

FOREWORD

The problems of gathering papers from authors for any publication is a task fraught with anxiety. To do so with authors from across the globe is an exercise guaranteed to produce stress on all parties. The task of reminding, persuading, enforcing or diplomatically extending deadlines, telexing, telephoning and letter-writing, has fallen to Christine Philbin of Conference Services Ltd. The happiest witness to her unflinching tact and efficiency is the fact that these Proceedings are complete. All authors presenting papers have submitted a full written one (indeed, some have provided several revised versions over the past few months). The only abstracts are, as intended, for shorter presentations and are at the end of Volume 2.

In addition to the logistics of keeping in contact with authors, there has been the task of replacing some papers where previous authors had withdrawn. To do so at short notice, while maintaining the logical consistency of the overall programme, has required an extensive knowledge not only of the people who could be suitable, but also those available to attend the Conference. In this area the manifold international contacts of Peter Dale and David Rhind have functioned magnificently. Not a few of these papers were written under some pressure to meet the publication deadline, and in an era when we promote the proliferation of anonymous computer networks, this proves the continuing necessity of those traditional skills of communication.

The covers for the proceedings have been designed and produced by Lorraine Rutt and George Reeve of Birkbeck College. In Durham, Arthur Corner typeset the title pages, and Eileen Beattie processed the volume overviews. Many thanks to all of them.

Michael Blakemore

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Digital Mapping and Spatial Information Systems

Volume Overview

While the majority of papers in Volume 1 concerned the developments in the methodology and technique, Volume 2 concentrates mainly on a wide range of applications. These range from those that mainly involve computer mapping, to others utilising complex geographic information systems. In geographical scales the studies go from individual townships to collaboration between the countries of the European Economic Community. Agencies involved are at local to national government, private sector consultancies, and utilities companies. The diversity of approaches and applications gives further weight to the need for viable international standards as debated in Volume 1, and highlights also the particular requirements of Auto Carto in the developing countries of the third World.

The initial section sets geographic information systems in an international perspective. At a municipal level Bernhardsen and Tveitdal show there to be positive cost benefits in digital mapping. Large volumes of data (some 20 gigabytes) are the concern of Brand who introduces the development of an integrated database for Northern Ireland. User needs have been identified, and the project is now at the stage of benchmarking proprietary geographic information systems. Nag illustrates the sorts of inter-agency collaboration that can take place in India, where the IRS-1 remote sensing satellite gives them better space technology than most Western nations. Wiggins et.al. use ARC/INFO as the GIS underpinning the CORINE project. This aims to integrate environmental information for the entire European Economic Community, with efficient data transfer between the development sites. Networks also feature importantly in Green and Rhind who detail the existence of a self-driven tutorial interface for ARC/INFO, which academics can access remotely using computer networks such as the U.K. Joint Academic Network (JANET) and British Telecom's Packet Switching Stream (PSS).

Land Information Systems (LIS are to a large extent synonymous with GIS) feature in several studies. Williamson notes that in Australia such systems are still dominantly parcel-oriented, since land valuation systems were the main development influences. In Sweden (Andersson) a particular factor of information systems are freedom of information - although there has been some speculation as to whether this will continue after the recent assassination of their Prime Minister. Smith assesses the possible benefits that would derive with the full computerisation of the resources in the U.K. Land Registry. With some 9.5 million plans and 400,000 index maps a pilot system

in operation by May 1986 should ascertain the feasibility of such a scheme. On a more sanguine note Burrough questions why GIS technology is not a widely used as it could be, citing problems of data imprecision, and the conservatism of many applications areas. He also claims that Remote Sensing has been a drain on finance and brainpower, exacerbated by an existing lack of skilled personnel.

Adequate skilled personnel has as a prerequisite a capable educational and training process. Cooper et al complain that the retraining of cartographic technicians is hindered by the high cost of training, and increasingly limited budgets. Tyrie argues that it is vital to strengthens the training process in the higher education sector, while Fortescue outlines the plans within the Ordnance Survey stressing not only a concern for skills developing within the Agency, also in the school system - the necessary seed-bed of future technocrats. The introduction of computer assistance in an architectural design curriculum is supported by Gimblett and Kelly who stress that it assists in creative thinking by students, an analogy which would hold true with mapping. Specific examples of training programs are provides for the educational sector (ITC) by McGrath, and the Australian Key Centre for LI Studies by Walker. McGrath observes a growing market for employment in spatial data handling (a factor also noted by Duru in the context of Nigeria), but also proposes that in the same way that mechanisms are being derived for the exchange of digital data, so they should be also for exchanging information about teaching methods and course content.

Suitable training for countries in the Third World is addressed in four papers. Taylor stresses the utilisation of 'appropriate' technology using case studies of Nigeria, India and China. In some instances the standard capital intensive methods of digital mapping are less suitable than labour intensive ones - the inverse of most developed world situations. Drummond and Stefanovic list a series of problems incurred when transferring high technology to such areas; notably lack of finance, uncertain qualifications of the labour force, harsh environmental conditions, motivational and political uncertainties. An instance of cost-effective appropriate technology for Zambia is an IBM PC-AT system used for land evaluation purposes (Anker et al). Lastly, Jeyanandan introduces the development of L.I.S. in Trinidad and Tobago.

A series of sessions illustrate Auto Carto activities from the local to national levels. An LIS for the municipality of Vienna is the subject of the study by Wilmersdorf. In Canada, the experience of Burnaby is that computer mapping is only one element of digital spatial data usage, and Wiebe stresses that database facilities which enable efficient management, not just mapping, are crucial - a view concurred by Mahoney who hopes to see what he terms a 'Corporate Information Centre'.

Interrogation of spatial data is important also in the Canadian Department of Energy Mines and Resources electronic atlas (Siekierska and Palko). Pearce elucidates some of the staffing problems that can occur, using the system in operation at the Department of Mines in Western Australia. Data quality suffered initially since temporary staff were used for data preparation, and had a high error rate. Slow data capture and inconsistent data accuracies were some of the problems met during 10 years of digital mapping in Cheshire (Gilfoyle and Challen), where problem solving rather than research solutions were adopted. One of the staffing problems in the U.K. Military Survey (Thompson) is that at a time when new technology is being introduced it is difficult to reward staff adequately because the exigencies of the British economy, and career structures, mean there is a reduction in staff numbers, often inflexible recruiting methods, and a static salary structure. Storage structures which underpin activities in North Rhine - Westfalia are detailed by Barwinski and Bruggermann, and Csillag et al base their soil information system on quadtrees. Four papers specifically address developments in the U.K. The South Western Electricity Board (Hoyland and Goldsworthy) aims to have full automated mapping and facilities management by the early 1990^s. The Wessex Water Authority has digitised its entire water supply network and developed a software system in-house. It now proposes to ask for tenders from GIS systems suppliers, though the authors bemoan the fact that 'the lack of digital map backgrounds in the U.K. is an impediment to developments'. A move to integrate Auto Carto between the Utilities is one role of the National Joint Utilities Group (Ives and Lovett), which is nearing the end of a five year trial set up in 1982 to link activities to Telecoms, Gas, and Electricity among others.

At an agency level, Roberta Franklin the activities of the Defense Mapping Agency in the electronic display of digital data, and Dennis Franklin explains their aim to have all-digital softcopy mapping by the early 1990^s. At present some 50 million sheets a year are produced, and digital access will allow much more flexibility of production, such as specific feature wide extractions. The U.S. Geological Survey (Starr) has projected its requirements to 2000, which includes full production of the 1:24000 scale series, and revision of 5600 topographic quads each year. The USGS National Digital Cartographic Database will utilise advanced data structures that allow more sophisticated attribute and feature identification (Guptill), notably the use of name complexes that will mean feature names such as the Potomac River will include all elements that comprise it such as shorelines, islands, bridges etc. The Australian State of Victoria has a 1:25000 mapping programme (McCull) that was seriously disrupted in 1983 when a fire destroyed a substantial amount of equipment and data.

The photogrammetric updating of 147 sheets of the French

littoral zone (1:25000 scale), comprising some 400,000 polygons, is studied by Grelot and Chambon. A prototype mapping system for the British Geological Survey has been developed (Loudon) in advance of production systems, Hydrographic mapping in the U.K. is benefiting from a new coastal survey vessel with advanced data logging and processing facilities (Dixey, Gobey and Wardle). Sidescan sonar used in the Institute of Oceanographic Sciences (Searle and Hunter) is producing good quality contour mapping 15 times quicker than conventional bathymetric survey. The U.S. National Ocean Service (Lisle) maintains 1000 charts and is moving to its Mark II automated charting system. Key problem areas still exist in this field, and Drinkwater and Fielding stress those of generalisation and digitising. Added to that are legal liability issues, whereby a computer error leading to an erroneous symbol on a chart could result in loss of life. These legal issues are now concerning land surveyors as well, with the threat law-suits increasingly likely.

More methodologically oriented papers involve crucial areas of generalisation. Lodwick, Paine and Ratchinsky evaluate the various techniques of filtering used in enhancing Landsat imagery. A set of models are specifically developed for the generalisation of buildings, road and river networks (Meyer). A gradual move towards idealised fully automated algorithms is questioned by Monmonier who uses the analogy of 'training areas' used in supervised classifications in remote sensing. The deliberate human intervention he proposed may be better than some existing expert systems approaches. A new departure into fuzzy logic is proposed by Vicars and Robinson who see expert systems being useful in the derivation of hierarchical object structures for spatial data peculiar to each scale of mapping. These would then provide some of the 'rules' to be operated on. Lastly, Mark and McGranaghan examine the increasingly topical issue of in-car navigation systems with auto carto display facilities. They question whether this is not an overtly "technology-driven" application area, where the hardware can perform, but the users do not as yet want it to do so. Could it be that actual graphics in vehicles are not always the most useful data - in many cases procedural directions may be preferable.

The economic and commercial aspects of auto carto form a final set of papers. Woodsford carries out a comparison of digitising methods, particularly concentrating on the manual and scanning technologies. Weir and Swetnam stress that any investment must be the result not of costings on the basis of machinery and software, but on a much wider range of "informed" investment appraisals. They give procedures for so doing. The marketing of digital map data is a vital aspect of the U.K. Ordnance Survey's scales development; Leonard lists the marketing techniques they consider.

Marketing strategies are strongly developed in the

private sector. Where agencies and bureaux are competing aggressively against each other there often is an incentive not to distribute data so that competitors can use them easily. The real importance is in the added value that market research can give to data sets. Thorpe gives an overview of the mainly military activities of Scicon, where systems for assessing intervisibility are important component of battlefield digital map usage. Sheath claims that 'a very sound map production has evolved' in the British Petroleum Exploration System. This has had a slow evolution over many years, which he claims has benefitted BP immensely. Two market research bureau in the U.K. are represented. Pinpoint Analysis (Beaumont) have much in-house software which is used effectively to communicate information concisely. Beaumont argues that "information overload is a real danger to efficient and effective marketing". CACI (Harris and Pettigrew) detail a mixture of proprietary systems and home-grown software in their study. The effort required in determining the logistics and timing of a major GIS development are given by Dangermond and Sorensen, here in the case of Baghdad in Iraq. Finally, innovative hardware utilisation and software development are manifested in the BBC's Domesday project (Openshaw and Mounsey). A laser disk stores 500 megabytes of digital data, 50,000 photographs and 20 million words of text. A minicomputer-based enquiry system has generated a vital information source for use primarily in schools (for which it is intended as a low cost database), but also in many commercial areas where such a well structured massive data set has considerable value.