Proceedings

3rd EC - GIS Workshop

INSTITUTE FOR SYSTEMS, INFORMATICS AND SAFETY

Proceedings of the

3rd EC - GIS Workshop

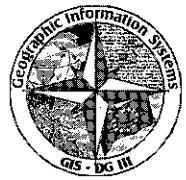
Leuven, Belgium - 25-27 June, 1997

JOINT RESEARCH CENTRE
EUROPEAN COMMISSION

SIEMENS NIXDORF

Geographic Information Management NV

INSTITUTE FOR SYSTEMS, INFORMATICS AND SAFETY



Proceedings of the
3rd EC - GIS Workshop

Leuven, Belgium - 25-27 June, 1997

Edited by
R.J. Peckham

JOINT RESEARCH CENTRE
EUROPEAN COMMISSION

SIEMENS NIXDORF

Geographic Information Management NV

Printed in Italy

Foreword

The 3rd EC GIS Workshop was held at the Faculty Club, Leuven, Belgium, from 25th to 27th June 1997. It was organised by the Joint Research Centre, Institute for Systems Informatics and Safety as part of its support to Directorate General III (Industry) in the area of Geographic Information Systems.

As with the previous two workshops in this series the aim was to present GIS projects sponsored by DG III, to establish and maintain contacts, and to enable consultation and cross fertilisation of ideas between the developers and participants. In addition to GIS projects and applications more general issues relating to the current evolution of GI technologies, standards and the market were also presented and discussed. These are all of importance to DG III for the orientation of future programmes in the area of Information Technology and, in a wider sense, in the development of the Information Society.

This year the workshop was characterised by an attendance of approximately 80 lively participants many of whom were prepared to stay on and continue the discussions long after the formal sessions were over. Perhaps the wooden beams and atmosphere of the ancient rooms of the Faculty Club played their part! The current concerns with increasing interoperability among GI systems and data were frequently aired and the workshop provided opportunities for significant contacts with the Open GIS Consortium which should certainly lead to a strengthening of Europe's participation.

This report presents all of the full papers which were received following the workshop together with several extended abstracts of particular European or topical interest. Also reported here is the final discussion which was held at the end of the workshop. Separate collections of all abstracts and copies of overhead transparencies presented in the meeting have already been distributed.

Local arrangements for the Workshop in Leuven were organised by G.I.M. - Geographic Information Management N.V.- and thanks are especially due to Françoise Dehondt, Wim Devos and Vital Schreurs for their very willing collaboration. Thanks are also due to Siemens Nixdorf who provided additional financial sponsorship which further helped to make the workshop an enjoyable event to remember.

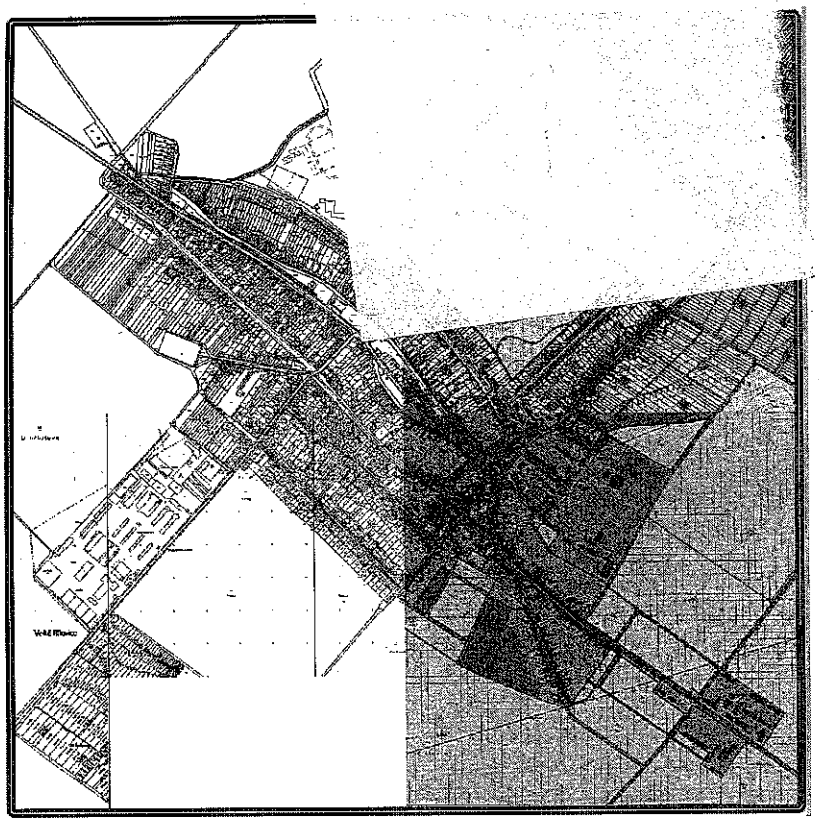
R.J. Peckham
JRC, Ispra
September 1997

Contents

STANDARDS AND INTEROPERABILITY

SAMPL

VECTOR CADASTRAL MAP ***LAN***



ORIGINAL RASTER CADASTRAL MAP ORIGINAL RASTER URBAN PLAN

GIS for Historical Asset Management in Italy

M. A. Esposito, S. Maffulli
Università degli Studi di Firenze, Dip. P.M.P.E.
via S. Niccolò 42
50100 Firenze
Italia

1. Keywords

GIS application, Cultural Asset Management, Database Acquisition and Structuring

2. Aims and objectives of the Application

Given the high density of cultural monuments in Italy, in particular buildings, gardens, squares related to towns or regions, managing these Historical Assets is a top priority. To reach this goal, the patrimony must be managed in the following three steps:

1. **identify** the existing asset stock and collect all information about it;
2. **connect** this information linking different data bases and make them available for queries;
3. **use** the cultural patrimony through restoration, promotion of tourism, creation of services for school and researchers, etc;

This application project is aimed at defining a standard procedure for linking the Attribute Information of the Asset with the Geographical Information, improving the effectiveness and use of the Information.

3. The current Italian Cultural Asset Management

The backbone of the Italian cataloguing system is the so called "schedatura" (filing system) which is basically a system of different paper forms that have to be compiled. These forms are broken down into three levels: from the most basic Inventory, the more detailed Pre-catalogue (which also contains the Inventory information) and finally the Catalogue itself. (see Fig. 1).

Cataloguing the territory is done via a formula called "a funnel": it contains a Territory form (T), a Historic Centre form (CS), an Extraurban Centre form, an Urban Sector form (SU) and the emerging entities like Architectonic Works form (A) and the Parks and Gardens form (PG), to arrive at single "beni mobili" (see Fig 2).

Since the early 1970s, the Public Authority has been trying to improve the whole Asset Catalogue System introducing new forms with more rigid field entries, to make them suitable for use in an electronic database. The current database is used for translating into electronic form the old paper forms, so compiled forms can be sent by modem from the Local Administration Offices to the Central Administration Office.

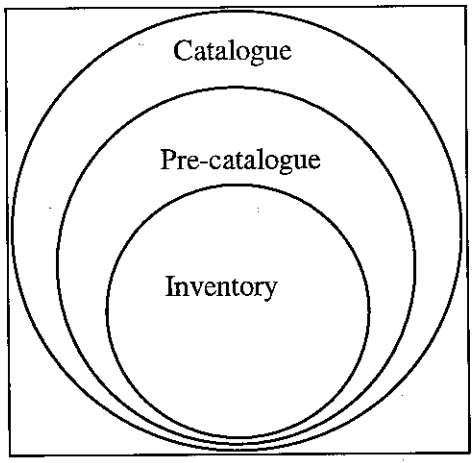


Fig. 1. Scheme of levels of the Cataloguing System

Since the database is simply a translation of paper forms, it does not use all the advanced features of modern database systems: many fields are redundant, or contain data that could be retrieved by elaborating other raw data. Therefore, to proceed further with the analysis of the present situation, it was necessary to restructure a database that was simply a transposition of the existing one, but without all the redundancies and the other weaknesses. This database uses all the information specified in the official paper forms and will be used as a starting point for creating a fully relational database.

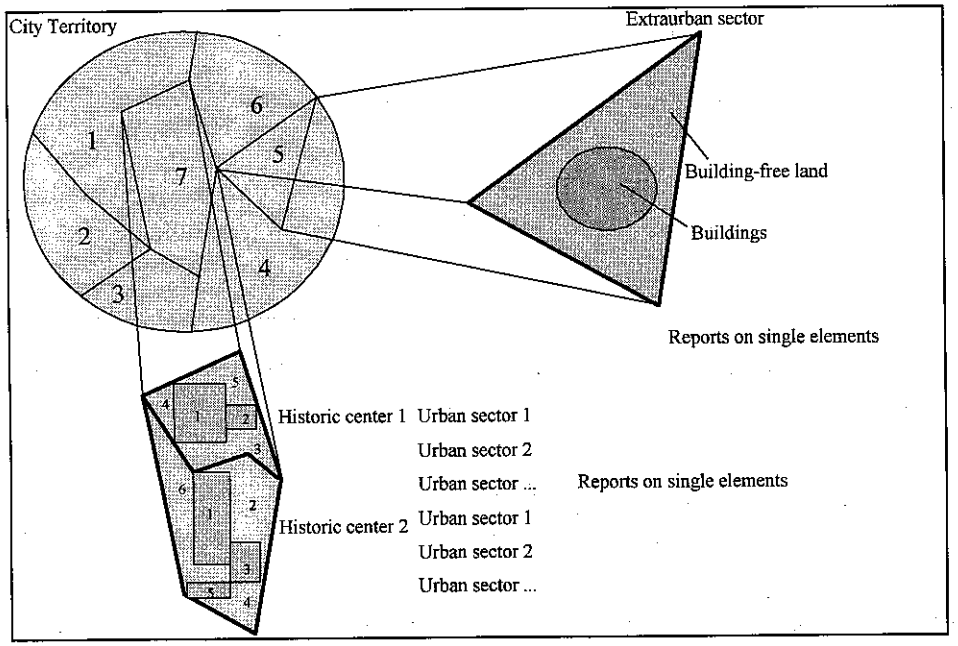


Fig. 2. Scheme of the territory subdivision

4. The actual data acquisition method

At the present time the method applied for data acquisition is the following:

I. identify the "culturally-homogenous zones" inside the territory of the Soprintendenza. O of these city zones will be chosen to start the Cataloguing Process's steps 1 to 6 which w then be repeated for each city;

1. retrieve the basic cartography of the City territory: the IGM 1:25.000 and the cata 1:5.000;
2. gather a general bibliography about the entire territory;
3. project of the Catalogue Procedures:
   a) locate the urbanised areas existing in the Commune that will be catalogued w the CS form;
   b) subdivide the rest of the territory in extra-urban sectors, catalogued with the form;
   c) subdivide the urban areas in urban sectors (blocks) catalogued with the SU form;
4. compile both "Repertori per lo stato attuale" (Report on current situation) and t "Repertori per l'indagine storica" (Report on historical information), included in t forms for the Extra-urban Sectors (TP) and for the Urban Sectors (SU), and survey the single building unit of the blocks in scale 1:200;
5. compile the more detailed forms type A for those buildings for which the "repertori" a not sufficient and survey of these buildings in scale 1:50 or 1:100;
6. compile the CS forms, assemble of a map in scale 1:500 and of an aerophotogrammet in the same scale, eventually;

II. compile the T form, related to the Territory as a whole, and of all the aforemention reports;

III. verify that the information about the single elements ("repertori" TP, "repertori" SU a A) corresponds to the information regarding the entire territory;

If the urbanised area is very large, it can be divided into smaller, areas which are easier manage. The CS forms are still in development and therefore have not yet been fu implemented.

The information necessary for filling the forms is retrieved by an archivist call "Catalogatore" who fills out the form, gathers all the necessary cartography, takes t pictures and, if necessary, takes the metric survey. If there is an existing electronic form f the asset stock element, then the data is entered/typed by an employee into the Catalog Office's computer with a Data Entry, Print and Querying program, which does not hand images or cartography. The electronic data can then be sent by modem to the Centr Cataloguing Office in Rome from the local offices.

5. The metadata catalogue of Geographic Information

Metadata can be defined at its simplest as "data about datasets". The Technical Committ CEN/TC 287 "Geographic Information" adopted a standard that specifies which data shall used to describe a geographic dataset. This includes data about the content, representatic extent (both geometric and temporal), spatial reference, quality and administration of geographic dataset. This standard also identifies those data which are mandatory f describing geographic datasets, the minimum set of metadata.

In this application project, the paper forms used by the Soprintendenze will be transferred into this standard to have a base for developing the GIS application and integrating them with more proper geographic datasets.

6. Definition of Data Acquisition Procedure and GIS Data Base Structure Procedure

1. Acquire raw data in a GIS environment of the state of the current database (preserving the original logical names);
2. define a structure typical for the application;
3. integrate the structured data and the geographic datasets.

This phase is currently in progress, with the research of suitable digital cartography and of digital archives from the Soprintendenza.

7. Definition of query interface design

The application will be based on ARC/Info to standardize the information. The possibility to query the database from a remote computer, via the Internet, will be an important feature, to give easy access to the information by the end user.

8. Conclusions

The opening of the European borders has greatly increased the circulation of professionals, but can also increase the possibility of improper intervention on the historic patrimony of the European Union. A database that can be consulted by professionals as well as by administrative offices and that can be queried remotely is, therefore, of vital importance.
Aside from these bureaucratic effects, easier more efficient and decentralised access to the information would have other important consequences. It can be used to prioritise restoration campaigns, make links between museums and "beni" in the region and finally for didactic purposes in general and research.

9. Definition of Italian terms

- **Beni mobili**: cultural objects, including furniture, coins, paintings, clothing, etc.
- **Beni immobili**: cultural objects that can not be moved, including buildings, tombs, bridges, etc.
- **Catasto**: register of landed properties
- **IGM**: Military Geographic Institute
- **Schedatura**: filing system
- **Soprintendenze** Government institution responsible for the management of all cultural monuments; they are separated in:
- **Soprintendenza ai Beni Architettonici e Ambientali**: Government institution responsible for the management of the architectural and territorial monuments;
- **Soprintendenza ai Beni Archeologici**: Government institution responsible for the management of the archaeological monuments;
- **Soprintendenza ai Beni Culturali, Artistici e Storici**: Government institution responsible for the management of the cultural goods;

Assessment of "cumulative" uncertainty in Spatial Decision Support Systems

Stefan Kleeschulte
G.I.M.-Geographic Information Management sa
9, rue Jean Pierre Sauvage
L-2514 Luxembourg

Abstract

The objective of this research and development project in the framework of the Environm and Climate Programme of DG XII is (1) the quantification of "cumulative" uncertainty c to input error and error propagation in spatial decision support systems (SDSS) and (2) to u the results for a risk-cost-benefit decision analysis. To reach this goal hydrologi programmes for modelling of groundwater contamination from agricultural and natu systems are applied at different levels of scale.

To execute the project a GIS database with European-wide data sets has been compiled fr various sources and integrated in a project database. These data sets are used as input data the groundwater models, aggregated to different levels of scale (regional, national a European) to create different levels of generalisation.

The output error resulting from error propagation and the combination of different input d sets as well as the impact of uncertain data from a risk-benefit point of view are addressed the project.

The paper concentrates on input data and data accessibility because no final modelling resu are available to this date.

1. Introduction

Spatial Decision Support Systems (SDSS) in combining environmental modelling a Geographic Information Systems (GIS) as building blocks provide decision makers with interactive tool for exploring the range of possible scenarios and assessing various alternati answers. SDSS as tools for decision makers will play an important role in the near future the determination of environmental policy. Knowing the accuracy and limits of confidence answers given by these systems is therefore essential and can be used to define alternatives to reduce monetary risks associated with technical issues and (b) approaches minimise input data uncertainty and improve model performance.

Estimation of uncertainty has to be performed and clearly stated when using such syster Yet limits of confidence and accuracy of SDSS are currently not available in a formalised a comprehensive way. Research is required in order to assess the uncertainty associated w such models. It is known that uncertainty is associated with inputs of the system: s vegetation complexes, climate, assumptions in the modelling, scale and spatial variability, well as the output (predictions) based on the input variables.

At this point, it seems necessary to define the term "uncertainty" and to separate it from t term "error". According to Hunter et al (1995) "uncertainty" is characterised by a lack