, a lot of disseminated information can be found. Discussing with the colleague Professor Borut Jubanec, from the Faculty of Architecture of Ljubljana, in summer 2013, it seemed impossible to carry out the collection, unification of the exposition criteria and the data sample. But in Caceres that is a fact, just now. The Civil Council in Caceres, knowing our research work, looked for other projects in several archives like their own one, from different public institutions and from some professionals. When the Municipality of Caceres started working in the project, the progress was quicker especially thanks to some researchers' works, like José Luis Sánchez de la Calle's one, that at that moment was the coordinator of the Integral Rehabilitation Area (ARI) of Caceres, Luis Antonio Álvarez and Faustino Cordero, in charge of the SIG office in Cáceres [SIG of Municipality of Cáceres, 2014]. The former one has made a big effort in contacting people with institutions, getting a huge compilation of material. The others have helped in the process of the research and in the transfer to the GIS basis of the municipality.
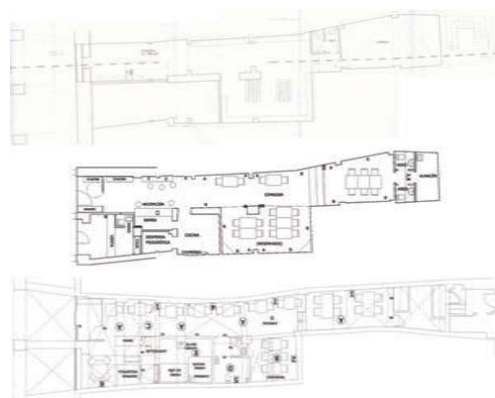
Slika 2: Tlorisi variantnih rešitev na glavnem trgu. (Cáceres)
Figure 2: Plans on business premises in the Main Square (Cáceres).

Researching papers

In the same way, we could refer to bibliographical information for its distribution: academic and school studies, specialized monographs on research by researchers, reports presented in official requests or licenses required for building or remodelations, locally, at a provincial or autonomous level. In the case of Spain, we must deal with varied intermediate stages between council and country. As well as at a national, European and supranational level or at the stage of other institutions like UNESCO or ICOMOS. A suitable source in Caceres on building historic studies could be mentioned, a monograph on religious architecture [Garcia, 2005], which is prepared to be incorporated into the database. At the same time in Ljubljana, Joze Plecknik's monographs, as a sample. We usually read very interesting papers on Arts and History about buildings and constructions, written by experienced researchers, without the help of precise drawings of a figure or a plan drawing. And we think that an image shows more than a thousand of words. Historians could use technical supports if they had them [Lozano, 2011].

A previous and similar experience on mainly archaeological remains in Rome could help [Carafa, 2010]. The multidisciplinary approach of this task, object of study, could allow us to work on a wider project. By now, geographers, historians, computer experts, librarians or architects, who provide the technical support of the material, are working at the same time. Without the help of these, the dissemination would certainly be much more limited.

Technical process

The process kept to achieve our purpose began five years ago, about in 2008 in Caceres. Then, we discovered at the archives of the Central Library of the University of Extremadura in Caceres a large amount of graphic works, part of them without a suitable organization due to the fact of having been moved from one building archive to another. Graphic designs from survey works, part of End Degrees Projects from the field of Technical Architecture as this degree is known in Spain and sounds in other European countries as Building Engineering, were deposited in a Letters Library. It was a transfer from a Technical College without research experience to a professional library with many researchers working in it and with a good team of librarians and file clerks in charge. But with the risk of losing these works as they were printed only in paper and with no digital register.

The first phase consisted of the selection of the material available. A good database created in 2000 was there, with the works produced from 1985 until then [Prieto, 2000]. But it became old-fashioned through the last eight years and we were not able to transfer it to an actual database, despite of the efforts of computer experts and documentalists. The advantage of belonging to a small university located in a surrounding campus is the fact of holding interdisciplinary consultations very easily. As not much time has passed from 2000 to now and thanks to the faculty files, we could find the author of the work in case she or he could remember the access key. Sometimes, despite finding the author, it was impossible to recover the key. Although we really could print the collected cards in PDF format.

From those cards, the works containing the former materials of the buildings were selected manually, with the aim of placing them on an actual and accessible database. This table contains the signature to be located in the library, the date of execution of the graphic work, the academic rate got, the name of the work, its physical location on a map, the support (paper, photograph or slide) available, the author, the tutor and the scale of the lines. Some other paragraphs to be completed in the future were left in order to facilitate its location, as the postal code or the coordinates.

Once the works are located, they have to be processed to unify their formats in order to be shown with certain uniformity. We needed to scan or photograph these drawings to rectify with a basic program as Perspective Rectifier, Photoshop or On-Site Photo, and redraw with CAD help obtaining DXF or DWG format support to insert in a certain scale on a GIS web page. We chose the detail of 1:1000 or 1:500 scales where you can discover building spaces and levels, but no specific details.

After tracing DWG formats, some difficulties were patent due to the lack of technical means within our reach. Nowadays, a plan reader by means of a scanner technology size A1 or bigger can be reachable [Ademsis, 2014], but couldn´t in that moment. Then what we used was an image- setter, made with a group of colleagues from other department [Herrera, 2012] that has been improved through the years. The image setter consists of a group of auxiliary elements for plans photographing. The aim is searching the accuracy and efficiency. The components are: four tables –three supporting and one on –forming a lectern, two spotlights, a tripod and a photo camera. On the table, the paper to be photographed is set; the wrinkles are decreased thanks to a glass or methacrylate table. The whole is prepared in a wooden suitcase in order to make the storage and transportation easier. The case is also used as a basis support for the image setter. (Figure 3)

At the beginning we got the lay-flat of documents that had remained without being unfolded for ages by means of a transparent glass, with the risk of breaking, or a methacrylate. In both cases, the image definition was lost due to the light diffraction, taking into account that we were working in a cellar in quite uncomfortable conditions. The intensity of light that the plan gets can be measured with this system, in order to get the best image resolution (Figure 3b).

Slika 3: Detail izvedbe zajema podatkov z uporabo fotografskega aparata, umetno osvetlitvijo in s stojalom. Zaradi izravnave paprja smo v postopek uvedli sesalec za prah, ki izsesa zrak v ozadju in izravna papir (zadnja slika v nizu). *Figure 3: Image setter, detail of the camera and lens, the spotlights and the measure of the intensity of the light that the plan receives in the image setter. Board of the image setter. Incorporation of the vacuum cleaner in a corner. Detail of the image setter. The vacuum cleaner has been added, turned on and sturned off.*

Later from 2013 on ,we were improving the technique thanks to a craftsman, José Manuel Rubio Ordiales, who invented a vacuum suction system based on a domestic vacuum cleaner and a box of dimensions about 1m x 0.70 m x 0.04 m. with micro perforations on the highest dimension ,which maintains the document plain and decreases the image deformations. We are dealing with a double sheet table, drilled in one of the faces with a vacuum cleaner connected in a corner. The fact of having folds or deformations is avoided with this system. Using a glass board is not needed (figure 3c) as it can be watched in a photo sequence before (figure 3d) and after (figure 3e) connecting the vacuum cleaner. This manual phase of the research continues being very useful for CAD documents, which allow a direct treatment of graphic traces.

In this context, around the change of the century, from 2000 onwards, drawings are registered on digital support, under a DWG format, that we can import to a digital database. Despite of the progress in the treatment of drawings, some lacks have been discovered [Mato, 2014]. As an example, we can say that, in the past, when giving a work in paper, a quick look could be had only going through the pages which did not require specialized staff. Nowadays, as the papers are given in a digital support, usually a CD or DVD [Regulations, 2012], the content is unknown at a first glance. In this sense, a task of removing the content of those CDs and DVDs is being developed separating the valid material from the illegible one. With the pass of a maximum of 13 years, it is still possible to locate the authors in order to recover the contents if they have been kept in a safer computing support or in paper, which can mean an easy and safe although laborious reproduction.

Results

The results can be seen from anywhere in the world. To develop this work, we have simplified much the information offered on the web in order to make the consultation easier. We have compiled many different sources and showed them on the SIG civil council web page [http://sig.caceres.es/sig-de-caceres/]. You need to surf with Internet Explorer for system requirements. You can click on "CARTOGRAFIA", after in "Visor de Cartoteca" (on the left), and finally on "VISOR", in the middle, Figure 4. Then click the layers you want to be active. I suggest one of "Cartografía del núcleo urbano", e.g., "Caceres 2003" and, of course, "Patrimonio Arquitectonico UEX" (Figure 5). Web presentation is changing in summer 2014, but the steps are the same.

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The minimum information suggested will start with the physical location on a digital cartography of reference (figure 6), usually organized in a GIS, where we can press "HERE" with a CLICK on the screen (see figure 7) and you can read the origin of the survey work (in this case, supplied by an architect, Viola, and with extra information in a Work End Degree by Redondo, from 1996, filed in the library of the University of Extremadura, with the code number TFC-AT-565, for further information).

If we aware of details we come to the point of getting precise information on the building object of study; by now, the name, its location on a standard basis [INE, 2014], and the source where the information has been got and where to go for further information.

Conclusion

The advantage of the system respecting a traditional search engine such as Google or similar is that you can locate physically the place and on it, you get the required information. In comparison with Google Maps or similar supports, the added value is that we have precise information at our disposal on the inside of the buildings and the reference about where to find further technical information. In the future that platform GIS will be compatible with the regional government with standards ISO/TC 211 [Norwegian, 2014] and OCG [Open Geospatial Consortium, 2014], with Google and its parallel competitors. As a matter of fact, this is an overlapping layers system and unifying the inserted database is required. In this way, either we or the Cadastre of Spain [Cadastre, 2014] are working or other portals run in other countries. [Geoportal, 2014]

To finish with, we could talk about the dissemination of graphic documentation on the architectural heritage with academic support that guarantees the quality. In any case, it is an open process .On one side, the possibility of adding more information in the same database. On the other side, the integration of different platforms, regional or global. Finally, spreading this action to other towns in the region and to other parts of the country as the basis material and work system is available. This is one of the aims of a teaching visit arranged for the spring in 2015 in the cities of Ljubljana and Zagreb, to start working groups and agreements among the several institutions that keep the documentation on the architectural heritage or supervisor organisms on heritage conservation.
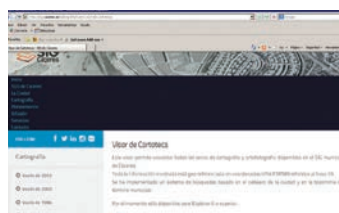
Slika 4: GIS Cáceres. Uvodna spletna stran.
Figure 4: GIS Cáceres.Viewer acces.
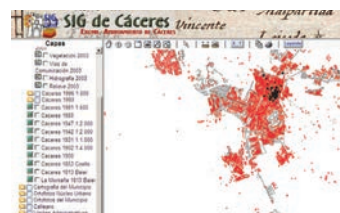
Slika 5: GIS Cáceres. Grafični pregledovalnik.
Figure 5: GIS Cáceres. Viewer.

Slika 6: Grafični pregledovalnik, nivo kataster.
Figure 6: GIS Cáceres.Viewer's detail.

Slika 7: Grafična podatkovna baza.
Figure 7: GIS Cáceres. Source's dates.

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