

The use of DBS and GIS in the study of medieval landscape: the case of the county of Barcelona from the late antiquity until 11th century

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During the last years, the study of the landscape, as a system, has shown a very fertile way to advance the historical research, from a point of view that includes the understanding of its complexity and to integrate the various historical sources: documents, archaeology, paleo-environmental studies, geo-archaeology, etc.

From this point of view, and for the last five years, we have been focusing our attention on the study of the territorial evolution of the county of Barcelona, from the late antiquity to the end of the 11th century.

The studied territory includes an area of approximately 4.500 square kilometres, with a length of about 125 km and a width averaging 40 km, in a strip parallel to the Mediterranean coast. At first sight, the territory seems to be too big to deal with in terms of the kind of research proposed here, not only because of the size, but also because of the great volume of information to use. The choice has been planned and responds to the interest in using the computer science resources when dealing with the information. It is a serious aim to look for an answer to the way of handling it, as well as how to face the data processing of huge amounts of information in the historic research, as it has been possible for other fields of science. We think that if we overcome this challenge, it can open new perspectives of research and ways of developing the research itself, and at the same time, allows us to obtain new information from sources which up to now were isolated and therefore appeared irrelevant. A smaller territory could make things easier, but perhaps it could not be significant enough.

The territory that we identify as the county of Barcelona contains a wide variety of aspects, not only in its own historical process, but also related to the approach to this research, which made us consider it as a suitable area.

– We recognise the process of implementation of a new territorial organisation, from which we have an important amount of recorded information, which in turn allows us to follow the process of formation and also its historical context, as well as its evolution afterwards. We have a lot of transcribed written sources that confirm many things.

– This space is defined inside the process of expansion of the Christian world over a territory previously under the Islamic domination, which at the same time was settled since the Roman period, easily recognisable through the archaeological research. We are in a territory that will extend its borders towards the South, and that will let us think and analyse questions related to the concept of border and the establishment of ways of domination, control and exploitation of the new incorporated territories.

– It shows a wide geographical diversity, which lets us deal with various aspects, not only from the territorial dynamics inland, but also from the coastal one, as well as to analyse their relationship. The variety of relief and the natural conditions also allow us to observe and analyse the influence that they can have in the historical process in different landscapes.

– There is a great number of archaeological sites and preserved built structures (castles and fortifications, churches, areas of habitation and urban ones, necropolises, bridges, etc.), which provide us with some historical infor-

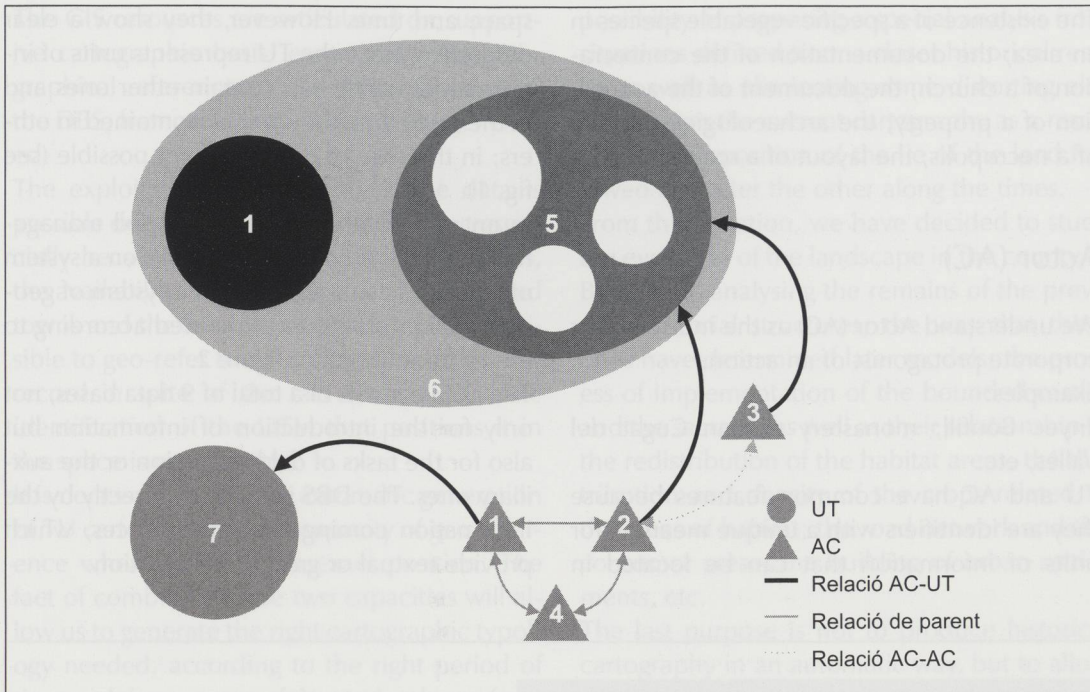


Fig. 1: The graphic shows a diagram of the relationship among TU, between TU and AC, and among AC. The TU 6 holds 1 and 5, which contains at the same time 2, 3 and 4, while there is no relationship with 7. In the case of Actors 1, 2 and 4 they maintain a kinship relationship, while between 2 and 4, there is a business relationship (seller-buyer), with relation to TU 5. Each identification number is exclusive for each TU and for each AC.

mation, able to be processed together with that from the documentary sources.

– The modern and contemporary transformations have been very strong in some of the areas, but there some ancient relics have been also preserved, which makes it possible to analyse the influence that they had on some patterns of preservation of the information, or to analyse how the preceding could have conditioned later actions. The strength in the processes of transformation, in which most of this old territory is involved, also makes us think about the relationship between the current management of the territory and the problems of preservation of the historical and cultural heritage.

The work system used is based on a list of concepts that allow the integrated management of the information. The first concept to list is the unit of information. It is referred to any kind of a piece of information regardless of how it is obtained, its chronology or its typology.

A unit of information will be

Any indication that lets us know the components, the status, the variations and interrela-

tions from and among the elements that form a system.

Every unit of information may belong exclusively to one of the two unique kinds of representation of units of information with which we will work: Topographic Units (TU) and Actors (AC).

The concept of the Topographic Unit (TU) is closely linked in its origin and in its first definition, to the archaeological research. But in any case, it is created so as to restrict it to this kind of source. The concepts TU and Actor (AC) are the axis of the system of the information management, since they allow us to identify and to represent in an integrated and unique meaning, the units of information held in the sources.

Topographic Unit (TU)

We understand Topographic Unit (TU) as the indicator of an action or situation, which can be located in space and time, regardless the specificity of the source of information and its biotic, abiotic or anthropic origin.

Examples:

The existence of a specific vegetable species in an area; the documentation of the consecration of a church; the document of the acquisition of a property; the archaeological records of a necropolis; the layout of a road, etc.

Actor (AC)

We understand Actor (AC) as the individual or corporate protagonist of an action.

Examples:

Ènyec Bonfill; monastery of Sant Cugat del Vallès, etc.

TU and AC have common features because they are identifiers with a unique meaning for units of information that can be located in

space and time. However, they show a clear difference, since the TU represents units of information, which can contain other ones and at the same time they can be contained in others; in the case of AC, this is not possible (see fig. 1).

In an operative way this developed management system of information works on a system of database management and a system of geographical information, structured according to the representation of figure 2.

The DBS consists of a total of 9 data bases, not only for the introduction of information but also for the tasks of data validation or the auxiliary ones. The DBS is supplied directly by the information coming from the sources, which provide textual or graphic information.

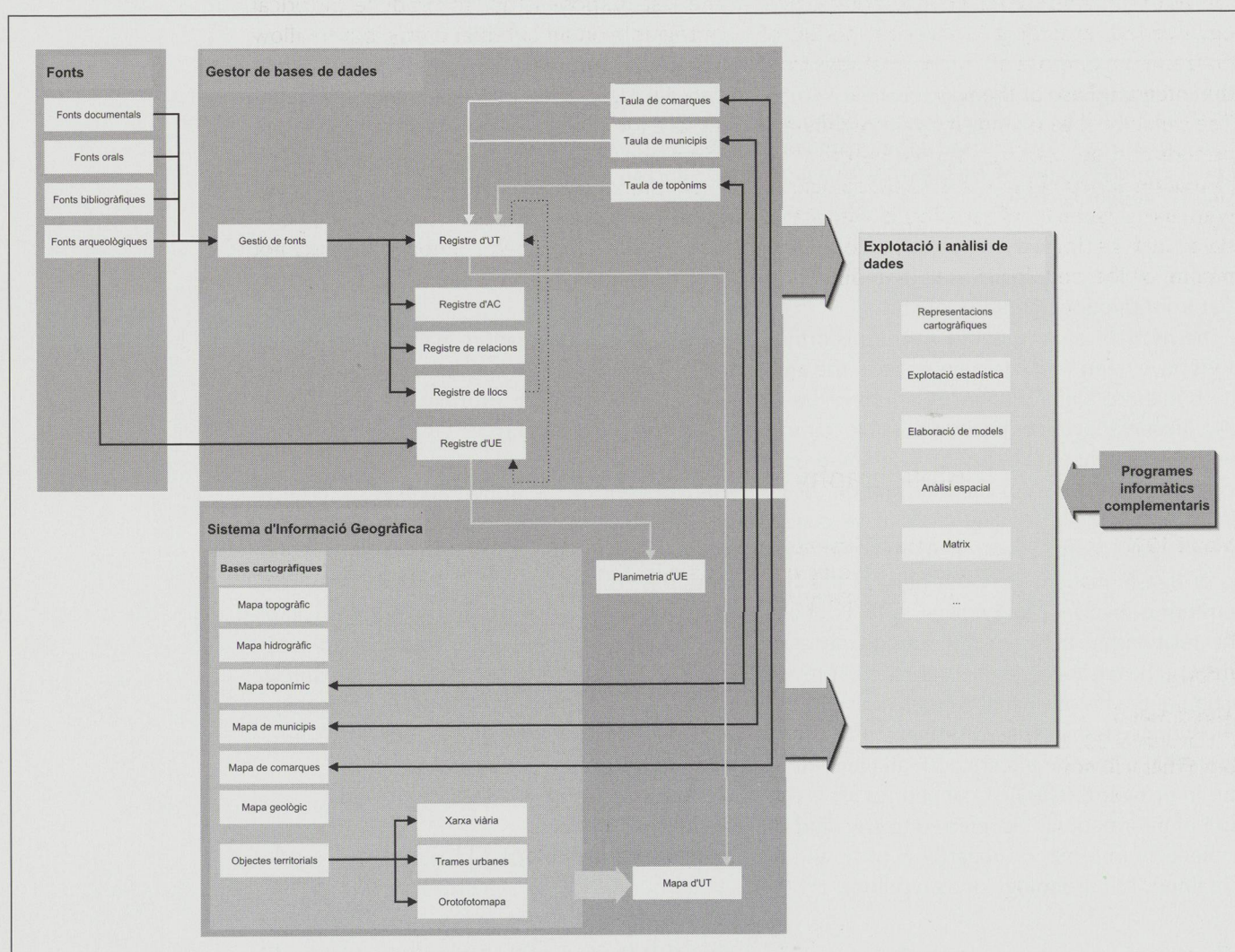


Fig. 2: The computing core of the information management system consists of the system of data base mangement (DBS) and the system of geographic information (GIS). It is possible to have a possible interconnection between them, which allow the access and display of the information in a textual and cartographic way. The DBS and the GIS let us apply the analysis tools, which are completed with other external ones, but interconnected at the same time, this fact increases the number of possibilities.

The GIS resources are articulated on supportive cartographic basis, essential for the geographical references of the data managed by the DBS, from which the TU maps are generated.

The exploitation and analysis of the data is possible due to the DBS and the GIS, but especially because of their interconnection. Thus, the availability of auxiliary maps of regions and towns and the location of places, make it possible to geo-refer to the information of the TU record in spite of the fact that an accurate identification of the UTM that positions it in the space is not possible.

It is necessary to add the automatic generation of TU cartography to this capacity of geo-reference when we know its exact position. The fact of combining these two capacities will allow us to generate the right cartographic typology needed, according to the right period of time and the purpose of the study, always from the integrated use of the sources

The capacity of generating maps from different periods of time, starting from the historical information (documentary and archaeological), with the possibility of crossing it with other data, such as, for example, the paleo-environmental or the pedological sets one opens the

possibility of proposing a special analysis from situations defined from a closer historical reality as well as eliminating some distorting elements from the current cartography as a result of the superposition of the lie of the land followed one after the other along the times.

From this situation, we have decided to study the evolution of the landscape in the county of Barcelona, analysing the remains of the previous territorial structures; the way that these ones have determined later models; the process of implementation of the bounded castles and the *sacraría*, as well as their relationship to the redistribution of the habitat areas; the distribution and density of the crops related to the areas of habitat; the road network and the consumer areas; the building of urban settlements, etc.

The last purpose is not to produce historical cartography in an automatic way, but to allow the integrated management of the information, taking into account the territorial meaning and identifying the territorial reality, before going ahead with the territorial analysis. The exploitation and the data analysis is the last step of a complex process to which the computer science tools help, although they are not really the objective.

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