

## DEVELOPMENT OF A METHODOLOGY FOR THE DISCRETE UPDATING OF CADASTRAL CARTOGRAPHY BY MEANS OF GPS AND SIG TECHNIQUES

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### ABSTRACT

The Cadaster together with the Land Registry are an important part of the basis of the actual economic system. The Cadaster, issued out of the economic needs in taxing countries, has gradually lost this taxing aim as opposed to the other types of taxes, being even more so for the Cadaster of farming land. However, the present tendency of the different cadasters is to diversify the use of cadastral information, therefore the necessity of its updating has arisen for other uses, either private or public.

Taking as a model of cadastral updating the running of the Land Registry, in which the field owner is interested in such updating, one has noticed the user's interest in performing such a task. The updating of the Cadaster, and more specifically the cadastral cartography, is however performed massively taking the whole of the municipal area. That is why we realised that it would be of interest to bring forward a methodology of discrete updating of cadastral cartography, and all this should be done by integrating most of the tendencies of the Cadasters in the world, that is to say by using GPS and SIG techniques.

Our proposal for a discrete updating methodology of cadastral cartography is divided into a system of data entry and a system of exit of such data, corresponding these two systems to the two techniques mentioned above. The system of data entry is in itself subdivided into three subsystems:

Subsystem of Data Capture. This subsystem allows the accuracy required by this type of cartography and at a reasonable cost based on GPS techniques in differential mode and with receivers C/A allowing a maximum base line distance of 100 km.

Subsystem of Georeferencing. This subsystem implies the homogenisation of the system of geodesic reference for all the data collected with GPS. To avoid problems with the transformation of coordinates, the subsystem itself makes the transformation in order to homogenize the parameters of datum change.

Subsystem of integration of Cadastral Cartography. Generally the formats used are usually a cad for-

mat, without topology. This format must be change into a format capable of doing algebraic operations with spatial elements such as polygons.

The system of analysis and results must permit the graphic comparison of boundaries between the cadastral cartography and the measurements done with GPS, that is the modification of boundaries. It must also allow to quantify the surface variation and to identify the boundaries of the plots analysed. This system is formed by SIG (System of Geographical Information), based on the topology of surface entities such as the polygons which represent the cadastral plots and the measurements with GPS.

To check upon the efficiency of this methodology, such methodology was applied to the practical case of the updating the public communal land in the municipal area of Níjar (Almería Province in the south of Spain), where 234 plots were measured in 71 cadastral polygons, representing a total amount of 3000 hectares measured. In this application the subsystem of data capture was a GPS with code C/A, using the differential mode for point positioning with a maximum base line distance of 50 km. The reference system used was the WGS84, which used the datum change by means of the parameters proposed by the IGN of Spain (with 5 parameters).

The original cadastral cartography in this work was presented with the format DXF, and so are also presented the measurements done with GPS. Therefore after selecting the analysis system, SIG ArcView 3.1, we proceeded to transform it into a format capable of achieving this type of operations, Shape format (SHP), which does not present a proper topology but is however, capable of achieving algebraic operations for the required analysis.

The possibility of implementing applications that allow to hurry up the processes, this task was of great importance in the programme selection for the SIG creation. So the application CAT-MP was developed. It is formed by 36 scripts in AVENUE language. The application allows to select the cadastral plot which is going to study, and it is able to overlap the plot measured with GPS. The analysis of the differences between both is automatically done and the software application provides information about the percentage of discrepancy between the original plot and the plot measured with GPS. In this way the Council, discrete user in this particular case, is able to decide about the problem of updating or not. Whenever it is necessary to make a report, this one can be issued to inform the affected owners about the performance. The reports contains two sort of information, in one way, a window with the cartographic information of the analysed plot, the problematic areas in the plot, their corresponding plot identification numbers. And in the other way the alphanumeric information about the studied plot and the problematic areas in the displayed window; this alphanumeric information includes the identification number of the plot, its location, its total surface, the affected area, the percentage of discrepancy between the measured plot with GPS and the original cadastral plot, and the data of the owners of the neighbouring plots.



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