

Computer Applications and Quantitative Methods in Archaeology



Demonstrations

Friday 26th March 1994

DISH Laboratory A (2 University Gardens) 2.30 - 4.00pm, 4.30 - 5.30pm

Ewan Campbell, Paul Cheetham, Vicky Dale, Sebastian Rahtz, Graham Tilbury and Anja Wolle
TEACHING AND LEARNING TECHNOLOGY PROGRAMME ARCHAEOLOGY CONSORTIUM

Demonstration of a number of courseware packages designed for the teaching of undergraduate archaeology students. Funding for their development has been provided by the UK Higher Education Funding Councils as part of their TLT Programme. Software used includes AuthorWare Professional, Multimedia ToolBook, and Visual Basic. The developers of the various packages will be on hand to demonstrate and discuss the products, and delegates can also try them out for themselves. These and other packages currently under development will be freely available for use in all UK Higher Education institutions.

Modules to be demonstrated and available for use will include:

Archaeology at Work (Paul Cheetham and Roger Martlew) Planning and Heritage issues
Statistics (Vicky Dale and Clive Orton) Introductory statistics for archaeologists
Envarch (Anja Wolle) Environmental Archaeology based on the Avebury region
WinDig (Sebastian Rahtz) Excavation simulation

Other modules will be demonstrated by Ewan Campbell, the Consortium co-ordinator, and will include:

Animal Bone: The identification of animal bone
Field Archaeology: A story-line introduction to field archaeology
Scanning tutorial: Advice for scanning images

DISH Laboratory B (1 University Gardens) 2.30 - 4.00pm

→ **Carlos Reynoso, Damian Castro and Jorge Miceli, Universidad de Buenos Aires, Argentina.**
A GIS MODEL FOR ARCHAEOLOGICAL SPATIAL ANALYSIS

VB-GIS is an experimental computer system for exploration, analysis and statistics on spatial or distributional archaeology. It is a working platform programmed in Microsoft Visual Basic for Windows, strictly based in an artificial intelligence prototype designed in PDC Prolog. It works also on Windows NT and Chicago environments.

The main characteristics of VB-GIS are:

- Compatibility with almost any data format: dBase, Excel, Lotus, Quattro, Paradox, Btrieve, FoxPro, Oracle, SQL Server, Surfer, Arcospace, text files. Full ODBC support for database servers working on any environment. Import of mapfile images from AutoCAD DXF, Arc/INFO, GIMMS CUS, GeoSoft MAP and UK OS NTF formats.
- Full menu and toolbar-oriented operation; no formula typing. Basic statistical tables included.
- Automatic generation of artefact files from analogical data. Mapping of objects on screen, or dragging and dropping of data on the square grid. Constrained or unconstrained random data. Real spreadsheet editing tools, allowing 2 billion rows and columns.
- Interactive mapping design, including specific resources for sites, non-sites, plants and grids. VB7GIS accepts scanned pictures and files in PCX, BMP, RLE, GIF, TIF, TGA, JPEG and WMF format.
- Two-way pasting of any type of data through the Windows clipboard. Includes second generation of Object Linking and Embedding (OLE 2 and OLE Automation). Data types regarding maps and databases include video clips, photos, vector data, spreadsheets, word processor documents, statistic graphs and any data type registered in Windows OLE services.

- Graphic tools for marking regions, with independent zooming and stretching. It is possible to work on several maps at the same time, or to tile partial maps in a composed image.
- Pasting from libraries of pointers, scale rules and archaeological signals.
- Unlimited capabilities of image processing: transparent maps and data, addition, abstraction or subtraction of image elements, image edition through DDE and Object Linking and Embedding, analytical mapping from conceptual data, level integration and segregation, perspective mapping.
- Automatic generation of paper data, with publication quality output of text, tables and graphics.
- Index calculation on intrasite or intersite data, based on quadrats, regions, transects or exact co-ordinates. Contingency tables generation. Nearest neighbour of 32767 orders. The same number (by level) applies to the number of artefacts or artefact types.
- Indexes and graphics: Hodder's A coefficient, Poisson distribution, Morisita curves, contouring and trend surfaces; Bray's, Driver's and V coefficients; Whallon's overlapping clusters analysis and unconstrained clustering; Kintigh's heuristic approach; Pielou's segregation index, dimensional analysis of variance, chi square, spatial scale, Carr's polythetic association index, kriging, MRPP, linear nearest neighbour, Johnson's Local Density Analysis, etc. Additional capabilities on demand. Programable complex functions in Release 1.0.
- Full vector map editing through CAD Control for VB, allowing 65535 levels of data. (Not implemented in pre-release)
- Advanced 3D tools: viewpoint, object orientation and placement control; camera-lens metaphor, parallel and perspective projection; differential lighting; flat and Phong shading; hidden surface removal; texture and patterned mapping; shadows; extruded, rotated, spline, random and arbitrary surfaces; roofs, pits and walls; wireframes; semi-transparencies; contour drawing; vector and matrix operations; preset optimal views.
- Fast bspline, Hermite, Catmulrom, Bezier and Beta interpolated surfaces. Four surfaces can be managed at once.
- Automatic 3D contouring and topographical maps from collar encoding of flat images. VB7GIS accepts scanned physical maps as input, rendering in one step fully configurable 3D projections.
- Photographic lab tools for bright and collar contrast, border smoothing and sharpening, masking, posterizing and filtering. Custom 3x3 filters: High and low pass filters, Isotropic, Laplace, Hough and Sobel transforms, etc
- Pseudo-runtime mode fully configurable for presentation and conferences, with special transition effects (fade, scroll, spiral, morphing) and process embedding. (Not implemented in pre-release)
- Full set of commands for Windows Sound System "Voice Pilot" program. Complex sequences of commands can be controlled by voice.
- Special Postscript facilities for printing and plotting. Grayscale and textures support.
- Statistical graphics in all conventional formats: bars, pies, columns, lines, areas, loglin, scatter, polar, HLC. Full graphic setting and printing. Object-oriented access to specialised graphic programs for bitmaps or vectors.
- Distance, area, angle, surface, random walk and gravity calculation. 'Intelligent' conglomerate mapping using AI techniques.
- Semivariograms and sampling. Integrated simulation and hypothesis testing.

**Carlos Reynoso and Dr. Hugo Jacobaccio, Universidad de Buenos Aires, Argentina.
LLAMAS: A VISUAL-ORIENTED SIMULATION SYSTEM.**

LLAMAS is a simulation system programmed in Visual Basic for Windows. It is designed to test the descriptive adequation of population and ecological data, simulating the dynamics of an American camelidae herd and the archaeological deposition of bones. "Cultural incidence" of several variables operating at once can be introduced.

**Monique van den Dries, Institute for Prehistory, Leiden
AN EXPERT SYSTEM FOR THE ANALYSIS OF USE-WEAR TRACES ON FLINT ARTEFACTS**

The use-wear analysis is a method which is based on visual interpretations and subjective expert knowledge. Attempts are being made to formalise and quantify this knowledge, in order to make it less subjective and to give the method a more standardised character. At the Leiden University, an expert system application is being developed for this purpose. The application is called WAVES, which stands for Wear Analysing and Visualising Expert System. This name refers to the fact that the system supports the process of the analysis and that it uses illustrations of use-wear traces (schematic drawings and photo's) for this purpose. This visual aspect is thought to be very important, because the use-wear analysis is based on visual interpretations. In this way, the system's method of analysis shows a strong resemblance with that of a human analyst. The knowledge on which WAVES is based, is mainly derived from the results of an experimental program (300 experiments with replicated flint tools). These results have been quantified in order to obtain an objective determination of the diagnostic value of different wear-attributes for specific contact-materials and motions. The results of this quantification have been used to compose the application's basic knowledge-rules. Additional knowledge has been gathered from human experts. The application is meant to be used by students as well as by experienced analysts. It offers students a possibility to learn and practice the process of the use-wear analysis and it provides experienced analysts with a means to evaluate their interpretations. The application WAVES is a WINDOWS-program. It runs on a standalone personal computer with a 80386 or 80486 processor. It requires two megabyte internal memory and (at the moment) 30 megabyte hard disk space. In order to obtain a high quality display of the photo's, a graphics card is needed that enables a 256-colour display at a 480x640 resolution (1 MB memory), and a SVGA-colour monitor. WAVES will be available for distribution once its development is finished.

**Tunekazu Kato and Kazumasa Ozawa, Osaka Electro-Communication University, Neyagawa, Osaka,
Japan
A DIGITAL TERRAIN MODEL BASED GIS IMPLEMENTED ON PERSONAL COMPUTER**

A GIS implemented on a notebook type of personal computer with a colour graphic display (liquid crystal) is demonstrated. This system contains data of more than five hundred hill-fort sites and of digital terrain model of a part of Japan. Some special types of information processing will be demonstrated in relation to detecting the ancient beacon networks.

DISH Laboratory B (1 University Gardens) 4.30 - 5.30pm

→ **Carlos Reynoso, Lic. Liliana Manzi, Damian Castro, Jorge Miceli and Diego Diaz , Universidad de Buenos Aires, Argentina.
VB-BASE: A VISUAL DATA BASE FOR ARCHAEOLOGICAL ARTEFACTS.**

VB-BASE is a graphical front-end programmed in Visual Basic for Windows. It can be attached to almost any system design to deal with almost any data structure. SQL commands may be issued and tested against several

data bases and tables, including MS Access, dBase, Btrieve, Paradox, Excel, FoxPro and specialised data base servers on minis and mainframes.

**Mike Rains, Scottish Urban Archaeological Trust
INTEGRATED ARCHAEOLOGICAL DATABASE SYSTEM (IADB)**

The SUAT Integrated Archaeological Database (IADB) system has been designed from the outset as a tool for use in post-excavation analysis and is built around a strictly hierarchical data structure including Finds, Contexts, Sets, Groups and Phases. The IADB takes the form of a "workspace" for the production of, initially, Sets, followed by Groups, and eventually, Phases. The aim is to make available to the post-excavation worker on the desktop (i.e. screen) all the appropriate Level II records (including catalogue data, textual descriptions, plans, photographs and stratigraphic matrices) and accumulating Level III records in a fully cross-referenced and easily accessible form.

**Steve Bullas, Strategic Decisions Ltd
GEOSPAN/GEOFISH**

**Phil Perkins, Dept. of History of Art, Birkbeck College, London
AN ELECTRONIC ANCIENT ROME**

A demonstration of a computerised information system developed at Birkbeck College. The PC based system contains diverse information about the buildings of the ancient city of Rome. Designed as a study aid it contains images, text, graphics, maps, video and bibliographic databases relating to the buildings of Rome. The information is accessed via geographical map based query, bibliographical query or query by name, function and other attributes.

STELLA Laboratory (6 University Gardens) 2.30 - 4.00pm, 4.30 - 5.30pm

**Sara Champion, Dept of Archaeology, University of Southampton
SURFING CAA**

Demonstration and hands-on experience of the far reaches of the Internet ... A laboratory of machines will be devoted to using Gopher to explore the kinds of resources available to archaeologists around the world.

**Department of Archaeology Lecture Room (10 The Square) 2.30 - 4.00pm,
4.30 - 5.30pm (and on the green in front if dry weather!)**

**Vanessa Blake, Geospace Ltd
GROUND PENETRATING RADAR DATA COLLECTION**

Demonstration of ground penetrating radar equipment with an emphasis on data collection.

**Richard Trainor, Leica UK
PENMAP AND ASSOCIATED SURVEY HARDWARE AND SOFTWARE**

Demonstration of the Penmap survey and recording software system developed on a handheld pen computer system, together with associated survey hardware.