



# Abstract for Auto Carto London

Title Bench Marking and Acceptance Testing: Towards Standard Approaches

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## Bench Marking and Acceptance Testing : Towards Standard Approaches.

A Benchmark test is a most important step for the client who, having no other information, must know how closely a system meets required specifications. A useful Benchmark test is costly.

It is fairly unusual for a client to pay for a Benchmark, but clearly "free" benchmarking is in the end paid for by ( other? ) customers through initial and recurring charges.

Each Benchmark test will check some functions which may be of interest to several users, and some specific functions representing the unique interests of the potential customer. The results of Benchmark tests normally remain confidential, known only to the selling organisation and the potential customer, and perhaps to third parties acting as agents for the selling or the customer organisation. But could the results of Benchmarks be made more widely available, thereby saving costs, without damaging the reputations of selling organisations still, for example, developing particular functions?

Benchmark tests are usually designed to ascertain whether, and how effectively, planned specifications are, or could be, met by a system. As a result of these tests, specifications may be modified and a purchasing decision made. Some specifications, such as digitizer resolution, are stated by most selling organisations, but more useful quality parameters are not. Industry wide procedures for determining quality parameters and the inclusion of such statistics in the commercial literature might be cost effective. Clear descriptions of software capabilities successfully achieved might permit the benchmark test to be reduced to those requirements of a buying organisation which are truly unique.

As the original specifications control the Benchmark testing, so the Benchmark testing, through the media of modified specifications, controls Acceptance testing. Acceptance testing ensures that the actual delivered system meets all modified specifications - both hardware and software. Acceptance testing may take place in several stages in a one week to six month period granted by the manufacturers, during which final payment for the system may not need to be completed. Because there is some time pressure on this testing, efficient procedures have to be developed.

Proposals for a range of suitable Benchmark and Acceptance tests are given.

# Abstract for Auto Carto London



Title GEOGRAPHICAL DATABASES FOR PLANNING PURPOSES .....

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Affiliation National Land Survey of Sweden .....

Geographical data processing started early in Sweden. Already 1955 professor Hagerstrand at the University of Lund published a work in the Swedish Geographical Yearbook: "Data processing machines and aerial photography - a project of combination". That must be the first work in the field of Geographic Information Systems, however, the concept information system was not known at that time.

In the bootstraps of Hagerstrand and with the further development of the computers several administrative systems were computerized. As usual, the tax systems were the first ones, with a population register and a property register as the basic databases. Later on, the Central Board for Real Estate Data was established as a governmental agency with the task to implement a Land Information System for registration of real properties, land titles, mortgages and so on.

National Land Survey (NLS) is the official mapping agency of Sweden. Even if digital technique was used rather early, it is first in recent years the new technique has been used in regular production. Today, the digital technique is fully implemented and a mapping system, AutoKa, has been developed. Along with the map production also databases are produced. These databases have a status similar to the official maps.

The objective of this paper is to present how the administrative registers and the databases created in the digital mapping are going to be used in physical planning at the regional level. First a pilot project in Skåne (the southmost province of Sweden) is described. In order to carry out the project the software of NLS was extended with a capability to handle graphical and non-graphical data simultaneously.

After evaluation of the project three Land Information Centres (LINFO-centres) have been established in three different counties for a test period of three years. The LINFO-centres have to be organized, financed and managed by regional bodies. The support from NLS consists of basic land information education and software. Several projects have been designed. Some projects are concerned with the support of information, which is a new obligation of the planning unit at the county administration in the new laws on physical planning, building and conservation of natural resources.

The test period also has to show how the LINFO-centres will be organized and managed on a long term.



# Abstract for Auto Carto London

Title A Design Framework for Water Resources Decision Support Systems

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Water resources decision support systems (DSS) can be organized in many ways depending upon institutional objectives and the nature of decisions that a system is designed to support. In this paper we outline a framework for aiding designers of water resources DSS through the use of the ROMC strategy advocated by Sprague and Carlson (1982): Representations, Operations, Memory Aids, and Control Mechanisms. These aspects of a water resources DSS should be clearly specified in order to ensure the successful development and operation of a water resources DSS.

Representations in a water resources DSS take the form of cartographic and non-cartographic displays, tabular listings, and computer formatted reports. At the DSS design stage, important choices must be made about methods of spatial referencing, and the degree of spatial precision chosen for storing cartographic representations. Thematic precision (e.g. number of categories) also plays a role in both cartographic and non-cartographic representations.

The specification of the number and types of operations in a water resources DSS is controlled by a need for information upon which to base decisions, a need to select from alternative problem solving strategies, and a need to design effective representations. From a cartographic standpoint, an important operation allows simplification (Douglas and Peucker, 1973) or enhancement (Dutton, 1981; Armstrong and Hopkins, 1983) of stream traces for producing maps at various scales. Examples of other, non-cartographic operations needed frequently in a water resources context are: production of summary statistics for streams or basins, and the application of logical decision rules to determine suitability from combinations of variables.

Memory Aids often take the form of a detailed database design and implementation strategy. An important component of a database is the adoption of a logical model to support representations and operations. Logical models vary in the types of relationships they support and in methods for producing efficient linkages among database elements. Miller (1984) has provided a structure for water resources applications based upon the relational model; Hopkins and Armstrong (1985) provide an example using a network design.

Control Mechanisms provide the means for performing operations, using representations, and manipulating memory aids. A number of control mechanisms are available, ranging from low level programming commands, to menu or icon driven displays, to natural language interfaces. The provision of documentation is also a vital aspect of control.



# Abstract for Auto Carto London

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Title ..... Graphic Stereo Raster Injected Verification Subsystem  
..... for Photogrammetric Acquisition .....

Author(s) ..... R. Beerenwinkel, J.-D. Bonjour, R.D. Hersch, O. Kölbl

Affiliation ..... Swiss Federal Institute of Technology - Lausanne

The last two years, the practice has shown the importance of graphical injection systems for photogrammetric acquisition on stereo plotters (e.g. Zeiss-Videomap system and Intergraph system for Kern or Zeiss plotters). Such systems seem to be particularly necessary for cartographic updating - to confront photos with digital maps - and for controlling precision and completeness of the map.

The Laboratories of Photogrammetry and Microinformatics of the Swiss Federal Institute of Technology of Lausanne have developed, in collaboration with the industry, such a graphical verification system. The main innovations of this system, in comparison with the above cited existant systems, are full editing facilities, the possibility to include the height information, and a rather low price. Furthermore, the system can be used as a peripheral for analytical or analog stereo plotters. These innovations are due to the development of a powerful display architecture with build-in dedicated panning functionality.

This paper will describe the characteristics of the hardware and the possibilities provided by the software. The system is based on a Motorola microprocessor and NEC graphical controller chips. It allows the operator to move in real-time (panning) in a virtual working space of 32'000 x 32'000 pixels, with a vertical and horizontal resolution of 1 pixel.



## Abstract for Auto Carto London

Title Current state of development of a geographic information system based on linear quadtrees.

Author(s) .. James Hogg & Mark Gahegan .....

Affiliation .. School of Geography University of Leeds .....

Over the past two decades, scientists have developed geographic information systems to handle information about spatial structures and processes associated with man, his organisations and the physical environment. Most of these have been designed to perform specific and often a somewhat limited range of operations on one type of data for a particular set of applications. For example, geographic information systems for digital mapping rely mainly on vector representation for point, line and polygon mapping. While these are efficient for cartographic applications, they exhibit severe shortcomings in meeting acceptable levels of performance for geographic applications such as those involving search in large regional geographic information systems.

Over the past five years, the development of a variety of hierarchical data structures based on quadtrees has stimulated a review of traditional objectives and methods in designing geographic information systems. The potential advantage of using quadtrees lies in the efficiency with which many types of queries can be handled. Geographic information systems based on quadtrees overcome several major shortcomings that exist with traditional methods of storing spatial data, remove major barriers to geographical research and expand the horizons of geographers and other field scientists for participation in the analysis of large sets of images from archival maps, remote sensors and other sources.

In this paper, we describe the current state of development of a geographic information system using hierarchical data structures based on linear quadtrees. We outline briefly the philosophy that we adopted in developing the system. Then we explain the theory of the linear quadtree and its implementation in a suite of computer programs written in the C programming language on a VAX 11/750 computer running Berkeley UNIX 4.2. We describe the functions that we have implemented including quadtree encoding, set operations, determining properties of regions, neighbour finding, traversing an image, generation of statistics and output of maps. We illustrate how the geographic information system can be used with images from a variety of different sources to perform spatial analysis for applications in different fields of geographic research and comment on its performance, scope and limitations with particular reference to its potential use in Great Britain for regional planning and resource evaluation.



# Abstract for Auto Carto London

GIMMS Release 5, an overview of the facilities and design issues  
Title .....

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Department of Geography, University of Edinburgh  
Affiliation .....

This paper looks at some of the new facilities in GIMMS Release 5.0 and investigates the design thinking behind it.

The GIMMS system is a mature mapping system which has gone through four major releases since its inception in 1970.

The development cycle has continued and the opportunity was taken in generating the next release, 5.0, to radically change many parts of the system, bringing it more into line with modern computing practice while attempting to keep upward compatibility with previous releases.

In particular, the user interface has been greatly enhanced to include menu and conversational modes as well the previous command modes. Unlike many other systems, any user can define the characteristics of their terminal, and are not dependent on the supplier supporting their particular type of terminal for menu operation. As well as the GIMMS predefined commands, the system has also been enhanced to include sophisticated macro facilities, to allow the user to set up their own commands or menus, which can access many of the facilities of the system by defining a few parameters.

Many new facilities have been added, the most important of which is probably the capability to produce contour maps. The system can deal with very large grid structures for contouring, depending on the machine, and there is a straight trade-off between size of data set and speed.

The system has also been made much less machine specific, thereby making it easier for users, when they move to a new machine, to use GIMMS without learning new procedures.



## Abstract for Auto Carto London

Title Database Management Handler for Wild SYSTEM 9 .....

Author(s) George Moon / John Tulip / John Collins .....

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A new generation mapping and information system from Wild Heerbrugg uses a modified relational database management system for data manipulation. Modifications were made to circumvent the usual criticisms of the relational approach; too slow for spatial data manipulation. Two important modifications are the addition of a variable length text field and the addition of an undifferentiated variable length field. These modifications will be discussed in this paper. Examples from the database will be given to illustrate the results of the modifications.

The data structures for the spatial part of the database will also be examined with emphasis on the reasoning for the structures. Of special interest is the spatial request handler which manages the spatial data within the DBMS. The capabilities of the spatial request handler will be discussed with illustrations.

It is concluded in the paper that the spatial request handler by manipulating complex, simple and triangular feature classes is an effective means of handling spatial data.



# Abstract for Auto Carto London

Title    Integration of different mapping technologies ..  
Author(s)   Jan Ulc ..  
Affiliation   Intergraph Europe Inc. ....

This paper gives an overview of the design philosophy of Intergraph interactive systems for digital mapping, and reports on company's latest developments in the area of data acquisition and integration.

Hardware foundations include a range of standard processors and peripherals, as well as Intergraph-developed special processors to enhance system performance (incl. an array processor for raster image display and processing) and a range of graphic terminals. Of particular interest is the stand-alone UNIX and IBM-compatible engineering and surveying workstation Interpro32, which can also function as an Intergraph graphic terminal over Ethernet.

Open System Architecture and object-oriented system concepts are being utilized in developing next generation mapping and GIS software.

- In the area of data acquisition:
- a) scanners are gaining acceptance, although not all types of maps are suitable for scanning. The "scanability", automatic feature detection and editing of different types of data will be discussed using practical examples.
  - b) The on-going integration of photogrammetry and interactive graphics resulted in development of first fully integrated photogrammetric workstation Intermap Analytic. INA includes dynamic colour superimposition, interactive graphics and user control in the stereoplotter's field of view. A summary of design objectives, technical characteristics and application software for INA will be presented.
  - c) Raster imagery, either remotely sensed multi-spectral digital image or scanned aerial photographs and other hard copy documents, can now be fully integrated with line-based mapping database. Intergraph's image processing software utilizes standard Intergraph colour terminals and include a range of display, spectral and spatial manipulations.





## Abstract for Auto Carto London

Title Object-oriented mapping and geographic information system

Author(s) Miguel Suarez . . . . .

Affiliation ... Intergraph Europe Inc. . . . .

Object-oriented System and Open System Architecture are new concepts that are being employed by Intergraph to develop database and software foundations for next generation graphic systems.

Under this concept, the information is represented as a set of objects consisting of their own data definition, and a set of operations (methods) for manipulating the data, for carrying out tasks relative to an object, and, most importantly, for communicating with other objects.

Methods are invoked by messages, issued and controlled by an 'object manager'.

Open System Architecture makes code reusable in other programs, and transportable onto other computer environments.

Due to its inherent concept of distance, locality and proximity, the object-oriented system seems particularly suited for implementing new type cartographic and topological GIS databases. New approaches are being investigated to ensure satisfactory performance of interactive edit operations on highly structured databases.

The system further lends itself for integration and display of different data types, such as grid, raster and DTM, for extensive query possibilities, and for expert system possibilities. Progress in developing an object-oriented mapping and GIS system for a stand-alone UNIX environment will be reported, and a prototype demonstrated at the exhibition.



# Abstract for Auto Carto London

Title The Zeiss/Oberkochen PLANICOMP Family for Digital Mapping

Author(s) .. J. Saile ..

Affiliation .... Zeiss/Oberkochen ..

The range of PLANIMAP analytical plotters made by Carl Zeiss/Oberkochen covers the entire field of photogrammetric plotting. While one of the principal applications during the seventies was triangulation measurement, the last few years have also seen the emergence of these instruments in the field of mapping. Two of the reasons for this have been the favourable price/performance ratio and the use of digital mapping.

Digital mapping makes higher demands on the operator who must not only be familiar with the guiding of the floating marks but also with a multitude of commands for the measurement and classification of the objects involved. The efficient handling of the input data and the effective control of their influences are essential for the success of the work performed.

With PLANIMAP, VIDEOMAP and PLANICOMP, Carl Zeiss/Oberkochen offers a complete system for digital mapping. This paper describes the latest new developments in the PLANICOMP family.



# Abstract for Auto Carto London

Title .. .. Extensions in the Zeiss/Oberkochen PLANIMAP System ..

Author(s) ..... .. K. Menke.....

Affiliation .....

The PLANIMAP software system from Carl Zeiss/Oberkochen is used for data acquisition, processing and output with photogrammetric and cartographic instruments. It has been repeatedly extended since 1983.

For direct mapping applications, in particular, the PLANIMAP has provided the user with an exemplary method for some time now. A large number of maps has been produced by the digital method for the first time. The PLANIMAP now offers various new features, permitting rapid and convenient map revision. This is backed up by a further improvement in operator comfort, an extended data structure and by intelligent high-resolution colour screens.

This paper describes the major innovations in the PLANIMAP.



# Abstract for Auto Carto London

Title The Design of Future Archiving Systems to Support Advanced Remote Sensing Programmes

Author(s) D.R. Sloggett, A. Hull

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Future generation remote sensing programmes will provide order of magnitude of more data than current day systems due to the requirements for all weather operation coverage. This will generate larger quantities of data that will require archiving and management.

Collocated, with the raw data obtained from the satellite, ground truth data, calibration data and other sources of tabular information, required for product generation, will be stored within the archive. Single access mechanisms for this data and many other data types that will be stored within such a data centre archive will be essential and the paper discusses that in the context of the UK ERS Data Centre.

The paper features the design of the ERS-1 Data Centre as it has specific archiving problems with a total data rate of 100 Gbytes/day arriving in the course of the mission of the satellite. New technologies for archiving feature in the design and the issues of growth and interfacing with other data centres archived are also addressed.

The paper concludes with estimates of the size of ground data centres archives for many missions that are planned over the next decade and highlights the very real issues of costs of maintaining the data in readily accessible and in a format suitable for processing. The paper also addresses the issue of maintaining an archive of all products as they are generated or archiving of all raw data and generation of products on-demand.



# Abstract for Auto Carto London

"Investigation of Alternative Algorithms for the Transformation of Digital Cartographic Data"

Title .....

Author(s) ..... Ernst Jäger .....

Affiliation ..... Institute of Cartography of Hanover University (FRG) .....

In digital thematic cartography the change of map grids is of great importance. The primary aim is to carry-over the contents of a certain map into another one -with different projection in both maps. By doing this one aspect gets more and more significant : to keep ready cartographic data digitized once for any map projection. This is possible by the successive establishment of a standardized data base (e.g. CORINE-Coordinated Information System of European Environment). In small-scaled map regions ( < 1 : 500 000) the geographic-coordinate-system is the only practicable reference system of a data base.

The transformation of  $x$ ,  $y$ -map coordinates into geographic coordinates  $\varphi$  and  $\lambda$  principally occurs on two alternative ways:

- inverted close projection equations and
- interpolation methods (e.g. power series).

In the Institute of Cartography of Hanover University (FRG) for both methods computer-programs are developed and tested. The accuracy of the results is discussed and compared with results published by other authors. The paper compares advantages and disadvantages of the methods and mentions guiding rules for the selection of the most efficient method under certain conditions.





# Abstract for Auto Carto London

Title Automatic Raised Relief Maps . . . . .

Author(s) M. Claude Palkiewicz . . . . .

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A new type of output for the elevation  
data base of the French Institut Geographique National:  
raised relief maps.

## Introduction

The Institut Geographique National having set France's Altimetry in a data base, the next step was to automatize one of its traditional activities: the production of relief maps. Two studies have been successively undertaken, on hardware and on software.

## Hardware

The aim of the first part of this study was to examine the necessary instruments. It led to the purchase of a Rambda1 numerical controlled milling machine, to the manufacturing of a controller for the concatenation of data transferred and milling sequences and to establishment of a connection with the computer managing the data base. Simultaneously, materials were tested in order to find a bearer allowing milling as well as manual retouching.

## Software

The software is based upon the normalisation of raster files made at the IGN. It is thus possible to treat digital elevation models as well as thematic maps or any file from other sources. Completely modular, the chain of programmes can be divided into three parts:

- preparation programmes, such as introduction of tasks, reversing of relief, placing of houses, cutting out.
- control programmes, such as hill shading and visualisation on a graphic screen.
- the control programme of the milling machine. The aim of this last one is:

- to make all the controls (size, security....)
- to modify the milling parameters (drills, steps....)
- to transfer orders to the controller and to the milling machine. It improves the necessary time by using drills of different size for sketching and touching up.

## Conclusion

The last tests were being made as this summary was written. The first orders should be started in early 1986 and the results could be submitted in September 1986.



# Abstract for Auto Carto London

Title      Design Aspects of a Digital Mapping and Analysis System

Author(s)      Reino Ruotsalainen

Affiliation      Finnmap Oy

The paper will include different aspects when designing an economic system, which is intended to be used especially by urban planners for setting up a digital data base and to manipulate the data for planning purposes.

First, the objective and general principles of the system are specified. The hardware requirements are shortly reported.

Secondly, the software aspects are presented including:

- digitizing software and other input possibilities
- interactive graphic editing software
- plotting software
- attribute data base management and thematic analysis
- utilities software

Finally the experiences with the development of so called MASMAP-system (Mapping and Analysis with Small Format Aerial Photography) are presented. MASMAP-software has been developed by the Finnish company Finnmap and it is based on the above aspects and the specification of ITC (The International Institute for Aerospace Survey and Earth Sciences).





## Abstract for Auto Carto London

Title The problems of implementing Computer Aided Cartography  
in Tertiary College Courses.

Author(s) R. Beard . . . . .

Affiliation Luton College of Higher Education . . . . .

A number of courses exist in the United Kingdom for the education and training of Higher Level Cartographic Technicians. With any vocational course the first problem is to establish the needs of the employer and employee. Always a difficult task, this is made even harder by the inexperience of most employers and the rapidly changing technology. Needs may range from purely operational skills, through editing and design skills to system development and innovation.

To satisfy these needs there are, in practice, a number of aims to be achieved. Firstly a familiarity with the operation of specific hardware and software; secondly an understanding of the underlying principles of computer graphics; and thirdly the application of the first two to cartography.

To achieve these aims colleges are faced with the problems of finding the resources to finance the hardware and software; to provide the expert support that is necessary to install, maintain and develop these; to maintain teaching staff expertise in such a rapidly developing field and to find the necessary teaching time.

There are a number of levels of compromise which can be adopted by a college, for example, the use of personal computers for the teaching of principles and the use of sample packages on college based systems for specific applications.

Of paramount importance is the need to maintain flexibility to accommodate changing demands of industry and technology.



# Abstract for Auto Carto London

Title Teaching design aspects of computer Cartography

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Affiliation ... Oxford Polytechnic, ...

Few computer maps have been produced to production cartographic standards at economic costs or time scales. The full introduction of computer based map production as an integral part of a successful degree in course in Cartography faces similar obstacles. The students have to learn and apply Cartographic design principles, they cannot be impeded or compromised by the use of the computer.

This paper examines the relevance of the standard aspects of the computer mapping syllabus to the computer literate cartographer and to the programmer who is also a computer programmer from the viewpoint of integration into the Cartography degree syllabus both as a digital cartography stream, where appropriate CAD methods are learnt and practised, and for expansion of major areas of subject areas such as surveying, photogrammetry, map projection, terrain analysis and map design. This lays a basis for both the group project and dissertation to be computer based.

The software used is a combined raster and digital database with input via a DTM (itself obtained from surveyed measurements) or direct from a digitiser, combined with the GIMMS thematic mapping package. This exemplifies the bulk of the taught computer cartography material very effectively.

The Oxford Polytechnic Modular Course allows students to combine a large range of subjects. The paper explores the possibilities for those students who choose Computer Science and in particular information systems and software engineering.



# Abstract for Auto Carto London

## CONTOUR-TO-GRID METHODS FOR THE ARAC SYSTEM

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### ABSTRACT

Lawrence Livermore National Laboratory has been concerned with the accidental release of radioactive material into the atmosphere for the past fifteen years. This concern is apparent from their development of the Atmospheric Release Advisory Capability (ARAC), an operation for estimating the concentration of foreign material in both space and time. Such estimates involve the execution of a suite of sophisticated computer simulation programs which use terrain, geographical, meteorological and source concentrations as input. Under optimal conditions, the required data would be readily available. However this rarely happens in actual emergency situations since the data may only be available from secondary sources. For example, digital terrain data for locations outside the continental United States are often nonexistent.

By combining a digitizing system developed by ARAC personnel with a contour-to-grid program developed for ETL by the ZYCOR Corp., ARAC has developed a capability which allows operators to develop digital gridded elevation data from contour maps in an automated fashion. When combined with extensive graphics and editing capabilities currently available, ARAC will have a method for obtaining accurate gridded terrain data for any location for which a contour map exists within a reasonably short time period. The contour-to-grid program is compatible with the programs that currently handle terrain data in the ARAC system. It also has a menu-driven human interface and includes an edit capability. The program allows the selection of either of two numerical techniques for performing grid adjustments. The contour-to-grid system will become an alternate method of obtaining terrain data which is of critical importance to the ARAC project.

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