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**Proceedings
of the
GIS Research UK
6th Annual Conference 1998
(GISRUK '98)**

Compiled By

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and
D. Andrew Lewis**

31st March - 2nd April, 1998

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Welcome to GISRUK'98, the 6th annual GIS Research UK conference, and welcome to the University of Edinburgh! On behalf of the local organisers and the GISRUK steering committee, I hope you have a productive, successful and enjoyable conference over the next three days. GISRUK is *your* conference; there is no organisation running it, just individuals and a lot of goodwill. I regard myself merely as a simple caretaker guiding the conference through the current year. The fact that it *is* your conference contributes enormously to its success, which goes from strength-to-strength each year.

At this point, it is worth reviewing the aims which we have set out for the GISRUK conference series:

- to act as a focus for GIS research in the UK
- to provide a mechanism for the announcement and publication of GIS research
- to act as an interdisciplinary forum for the discussion of research ideas
- to promote active collaboration amongst researchers from diverse parent disciplines
- to provide a framework in which postgraduate students can see their work in a national context

To ensure the continued health and development of GIS, we must continue to encourage interdisciplinarity. Geographers remain the majority of GISRUK participants. Although significant minorities come from across Archaeology, Environmental Science, Geomatics, Computer Science and Geology, it is particularly important to encourage participation not only from those interested in applying GIS, but also from those disciplines where GI science and related information technologies are being developed. To achieve this, each GISRUK programme needs not only to reflect the interests and needs of our academic community, but to genuinely cut across traditional discipline boundaries.

The pricing structure for the conference reflects these aims, having been explicitly set to encourage the sharing of ideas and discussion over throughout the three days. This explains why there is no 'day rate' and indeed why we have encouraged you to stay together, as a community, in the University halls.

From the start, GISRUK set out to break the mould and move away from the tendency of many conferences of the early 1990's which seemed only to patronise the great and the good. This year, we have tried to extend the theme of wiping away divisions by including session chairs who are drawn from across the academic spectrum, from postgraduates to professors.

For GISRUK'98, we have a full programme, including keynote addresses from Nancy Tosta (USA) and Menno-Jan Kraak (The Netherlands), research presentations and posters. Although primarily a UK-based conference, the success of GISRUK is such that we attract significant participation from near-Europe and beyond. I particularly welcome our Keynote speakers, who through their internationality, bring us a freshness of ideas.

We continue to be justifiably proud of the high standard of GISRUK presentations. All extended abstracts passed through a rigorous selection process, involving two independent referees. I must thank the referees who have effectively guided me towards the most appropriate allocation between long, short and poster papers.

Very important on the GISRUK agenda are the discussions; whether these are formal in the form of our NGDF panel session, semi-formal in terms of the round table discussions or

indeed entirely informal over a pint of beer, that to many of us is the real success of GISRUK. We have always tried to provide a friendly conference environment which will encourage postgraduates and young researchers, and indeed you will see a number both giving papers and charring sessions. In this spirit, we are offering a prize of £200 for the best presentation by a young researcher at GISRUK'98. The prize was the suggestion of, and generously donated by, Robin McLaren of Know Edge Ltd.

Equally important, as many of you will be aware from previous years, are the social events. These have become an integral part of the GISRUK programme, again extending the openness of these meetings. I had many requests for a whisky tasting, and we have not disappointed. This will involve a guided introduction to a range of 'malts', and will be of equal interest to those who don't partake of the 'cratur'. Undoubtedly once suitably oiled, we can proceed to explore some of the very, very large number of hostelrys for which Edinburgh is justifiably famous. On Wednesday, we have a Wine Reception followed by the Bar, which benefits from another Scottish tradition - the late licence!

Round Table Discussion Sessions

Tuesday night includes the informal round-table discussion sessions. We hope to have the following topics available for discussion:

- Object Oriented GIS - are we researching an approach that will always be so cumbersome that it will never be useful?
- Digital Terrain Modelling: Where are we now? Where are we going?
- Public GIS
- GIS in Support of Traffic and Transport Planning
- Future Census Geography
- Web-Based GIS
- Changing needs of the GIS Industry: Education, Training, Employment and Professionalism
- GIS and tourism management
- Scale issues in the digital world of GIS
- Temporal GIS to model evolution of spatial objects in environmental modelling
- Decision Support Systems in Environmental Planning and Management
- Using GIS in Health - What are the Research Issues

If each of the groups can appoint a rapporteur, we would hope to have feedback on the main issues relating to these discussions fed back as part of the final plenary session.

Poster Papers and Software Demonstrations

The poster papers and software demonstrations are situated in Room 2.02, which is interlinked with the room where Coffee and Tea will be served (2.01). Posters will be on display constantly throughout the conference. Poster presenters and software demonstrators should however be available to show their work from 15.40 Hrs on Wednesday afternoon. Posters can be pinned up from Tuesday morning, and can be removed on Friday afternoon. Poster presenters should please contact Alistair Towers on the local organising committee in relation to any problems. Software demonstrators should contact Steve Dowers if they have problems.

Publishers Exhibition

The publishers exhibition is in the Old Library Reading Room, and the publishers will be in attendance throughout the conference. Your attention is drawn to the newly published *Innovations in GIS 5*, edited by Steve Carver, which is available from the Taylor & Francis stand.

Papers for *Innovations in GIS 6*

As in previous years, it is intended that selected full papers from GISRUK'98 will be published in the book *Innovations in GIS 6*. Both long and short papers will be considered, but you must ensure that TWO COPIES of your FULL PAPER are given to your session chair at the end of your session. The papers will be further refereed, and the time scales within which we have to work are therefore very tight. If we are able to include your paper, we will edit your work and return editor comments to you. You will then be asked to return camera-ready copy of your paper in the form of a finished book chapter. Guidelines on the house style for this camera-ready copy will be issued to you.

Young Researchers Forum

The Young Researcher's Forum, which has taken place just before GISRUK, was organised by William Mackaness, Jane Drummond and Robin Flowerdew, on behalf of RRL.net. The aims of the forum were to:

- foster and encourage research in Geographical Information Science
- raise awareness of key research topics in GIS
- improve the quality of dissemination of results of research
- give career guidance and highlight future opportunities for funding and research

Approximately 20 young researchers attended the forum, which included contributions from our keynote speakers.

Computer and Internet Access

The Geography GIS/Computing Area, in the basement of the Geography building, includes a room of PCs which all have internet access, together with other software including Microsoft Office. You are free to make use of these machines.

At the "Enter Network Password" dialogue box, give the username "VISITOR" (not case sensitive) and choose "OK". Once the automatic login procedure has completed, which takes about 30 seconds, you will be presented with the Windows 95 desktop.

To connect (via telnet) to remote machine, choose "Internet" then "Terminal" from the START menu. In QVT/Term, choose "File", then "Open" and enter the IP address (or number) of the machine you wish to contact. QVT/Term is VT200 compatible.

Once you are finished, choose SHUTDOWN from the START menu, and then choose the **fourth option** "Close all programs and log on as a different user" to return the machine to its initial state. Please **do not** turn the machines off.

Please note the following:

- Other software, including Microsoft Office and the Internet Explorer Web browser are also available.
- You must save any files on a floppy
- You will not be able to print output. If you urgently need to print please see one of our Computing Support staff
- You cannot use pegasus etc. to access a remote mail-box. You can only read mail if you can connect to your mail server using telnet
- You won't be able to use your own machine on our network without reconfiguring it with a new IP address which is within the 'edinburgh' sub-net
- Please do not attempt to change the PC settings

Help and Emergencies

The local organisers can be identified by their BLUE BADGES and should be your first point of contact for assistance. First aiders can be contacted through a local organiser, or via the Departmental Office in the Lister Institute or Geography. Urgent telephone calls can be made from the Geography Departmental Office.

In case of fire, a continuous siren will sound, and you should follow the EXIT signs to the nearest exit. Please take a brief moment to familiarise yourself with the various exits when in each of the rooms. Please do not re-enter the building until clearance is given by the Building Manager.

Minibus Shuttle Service

We will be operating a minibus shuttle service to and from Pollock Halls at the beginning and end of each day. The journey time is approximately 10 minutes. (Pollock Halls are approximately 15 minutes walk from Geography).

TIME	FROM	TO	FREQUENCY
Morning (from 08.00 Hrs)	Pollock Halls (Main Entrance)	Geography Car Park	Every 10 mins Last run at 09:10 Hrs
Evening (Tues) (from 17.00 Hrs)	Geography Car Park	Pollock Halls (Main Entrance)	Approx. every 10 mins Last run at 18:00 Hrs
Evening (Wed) (from 18.00 Hrs)	Geography Car Park	Pollock Halls (Main Entrance)	Approx. every 10 mins Last run at 19:00 Hrs
Close of Conference	Geography Car Park	Pollock Halls (Main Entrance) ✧	On demand (until 14.15 Hrs)

✧ Other destinations by arrangement, subject to availability of minibuses.

GISRUK Organisation

As I have already said, GISRUK is your conference. The Steering Committee always welcomes new ideas and enthusiastic new members. GISRUK will only continue to be successful if it grows along with the community it serves.

Steering Committee

Steve Carver	University of Leeds
Jane Drummond	University of Glasgow
Peter Fisher	University of Leicester
Bruce Gittings	University of Edinburgh
Peter Halls	University of York
Gary Higgs	University of Wales at Cardiff
Zarine Kemp	University of Kent
David Kidner	University of Glamorgan
David Martin	University of Southampton
David Parker	University of Newcastle

Local Organising Committee

Bruce Gittings (Chair)	Sandra Cowie
Steve Dowers	Bob Hodgart
Nick Hulton	Roger Kirby
Andy Lewis	William Mackaness
David Macleod	Tim Malthus
Chris Place	Neil Stuart
Fran Taylor	Alistair Towers

Sponsors

We have been particularly successful in attracting sponsors for GISRUK'98, reflecting the importance given to the academic sector by the broader GIS industry. I am enormously grateful for their generosity in supporting an event which will clearly not have any direct benefits to their balance sheet. In particular I am grateful for the continued and unfailing support of our primary sponsors:

- Association for Geographic Information
- Taylor & Francis

Our other sponsors are equally valued:

- Oxford University Press
- National Geospatial Data Framework
- Know Edge Ltd
- ESRI (UK) Ltd
- PCI Geomatics Ltd.
- Experian Ltd.
- Whitbread Plc.
- CACI Ltd.
- Smallworld
- GeoInformation International

Postscript

There are many people who have contributed to the success of this conference, and I must thank them all. Taking on the organisation of a conference is not something I would recommend! Since I foolishly said "yes" to my fellow 'steerers' two years ago, I have had many sleepless nights. However, the support I have received from all of the others involved, both within and outwith the University of Edinburgh has been remarkable, and undoubtedly prevented many hours of consultation with my psychiatrist!

Nancy Tosta and Menno-Jan Kraak have had a difficult job. We expect them to make a fleeting visit to our country and put their work into a national context which is not their own. I am most grateful to both of them for volunteering for this task!

My colleagues, who have formed our local organising committee, have made my job significantly easier. Things happened - what more can I say! I must also acknowledge the significant assistance of our band of student helpers, especially over the last week. Last, but by no means least, I am enormously grateful to Andy Lewis, who came to Edinburgh expecting to do an M.Sc. in GIS, and ended up organising a conference.

The members of the GISRUK Steering Committee have provided much invaluable advice and support over the past year. Their collective experience in organising these events in previous years has proved enormously helpful. I only hope I can reciprocate to the same extent in the future.

On behalf of the Steering Committee I would like to thank David Parker, who has steadfastly chaired the Steering Committee through the last few years, and following much hard work and a well-deserved promotion has stepped aside. We should also record our thanks Mike Worboys, who perceived the need for these conferences and ran the first of the series in 1993. Both Mike, and now David, have been raised to Professorial greatness, and as such have been excused from the GISRUK Steering Committee!

I must also thank Ray Harris and Anona Lyons in our Reprographics Unit, the Geography secretaries and Sandra Cowie and her team at the Lister Institute.

I am sure that there others who I have forgotten, I thank them too and hope that they, and you, will forgive my inadequacies as a conference organiser.

And finally to yourselves, for without you, the presenters, chairs and participants, we would not have a conference.

**Bruce M. Gittings,
University of Edinburgh,
March, 1998.**

GIS Research UK 1998 - Programme

Tuesday 31st March, 1998

13.00 Opening Session, Davidson Lecture Theatre, Lister Institute
 Welcome: Professor Roland Ibbett, Vice Principal, The University of Edinburgh
 Opening Comments: Bruce Gittings, Department of Geography, The University of Edinburgh

13.15 Plenary Session, Davidson Lecture Theatre, Lister Institute
 Chair: Michael Worboys, Department of Computer Science, Keele University
AGI/NGDF Keynote: *NSDI Was Supposed to be a Verb*
Nancy Tosta, Director of Forecasting and Growth Strategy, Puget Sound Regional Council, USA.
14.00 Panel Discussion: *National Geospatial Data Framework Research Issues*

15.00 Poster Introductions, Davidson Lecture Theatre, Lister Institute
 Chair: David Parker, Department of Geomatics, University of Newcastle

15.30 Break

16.00 - 17.00 Parallel Sessions

<p>Session 1: Managing the Environment Location: High School Yards Lecture Theatre Chair: Jonathan Baldwin, Universities of Leicester & Aberystwyth</p> <p>Investigating the Feasibility of Small On-farm Reservoirs in Staffordshire using a GIS-based Hydrological Model BEALE</p> <p>Spatial Analysis Tools for Measuring Forest Characteristics, Disturbance and Damage MILLER, QUINE & HADLEY</p> <p>Range Information Systems (RIS) for better Planning and Management: A Case Study of Banavasi Range, India SUGAMARAN, FURLEY, PLACE & HARRISON</p> <p>Using GIS to Map the Wilderness Continuum at a National and Local Level FRITZ & CARVER</p>	<p>Session 2: Geodemographics Location: Geography Lecture Theatre Chair: David Martin, University of Southampton</p> <p>The use of Raster Population Surfaces in Epidemiology - Can We Rely on Them? COOPER</p> <p>RISC Neighbourhood FARR</p> <p>A Preliminary Test for Fuzzy Geodemographics FENG & FLOWERDEW</p> <p>Comparison of Alternative Location-Allocation Algorithms KIM & OPENSHAW</p>
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18.00 Dinner, Pollock Halls
19.00 Round Table Discussion Sessions
20.30 Taylor & Francis Whisky Tasting (a social evening based around a introduction to the malt whiskies of Scotland, guided by an expert speaker, with soft drinks available for non-whisky drinkers)

Wednesday 1st April, 1998

09.00 - 10.40 Parallel Sessions

<p>Session 3: Urban Policy Location: High School Yards Lecture Theatre Chair: Gary Higgs, University of Wales at Cardiff</p> <p>Mapping Policy Discourse with CRANE: GIS as a Communication Medium for Spatial Conflict Resolution HORITA</p> <p>Public Participation and the Development Plan: a GIS Approach GILL</p> <p>Urban Morphology in the Context of GIS JIANG & O'SULLIVAN</p> <p>The Diffusion of GIS within the Retail Sector HERNANDEZ, CORNELIUS & BENNISON</p>	<p>Session 4: Cartographic Issues Location: Geography Lecture Theatre Chair: Menno-Jan Kraak, ITC</p> <p>Incremental Generalisation: A Feasibility Study HARRIE</p> <p>AAI -- An Expert System to Control Map Generalization IWANIYAK</p> <p>Small Area Population Geography: A Comparison of Alternative Models for Northern Ireland MARTIN & TATE</p> <p>The Use of Thematic Maps in the Exploration of Geographic Data in a GIS Environment van ELZAKKER</p>
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10.40 Break

11.10 - 12.30 Parallel Sessions	
<p>Session 5: Visualisation Location: High School Yards Lecture Theatre Chair: David Unwin, Birkbeck College</p> <p>Perceptions of Visuality CAMPBELL Visualising Higher Dimensional Spatial Data Sets: What GIS Lacks CHARLTON, BRUNSDON & FOTHERINGHAM Analysing and Visualising Long-Term Change WHITE, GREGORY & SOUTHALL</p>	<p>Session 6: Image Processing Location: Geography Lecture Theatre Chair: Jane Drummond, University of Glasgow</p> <p>Visualizing Historic Landscapes using Digital Photogrammetry MILLER, CAMERON & RAMSAY Object Recognition in Aerial Imagery using Moments Invariant for Dataset Revision TENG & FAIRBAIRN Using Pattern Recognition to Discover Concepts in Spatial Data TURTON</p>

12.30 Lunch, Lister Institute

14.00 - 15.40 Parallel Sessions	
<p>Session 7: Using GIS on the Web Location: High School Yards Lecture Theatre Chair: Sita Smith, University of Edinburgh</p> <p>Spatial Information Systems and the World-Wide Web: Requirements and Issues DE SOUZA BAPTISTA & KEMP Distance Decay effects in Web Server Information Flows MURNION Web Based Geospatial Data Conversion Tools PRADHAN & GITTINGS Developing and deploying a Knowledge Based System (KBS) within KINDS STEHR & BASDEN</p>	<p>Session 8: Spatial Analysis Location: Geography Lecture Theatre Chair: Jan Rigby, University of Lancaster</p> <p>Robust Normalisation in Spatial Data Analysis BRIMICOMBE To Interpolate and Thence to Model, Or Vice Versa? JARVIS & STUART Towards an Integral Strategy for Modelling Uncertainties in Spatial Data: Dialectics and Pragmatics KIRBY & ZHANG Modelling Disease Exposure: Estimating Relative Risk for Motor Neurone Disease in Finland SABEL, GATRELL, LOYTONEN, MAASILTA & JOKELAINEN</p>

15.40 Break

16.00 View Software Demonstrations, Posters and Publishers Exhibition

17.00 - 18.00 Parallel Sessions	
<p>Session 9: Environmental Decision Support Location: High School Yards Lecture Theatre Chair: Steve Carver, University of Leeds</p> <p>A Decision Support Demonstrator for Abiotic Damage to Trees, using a WWW Interface DUNHAM, MILLER & BROADGATE GIS, Environmental Impact Assessment and Scale Issues JOÃO Forestry Prediction by Spatio-Temporal Analysis and Fuzzy Sets MEZZADRI-CENTENO & DESACHY IRDSS – An Innovative Distributed Geographical System, serving Europe by the Use of Emerging Internet Technologies MOORE, PARR, MCCORMICK & MCALISTER</p>	<p>Session 10: Multi-Dimensional Modelling Location: Geography Lecture Theatre Chair: David Kidner, University of Glamorgan</p> <p>Modelling Floodwater Inundation in Space and Time PETER & STUART A Survey of Current Trends in Incorporating Virtual Reality and Geographical Information Systems HAKLAY Borehole Data Management and Volume Calculation KUDOWOR & TAYLOR Multi Dimensional Virtual Reality Geographical Information Systems (VRGIS): Research Guidelines WILLIAMS, MCCARTHY, UNWIN & RAPER</p>

19.00 Oxford University Press Wine Reception, Pollock Halls
19.30 Conference Dinner
 Followed by the Bar (with a traditional Scottish late licence)

Thursday 2nd April, 1998

09.00 - 10.40 Parallel Sessions	
<p>Session 11: Data Models and Databases Location: High School Yards Lecture Theatre Chair: Zarine Kemp, University of Kent</p> <p>An Object Based Approach to a Road Network Definition for an Accident Database BOLDSON & LUPTON</p> <p>ODESSA: An Object-Oriented Deductive Spatial Systems Architecture DINN, PATON & WILLIAMS</p> <p>An integrated Temporal GIS model for Traffic Systems ETCHES, CLARAMUNT, BARGIELA & KOSONEN</p> <p>Intelligent Interpretation of Terminology for Public Access GIS JONES, JONES & TUDHOPE</p>	<p>Session 12: Terrain Models: Applications and Analysis Location: Geography Lecture Theatre Chair: Andrew Lewis, University of Edinburgh</p> <p>Calculating the Line-of-Sight on a DTM: Quantifying the Effect of DTM Scale and Topographic Features DOREY, SPARKES, KIDNER, JONES & WARE</p> <p>A Critical Evaluation of the Potential of Automated Building Height Extraction from Stereo Imagery for Land Use Change Detection JAAFAR & PRIESTNELL</p> <p>The Application of GIS to the Modelling of Snow Drift PURVES, MACKANESS, SUGDEN & BARTON</p> <p>Parallel Distributed Processing for Terrain Visibility Analysis RALLINGS, WARE & KIDNER</p>

10.40 Break

11.10 - 12.00 Parallel Sessions	
<p>Session 13: GIS and the Internet Location: High School Yards Lecture Theatre Chair: Peter Halls, University of York</p> <p>Assessing GIS over the Web: An Aid to Public Participation KINGSTON, CARVER & TURTON</p> <p>Putting the Geographical Analysis Machine on the Internet OPENSHAW, TURTON, MCGILL & DAVY</p> <p>Using GIS to analyse the Spatial Pattern of the Internet in the United Kingdom SHIODE & DODGE</p>	<p>Session 14: Data Effects and Issues Location: Geography Lecture Theatre Chair: David Parker, University of Newcastle</p> <p>Implementing an Object Oriented Approach to Data Quality DUCKHAM</p> <p>Ordnance Survey Geospatial Data Management Systems - The Next Generation MURPHY</p> <p>A GIS Strategy for Controlling Error and Uncertainty Due to Upscaling of Distributed Environmental Models van ROMPAEY, GOVERS & BAUDET</p>

<p>12.00 Plenary Session, Davidson Lecture Theatre, Lister Institute Chair: Bruce Gittings, The University of Edinburgh Taylor & Francis Keynote: <i>The Web, Maps and Society</i> Professor Menno-Jan Kraak, ITC, The Netherlands</p>
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<p>13.00 Closing Session, Davidson Lecture Theatre, Lister Institute</p>

13.30 Close of Conference