



Elaboration of a GIS for the management of the new building of the Engineering's School

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Abstract

In this paper we present the creation of a GIS with the use of graphical representation as well as a data base with referenced elements of the new building of the Engineering's School. The objective is to manage the distribution and the efficient use of the building.

As parts of the work we will show these different phases:

- *Introduction of graphical data provided as cad drawings*
- *Development of a data base referring the different areas of the building, their use, persons related to them, timetables, etc.; and the complex relations taken into account, needed to create an efficient system.*
- *Integration of the previously elaborated data in a GIS platform (Geomedia-Intergraph)*
- *Consults development*
- *Publication as web system.*

The main difference with a traditional GIS is that we are not using geographically referenced data, but just graphical data. We are using a GIS system to support the management of a building. Besides we give access to the system to all the members of the university via internet.

We show our results and explore new use of GIS as a management tool.

1 Introduction

This project is located within the study area of Geographic Information Systems (GIS).

Geographic Information Systems are a technology that is part of the larger field of Information Systems. The general context in which they arise is that of "information society", which is essential to the rapid availability of information, to solve problems and answer questions in a fluent way.

2 Object

The purpose of this work is to design a search engine using GIS for planning and management of the Engineering Building's infrastructure, where actually are located the School of Industrial Engineering and Technical Engineering.

The GIS should provide an adequate response, in an easy and interactive way, about information needs and organization of school space. The information will come from a database and will use a graphical and friendly

interface in the consultation and treatment database, for solving spatial problems. It also aims to ease its operational use by the users, both students and university staff.

In the database you will find information concerning university organization, such as schools, departments, areas, teachers, classrooms, laboratories or subjects.

In essence, our goals are:

- Develop a space management system of a building.
- Customize for a user profile with no GIS knowledge.
- Get different answers Systems: Locations, occupation, availability, etc.
- Publish results in a web format.
- Test the possibility of use via phone, PDA or similar.

3 Planning

The phases of the work will be:

- Collection of basic documentation on geographic information systems (definitions, types, functions, ...) and databases. Present graphically the proportion, distribution and use of area of each center, department and area
- Election of the solving proposal and planning stages (Here we will describe how you will

implement the project, in terms of next steps and tools to use).

- Construction of the plant model of the school.
- Display units that are desirable.
- Design the database using the data provided by the School
- Implement the design that allows linking the database with the model, in order to take full advantage by accessing information from each of the data elements that are geographically selected by the user, or accessing information from the database using the link to the graphical representation shown as degrees, courses, etc..
- Development of queries to test the level of compliance with the objectives. Ask for their appointment, the location of each of the occupied units, such as classrooms, laboratories, offices, library, or any other functional unit to be operational on campus. It could make the following queries
 - o Check Dependencies, by geographical location.
 - o Visit the classroom capacity, schedule, etc.
 - o Consult laboratories, according to area or department they belong
- The GIS should enable users to extract the information contained in the database. To do this, you must have a working interface as intuitive as possible for those staff who are not familiar with tools such as CAD or databases.

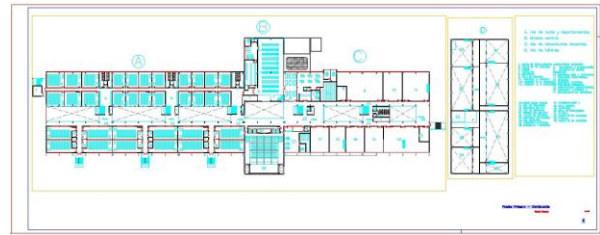


Fig. 2 elaborated CAD

Besides, it has been necessary a lot of work with layers in order to have a good export-import procedure, and get the right representation y the GIS program.

Finally, in the CAD system we can create polylines or regions, but to work with the GIS program it will be better to create contour polyline, which has the feature to group multiple lines of different elements into a single. In this way we achieve that every element that is of our interest us (classrooms, laboratories, etc.) behaves as a block, ie all the walls belong to the same element. This task has also been very laborious.

When all previous things have been done, we can work with data in our GIS program (Geomedia).

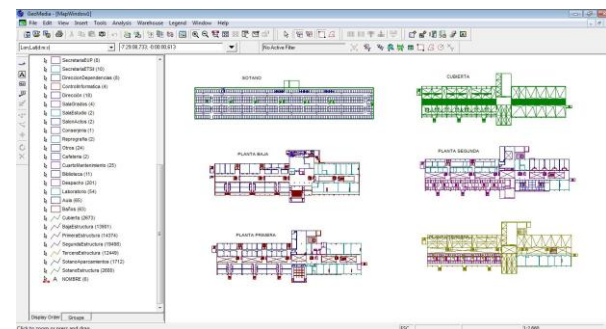


Fig. 3 Working in Geomedia

4 TYPE OF REPRESENTATION

We will take advantage of the vector data type that is more compact, in terms of volume of storage, than raster. In our model appear items such as classrooms, laboratories, offices, library, study rooms, etc. We need to classify the model in the shortest possible number of layers to display the different elements of the graphical representation in a direct and simple way.

To represent each of the main objects we first need to simplify the CAD model because usually it has excessive information. We divide the plane in the plants that has the building and work according to these areas. The most complex problem in which we find ourselves, is being able to modify the layers, that created the authors of the drawings to facilitate their task of representing the building and "complicate" ours. These objects are in different layers forming a solid block, and if we modify the layers, without previously opening the blocks the program generates an error.

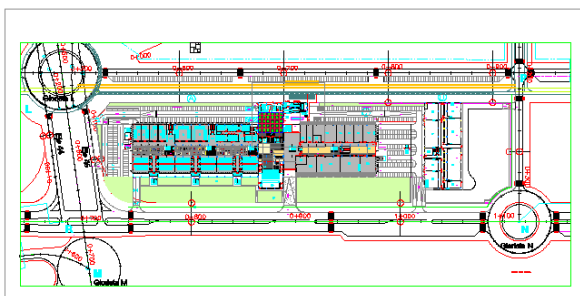


Fig. 1 CAD without modifying.

5 DATABASES

We need to make a database in which to store all the information we have about the School. It will be divided into three main parts:

- a database with the graphical representation (this model will be implemented as Geomedia imports the CAD drawings)
- a database with the Information of the School, that will contain the location, names and attributes of all elements of the School. It is performed manually and then integrated with the graphical database to get the information from one point to a number of features
- and a database with the queries on the program Geomedia, with which we will work the website. These queries are likely to be modified, creating new fields or adding new queries

The database program used to manage all data has been Microsoft Access. We have to highlight the importance of this phase of the work. Depending on the quality of the data and its organization, it will ease the query creation and its results,

Due to this we are going to use the relational database model, that will allow us to manage complex relations between different tables. Besides, this model is easy to extend with more data.

The following objects must appear in our system:

- the school building
- different areas like laboratories, office, classrooms, etc.
- the departments and knowledge areas that teaches at the school
- professors
- careers taught at the school
- subjects
- time tables

As an example we can see the following figure:

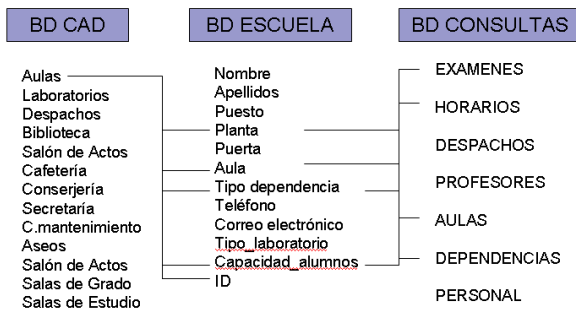


Fig4: interrelationship between three tables

The following image shows the complex interrelationship between the different tables of the database.

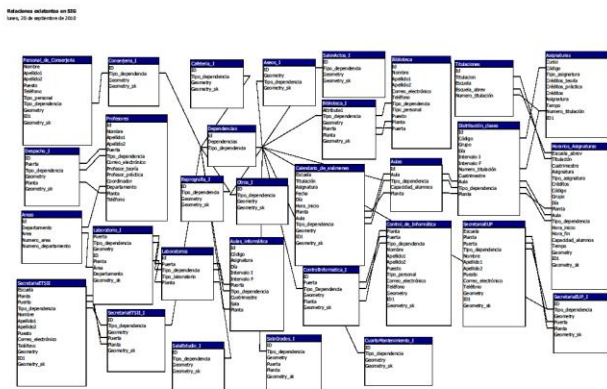


Fig5: tables used

We have used more than thirty tables in our database, and established a complex relationship between them.

6 WEB REPRESENTATION

After gathering all the information in Geomedia and georeference all elements of the school, we can go on to develop the website, where students, teachers, and other university staff can access to make inquiries.

To manage this object, we have used Geomedia Webmap Professional. It is not an easy tool to use, because of the configuration requirements.

The most difficult part of this item is that exporting inquiries to a web system means needing to program those inquiries. The program language used has been Visual Basic

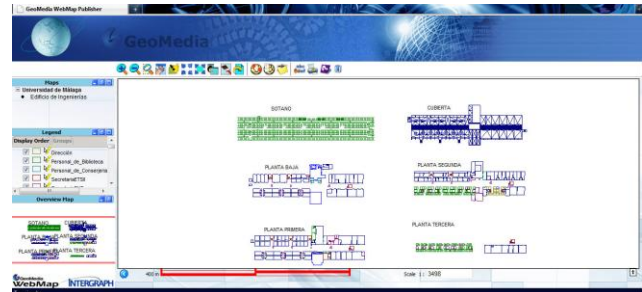


Fig6: web representation

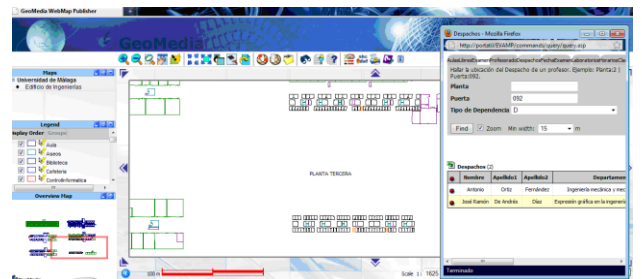


Fig7: Inquiry example

In the web representation we have studied with special care the legend and the results representation of the queries, so as to make the use of this system most friendly.

7 CONCLUSIONS AND FUTURE WORK

- We have found that having a GIS application for managing space on a college campus, allowing real-time information to manage and locate graphically, is very important and innovative
- It has been shown how it is possible to build a GIS software with some CAD tools, such as AutoCad or Microstation (which allow connection to databases) and database managers.
- You could complete the database with information on new careers and the inclusion of the practices of each subject, trying to get the occupation of all laboratories, in addition to the classroom
- Creating new inquiries, improving specifications across programming in Visual Basic.
- Perform a GIS for the entire university complex in Malaga.
- Integrate the maintenance management of the building in the GIS.

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