

Curriculum Vitae

Roger David BOYLE

The old men say, the Earth only endures

March 11, 2009



Easter 1992, Leeds; it doesn't look like this any more.

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1 Personal details

Born: 21st December 1954, Guildford, Surrey, UK.

Nationality: British

Marital Status: Married, one daughter (born 7th May 1984)

Current Salary: £

Incremental Date: 1st August

Notice required: 6 months

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Education:

-1972 Hele's School Exeter, 8 'O', 4 'A', 1 'S' University of London GCE
1972-1975 York University, BA (I), Mathematics
1975-1978 York University, D.Phil; Research into combinatorial number theory, particularly graphical reconstruction theorems

2 Current position

August 1st 2002 – date: Professor of Computing

August 1st 1994 – July 31st 2002: Senior Lecturer;

October 1st 1984 – July 31st 1994: Lecturer, Division of Artificial Intelligence, School (Department) of Computer Studies, University of Leeds, Leeds, LS2 9JT.

2.1 Offices held

1st August 2004 - date, Head of School: Academic Head of the School of Computing with responsibility for the teaching, research and administration. The School has approximately 70 employees and an annual turnover of several £M. It is aiming to be in the top 10 (at least) of computing research departments, and runs undergraduate and postgraduate programmes of commensurate quality, with approximately 50 registered PhD students.

1st August 1999 - 31st July 2002, Head of Staff Development: With oversight of developmental and promotional affairs for all staff.

1st August 1996 - 31st July 1999, Head of Teaching: With oversight of the management and development of all taught programmes.

Director of Innovative Teaching, March 1993 - 1996 with remit to evangelise for new teaching techniques.

Chair of School Staff meetings, 1992 - 1996 with ex-officio role on School Management Board.

July 1991 - September 1994, Senior Undergraduate Admissions Tutor Governing significant expansion of UG intake (1988: 85, 1991: 109, 1993: 130) against a background of increasing competition from other HE institutions, notably by welcoming non-traditional intake from CFE, Access and other mature entry routes.

October 1988 - June 1991, Undergraduate Admissions Tutor

2.2 Research

2.2.1 Computer vision and pattern recognition: 1984 - date

A Computer Vision group was founded in 1985 (with Dew and Thomas). Side effects were the creation of a new undergraduate module (one of the first in the UK in vision) and procurement of an imaging and vision laboratory. The appointment of Prof. D C Hogg in 1990 consolidated Leeds' position as a leading UK university in this area.

Throughout this time I have been interested in the lower level aspects of segmentation, their influence on higher level interpretation, and the feedback between these two processes. The theme is that low level processes are not an end in themselves, but a means to a higher end. Accordingly, the power or accuracy of low level techniques is often not important, and robust, simple approaches may well be preferable provided contextual knowledge (musical, constraints, syntactic knowledge, shape foreknowledge or whatever is appropriate) may be used to correct misinterpretation or reinforce probable judgements. This has been developed in a variety of domains:

1. Automatic vehicle number plate recognition (SERC funded, with Kirby and Williams).
2. Segmentation of radiographs (SERC funded, with Efford).
3. Efficient clustering techniques (which brought to Leeds Dr N B Venkateswalu (1994-96) from the Birla Institute, Pilani, India for a 2 year Fellowship as winner of the Jawarhal Nehru Fellowship prize).

4. Recognition of patterns in road traffic data using neural networks (funded by SERC/EPSRC three times, with Kirby and Chen).
5. Document analysis: attempts to read handwritten documents in which the predictability and regularity exploited by OCR systems usually breaks down (BT funded, with Thomas and Hanlon), and the automated analysis of musical scores (with Ng).
6. Automatic analysis of combustion chamber images (Shell funded).
7. Tracking and behaviour monitoring, particularly in livestock domains This has seen success in broiler monitoring (with Sergeant and Bulpitt), cattle (Magee) and notably with the Silsoe funded 'Robotic Sheepdog' (with Sumpter et al.). Early success was also demonstrated in monitoring sports team activity (with Needham), in which behaviour might be co-operative (intra-team) or adversarial (inter-team).
8. Medical imaging: issues surrounding 3D MT interpretation (with Hill) and Tera-hertz imaging (with Berry and Handley).

Current projects are

- Techniques for analysis of dynamic MRI, particularly of the MCP joint. We are providing software to assist clinicians in analysis of 4D data sets gathered to monitor rheumatoid arthritis. These are very noisy, and simple visual outputs are of great value (with Kubassova, Radjenovic).
- The robust extraction of watermarks from paper, particularly archaic texts, is of prime interest to paleographers. These data are often delicate and formidably noisy for digital analysis (with Ng, Al-Hiary).
- Visual monitoring of musical performance: score followers (via audio tracking) are becoming common, but are limited and find polyphonics difficult. Marrying visual to audio input is a possible route forward (with Ng, Quedsted).

2.2.2 Issues of Education in HE Computer Science: 1996 - date

Issues surrounding disparate intake, disparate staffing and fast moving curriculum make it widely accepted that CS within the university system has some special characteristics that makes its teaching a peculiar and particular problem of interest to the CS and Education research communities.

1. Project work: the undergraduate project is (nearly) a non-negotiable part of the CS degree whose precise role is not understood, or at least arguable. There is ongoing work in the characterisation of projects in CS (with Fincher, Clark et al.).
2. The motivational issues experienced in modern 'strategic' UGs, especially in a vocational discipline, are also a topic of study (with Jenkins).
3. Characterising the discipline, and identifying its 'community of practice' is an ongoing project (with Clark).
4. Inverting the many research projects into attrition by identifying characteristics of a 'good' student is an issue of clear importance. This is being studied within the discipline (with Clark), where prior qualifications have less relevance (if any) than they do in other science and engineering subjects.
5. The pace of change in the discipline, and transitory nature of some of the curriculum, makes the interface between research and teaching a discipline specific issue. The nature of the integration of research and teaching in traditional and 'new' universities is an ongoing topic of study.

Current projects are

- Curricular materials – predominantly digital – to assist in the motivation of the study of algorithms (with Clark and Briggs).
- The systematic integration of research into the UG curriculum (with Clark and Briggs).

2.2.3 Public awareness of science

I am committed to the communication of what we do to the people who ultimately fund it - the general public. Part of this is to explain the use of the funds we consume, and part is to try to overcome the popular confusion between IT and computer science. I have pursued this outside the university my service on an number of committees and bodies, and within by winning two EPSRC ‘Public Awareness’ awards.

- Modern imaging modalities, 2000: a video resource communicating the work of medical physics and computer science in modern clinical imaging.
- Computing on the buses, 2002: a sequence of posters on buses, supported by web material, to communicate to the public the difference between computer science and IT.

Additionally, I co-ordinated the School’s very high profile participation in the university’s Centenary celebrations (spring 2004).

2.2.4 Other

Trans-Basic: 1982 - 85

This project, funded by Systime, commenced in late 1982, was to supply a BASIC-PLUS interpreter, based on ITC techniques, to run under Unix. A team of three (RDB, McCann, Miller), and eventually two, completed the project in early 1985; in the event, the finished product was far more than an interpreter since the customer required a complete emulation of the RSTS operating system, which involved providing the RSTS environment from within Unix including user-id and file system characteristics. Trans-Basic became Systime’s leading product, and was described in a paper given at the ICX-89 conference in Valparaiso, Chile, June 1989.

Multicast communications: 2000-2003

(With Puanpronpitag) this work addressed the problems of fair use of TCP/IP in the context of layered multicast. A protocol was developed and published in the refereed literature.

Intelligent tutoring systems: 2000-2006

(with Dimitrova, Ibrahim, Kosba) Work has been conducted on the application of schema theory to the development of ITS, and the use of fuzzy reasoning in the development of advisors to teachers.

2.2.5 Postgraduate student supervision

1. (Co-supervisor) Colin Pattinson, 1982-1986: PhD, full-time: ‘Software Methodology in Local Area Networks’. Degree awarded 1986.
2. Boubeker Abdellouche, 1986-1989: PhD, full-time: ‘Knowledge based segmentation’. Mr Abdellouche died of a heart attack mid way through the third year of his work, and did not write up.
3. Peter Williams, 1987-1989: PhD, part-time: ‘Pattern and character recognition in moving traffic’. Mr Williams accepted a paid position with Microsoft, and did not complete.

4. Qiwen Zhang, 1989-1990: PhD, full-time: 'Clustering techniques for vision'. Mr Zhang accepted a paid position in the USA after one year's study, and did not complete.
5. (Co-supervisor) Andrew Crolla, 1989-1991: MPhil, part-time: 'Compression of astronomical images'. Mr Crolla transferred with his co-supervisor to the University of Bradford in 1991, and submitted his thesis there.
6. (Co-supervisor) Roderick Williams, 1989-1995 : PhD, part-time: 'An investigation into the mapping between user interfaces and application systems'. Degree awarded July 1996.
7. Stephen Hanlon, 1990-1994: PhD, full-time: 'A computational theory of contextual knowledge in machine reading'. Degree awarded July 1995.
8. (Co-supervisor) Mark Dougherty, 1991-1997: PhD, part-time: 'Neural networks applied to transport'. Degree awarded 1998.
9. Jonathan Guiton, 1991-1995: PhD, full-time: 'A knowledge-based system for understanding sequences of remotely sensed images'. Mr Guiton chose not to submit a thesis.
10. Kia Ng, 1991-1995: PhD, full-time: 'Automated computer recognition of music scores'. Degree awarded July 1996.
11. (Co-supervisor) Robert Love, 1993-1997: PhD, full-time: 'Reflectance models for VR'. Degree awarded July 1997.
12. Derek Sergeant, 1994-1998: PhD, full-time: 'Poultry tracking from video sequences'. Degree awarded July 1999.
13. Mark Colpus, November 1994-1999: PhD, full-time: 'Automatic monitoring of athletes from video sequences'. Degree awarded 2001.
14. Naomi Hill, 1995-2000: PhD, full-time: '3D medical image registration'. Degree awarded July 2000.
15. Neil Sumpter, 1995-1999: PhD, full-time: 'Animal tracking for a robotic sheepdog'. Degree awarded July 2000.
16. Derek Magee, 1997-2000: PhD, full-time: 'Behaviour monitoring of dairy cattle'. Degree awarded July 2001.
17. Chris Needham, 1999-2003: PhD, full-time: 'Group behaviour monitoring of team games'. Degree awarded July 2004.
18. Rjukan Armstrong, 1999-2000: MSc by research, part-time: 'Segmentation techniques for offline cursive script recognition'. Mr Armstrong chose not to submit a thesis.
19. James Handley, 2000-2003: PhD, full-time: 'Tera-hertz image classification and understanding, Degree awarded July 2004.
20. (Co-supervisor) Daniel Black, 2001 - 2003: PhD, full-time: 'Aspects of phase transition behaviour in constraint satisfaction problems'. Degree awarded July 2003.
21. Somnuk Puangpronpitag, 2000-2003: PhD, full-time: 'A framework for error and congestion control for reliable multicast protocols', Degree awarded July 2003.
22. (Co-supervisor) Peter Millican, 2001-2003: MSc, part-time: 'Turtle: Innovative Software for the Learning of Computing Concepts', Degree awarded July 2004.
23. (Co-supervisor) Zukeri Ibrahim, 2001-2006: PhD, full-time: 'Schema Theory-Based Computational Approach to Support Children's Conceptual Understanding'. Degree awarded 2006.
24. (Co-supervisor) Essam Kosba, 2000-2005: PhD, part-time: 'Generating computer-based advice in web-based distance education environment'. Degree awarded 2005.
25. (Co-supervisor) Elizabeth Minton, 2003-2004 : PhD, full-time: 'Computer support for learning among adult returners'. Ms Minton withdrew from her studies after 1 year.

26. Olga Kubassova, 2004 - : PhD, full-time: 2007 'Techniques to automate DEMRI studies of the MCP joint'. Degree awarded, 2008.
27. (Co-supervisor) Hazem Al Hiary, 2004 - 2008 : PhD, full-time: 'Digital extraction of archaic watermarks'. Degree awarded, 2008.
28. (Co-supervisor) Garry Qusted, 2006 - : PhD, full-time: 'Visual monitoring of musical performance'.

2.2.6 Membership of research centres

1. Centre of Medical Imaging Research, 1994 - date.
2. Centre for the Computational Analysis of Language and Speech, 1987 - date.
3. Interdisciplinary Centre for Scientific Research in Music, 2000 - date. Deputy Director, 2000 - date.

2.3 Teaching

2.3.1 Courses taught

New courses

Data communications and networks (year 2)	1982-92
Concurrent programming (year 3)	1984-86
Computer vision (year 3)	1985-90
(Half) Introduction to Pascal programming (year 1)	1988-91
(Part) Advanced computer architectures (year 3)	1988
Neural networks (year 3)	1989-95
Neural networks (MSc)	1991-92
Professional development (year 3)	1992-5
(Half) Professional development (year 1)	1993-5
Human Computer Interaction (year 2)	1993-6
Neural networks and Applications (MSc)	1995
(Half) Practical Information Systems (year 1)	1995
Perceptual Systems (MSc)	1997-
(Half) Professional development I (year 1)	1998-9
(Half) Professional development II (year 1)	1998-2001
Computer Networks (year 2)	1999-2003
Professional development (year 3)	2005-

Established courses

Pascal to C conversion (all years)	1985-88
Introduction to computer systems (year 1)	1987
Computer Vision (year 3)	1996-1999
Introduction to networked computing (year 1)	2001-2004
Speech and Image Processing (year 2)	2002-2003
Java programming (year 1)	2003-2004

2.3.2 Tutoring and supervision

Routine and regular tutoring of undergraduates through all 3 years of Honours courses in Computer Science, Computing and Information Systems annually.

Supervision of third year undergraduate projects (average 6 per annum) across the whole range of Computer

Science, Computing and Information Systems annually.
Supervision of MSc projects.

2.3.3 Innovation in teaching

I have taken whatever opportunity I can to develop new approaches to delivery, assessment and teaching organisation. Regular requirements to develop new modules (see above) have facilitated this; major contributions include;

1. Co-designer of CS/IS ‘laboratory module’ in 1987; this module engaged the students in free-standing practical work requiring self scheduling and self teaching, based around a core of mandatory 2 week practicals and a range of optional practicals. Co-edited associated handbook, and pioneered introduction of material aimed at developing student techniques and skills rather than pure knowledge.
2. In 1988, one of team of three to re-design ‘introductory programming’ module on purely practical lines; targeting of experienced and inexperienced students with material appropriate to their needs; pioneering of ‘exam-free’ assessment; pioneering of electronic submission and analysis of assessed work; interlocking of programming with software engineering skills.
3. In 1991, at Lupton Flats, Headingley, established first University ‘off-campus’ computer cluster in response to perceived demand for access away from the central site. This benefited students of all departments in all faculties.
4. In 1992, sole designer of module ‘Professional Development’ for delivery to third year students. This was designed to be process rather than content oriented, exposing the students to various aspects of professional IT life (estimating, presentation verbal and written, team working, tendering and overheads). Most material is presented in a student centred fashion, avoiding formal lecturing. The radical approach has been the subject of publication, and specific praise from external assessors (HEFCE, BCS).
5. In 1992, pioneer, with others within the School of Computer Studies, of extensive use of high performance workstations to assist in course delivery, with the stress on the theory and applications of highly visual material (pattern recognition) unsuited to lecture delivery.
6. From 1992, pioneer of ‘open book’ exams, hitherto unusual in a School based on highly fact-oriented assessment.
7. From 1992, member (and from 1993 leader, as Director of Innovative Teaching) of team of three developing novel teaching within the School of Computer Studies (30+ teaching staff). Co-organiser of one day workshops for entire staff on innovative teaching; organiser and member of topic based teams that give inter-related structure and themes to separate modules, overcoming ‘compartmentalising’ effect of university modularisation.
8. In 1993, pioneer of highly managed group projects among first year students. Groupwork in large classes was often detected by students as unjust and was generating low morale; this was overcome by designing project work to communicate and assess practice rather than products among a large class (125 students) in an economical manner.
9. In 1993, developing a mentoring scheme for final year students to oversee the work of first years. This had the dual effect of cascaded learning and profound reflective practice amongst the finalists.
10. From 1995-6, leader and primary architect of group to redesign single Honours degree programmes, streamlining and updating specialist provision and reinforcing a prerequisite structure to ensure the quality of advanced provision. These programmes were implemented during the academic years 1997-2000.
11. From 1996, overall strategic management of the School’s widening participation efforts. These have seen a variety of initiatives from contact with younger schoolchildren through to surveys of opinion in mature applicants. Long term influence on changing the profile of entrants is difficult and labour (and cost) intensive.

12. From 2002-2004, overall strategic management of the School's undergraduate admissions.

2.3.4 Organisation and administration of teaching

1. One of three to organise the School's 1994 TQA submission.
2. One of three to organise the School's 1995 BCS accreditation submission.
3. One of five to organise the School's 2000 BCS accreditation submission.
4. Over a period of years, architect of policy to recruit specialist Teaching Fellows to underpin quality teaching within the School.

2.4 Quality Assurance and accreditation activities

1. Subject accreditor for the British Computer Society since 2001; approximately 3 visits per year: Usually Panel chair since 2005. BCS as the Professional and Statutory Body for computing considers the quality of curriculum, delivery and assessment of taught degrees at nearly all UK universities at 5 year intervals.
2. Discipline assessor for the UK Quality Assurance Agency, 2001-2003. The QAA oversees teaching quality issues; the national regime changed after 2003 to make disciplinary inspections unusual.
3. Panel chair for the Eur-inf prototype inspection of the university of Debrecen, Hungary in March 2008. The Eur-inf project seeks conformance of European accreditation regimes, to assist in international student mobility.
4. Various acts of consultancy, paid and voluntary: these include speaking at events in other institutions (Leeds Metropolitan University, Keele University), advising on the UK QAA computing benchmarks, advising on the Eur-inf protocols, chairing the BCS Accreditation Committee, participating in small BCS working groups to respecify procedures.

2.5 Administrative

I believe university administration at all levels – national, institutional and departmental – needs to listen harder to the voices of the people at the grass roots, and have tried to enable this over many years of committee and other experience.

2.5.1 Membership of National bodies

1. Member of the Learning Development Group of the Conference of Professors and Heads of Computer Science (1999-date). Secretary of Group, 2000-2003, Chair 2003-2006.
2. Member of the ILT Membership Committee, January 2001 - dissolution.
3. Member of the Executive of the Council of Professors and Heads of Computer Science, 2002-2006.
4. Member of the BCS Academic Accreditation and Exemptions Committee, 2002 - date. Vice Chair, 2004, 2005; Chair, 2006,2007.

2.5.2 Membership of University bodies

1. Member of Management Committee of University Artificial Intelligence Research Facility (1984-90).
2. Member of Technical Management Group of University Artificial Intelligence Research Facility (1984-90).
3. Member of Advisory Committee of *Women and New Technology Project*, a DES funded scheme in the University Department of Adult Education (1986-88).
4. Member of the Board of the Faculty of Engineering (1984-87).
5. Member of University Computer User Group, (1985-1997). Secretary, 1990-92; Vice-Chair, 1992-1997.
6. Member of the Board of the Faculty of Science (1985-88, 1991-94).
7. Member of the Board of the Faculty of Arts (1991-92).
8. Member of the management committee of the Multimedia and Computer Based Learning Support Unit (a TLTP project) (1994-1996).
9. Member of the Engineering Faculty Teaching and Learning Committee (1997-1999).
10. Member of the University Expeditions Committee (1999-2005).
11. Member of the University Learning and Teaching Board (1999-2003).
12. Member of the University Affiliated Colleges Forum (Board of the Affiliates and Regional Institutions) (1999-2005).
13. Member of the International Corporate Leadership Programme steering committee, 1999-2002.
14. University Senate, 2004 -

2.5.3 Membership of other bodies

I have served and continue to serve on many School, University, and other bodies:

School Staff/Student Committee, School Library Management Committee, Many *ad hoc* School Committees, School Teaching directorate, School Computer User Group, School Management Board, School Staff Promotions and Development Committee, School Research Committee,

in addition to service on a variety of *ad hoc* groups.

2.6 Technical (1984-90)

2.6.1

During protracted period of staff shortage (1984-87), many duties normally allocated to Computer Officer, including; installation of Artificial Intelligence VAX-11/750 running Berkeley 4.2 Unix; installation of 'York Box' X25 interface; installation of 10Mbps ethernet connecting all School equipment, and other major departments; installation of Sun workstations; installation of 2 Microvax-I's, and associated software procurement; installation of 2 VAX-11/750s, and Software procurement and installation (Ultrix-32); advice and programming support for blind, handicapped student, involving specialist (particularly braille) equipment provision; procurement and installation of CRS 4000 framestore; installation of Sun to VAX ethernet gateway; ongoing software maintenance, including significant upgrades, and 'front line' hardware maintenance; management of all software licensing; management of Computing Assistant.

2.6.2 Software activities

1. *VAX communications*: A project to provide a fast DMA link between two VAX computers, one running VMS and the other Unix; the requirement was (initially) fast file transfer between the two operating systems which both saw heavy local use. The derived solution, while not adhering to accepted networking standards, exploited the characteristics of the two systems and provided the required transfer service, together with remote spooling, from October 1985. This work involved protocol design, implementation and testing from device driver up to user interface level.
2. *Image processing/Vision utilities*: Development of suite for image processing and other low level vision activity in response to demand from School course in Vision (1985). Provision of conversion filters to permit images to be displayed or dumped on a wide range of University equipment.
3. *Database provision*: Programming effort to support a long term project being conducted in the University Adult Education department in conjunction with the TUC to study Centres for the Unemployed, 1987 – 1992. This work is largely database design and support.

3 Previous positions

3.1 April 1st 1982 –September 30th 1984:

Department of Computer Studies, University of Leeds; Computer Officer.

Academic duties: Teaching; Introductory Pascal (year 1), Computational mathematics for physicists (year 2), Parallel processing (year 3), (New course) Data communications and networking (year 2). Tutoring and supervision; routine and regular tutoring of undergraduates through all 3 years of Honours courses in Computer Science and Information Systems annually. Supervision of third year undergraduate projects across the whole range of Computer Science and Information Systems annually.

Technical duties: Systems and application programming on; DEC-10 KI, VAX-11/780 (VAX/VMS), VAX-11/780 (Berkeley Unix), PDP-11/23, Prime 2250, Systime S500 (MPS, Coherent), Ungermann Bass (NET/ONE). User support at all levels. Routine hardware maintenance. User group representation – DECUS, GINO and EUUG.

Administrative duties: Maintenance of comprehensive departmental inventory. Insurance of all departmental equipment. Member of Board of Faculty of Engineering.

Managerial Supervision of Computing Assistant, appointed 1983.

3.2 September 1st 1979 – March 31st 1982:

Department of Computer Studies, University of Leeds; Computing Assistant.

Academic duties: Teaching; Introductory Pascal (year 1), Numerical Analysis (year 1), Computational mathematics for physicists (year 2), (New course) Parallel processing (year 3). Tutoring and supervision; routine and regular tutoring of undergraduates through all 3 years of Honours courses in Computer Science and Information Systems annually.

Technical duties: Systems and application programming on; DEC-10 KI, PDP-11/23, FPS-190L array processor, VAX-11/780 (VAX/VMS), VAX-11/780 (Berkeley Unix), Ungermann Bass (NET/ONE). User support at all levels. Routine hardware maintenance. User group representation – DECUS, GINO and FPS User Group (secretary of founding committee).

Administrative duties: Maintenance of comprehensive departmental inventory. Insurance of all departmental equipment.

3.3 September 25th 1978 – August 31st 1979:

GCHQ, Priors Road, Cheltenham (Civil Service); Grade GCT II.

Duties: Programming and Systems Analysis, classified under Official Secrets Act.

4 Grants and contracts held

PI(s) are **emboldened**.

Research related

1. **C D F Miller**, A P McCann and R D Boyle, £45000, Systime Computers, 1983-86: Research Assistant, Ms G Featherstone. The major output of this project was the *Trans-Basic* product (a complete Unix emulation of the RSTS environment) which was for some time the major Systime product, and which survives successfully under the management of a splinter company.
2. **R D Boyle**, A J Duke and L A C Hunter, £500, University of Leeds Research Fund, 1985: *Machine assisted analysis of historical documents*. Research assistant, Mr S F Wu.
3. **R D Boyle**, £900, Prof G Leedale, 1986: *Pseudo colouring of SEM images*. Research assistant, Mr S Ohlman.
4. **H R Kirby**, F O Montgomery and R D Boyle, £49800, SERC, 1988: *Number plate recognition identification techniques for OD surveys of highway traffic*. Research assistant, Mr P G Williams.
5. **R D Boyle** and R C Thomas, £5000, British Telecom ('CONNEX' initiative), 1990: *Neural Networks in word level text analysis*. A pump-priming project which has influenced my and Mr Thomas's work since it was awarded.
6. **H R Kirby** and R D Boyle, £37102, SERC, 1990-92: *Recognition of road traffic patterns using neural networks* Research assistant, Mr M S Dougherty.
7. **R D Boyle**, £7500, Shell Research, TRC, 1991: *ILESS – Ellipse identification and analysis in combustion chamber images*: A requirement from Shell for automation of a labour intensive task.
8. **R D Boyle**, £45093, SERC, 1991-93: *Knowledge based segmentation and analysis of wrist radiographs*. Research fellow, Dr N D Efford. This project has made significant contributions toward the automation of an essential paediatric technique, and has most successfully introduced the techniques of flexible templating into the medical image analysis domain.
9. **R D Boyle**, £2500, Shell Research, TRC, 1992: *ILESS – Ellipse identification and analysis in combustion chamber images*. Research assistant, Mr G Fletcher. An upgrade to the ILESS system.
10. **H R Kirby** and R D Boyle, £30208, SERC, 1993-94: *Models for traffic forecasting and control using neural networks* Research assistant, Mr M S Dougherty.
11. **R D Boyle**, £1000, University of Leeds Academic Development Fund, 1993: Funds to support the visit of Dr N B Venkateswarlu from Pilani Institute, India.
12. **R D Boyle** and D C Hogg, £138012, SERC, 1993-96: *Intelligent Deformable Models for 2D and 3D Medical Image Segmentation*, Research fellow, Dr A Bulpitt.
13. **R D Boyle**, £10000, Shell Research, TRC, 1993: *ILESS – Ellipse identification and analysis in combustion chamber images*. Research assistant, Mr R Love. An upgrade to the ILESS system.
14. **R D Boyle** £1500, University of Leeds Academic Development Fund, 1994: *A Hindi character database for OCR*. Research Assistant, Ms S Fountain.
15. **R D Boyle** £3000, ULIS, 1994: *Pattern analysis for the 'Automatic nose'*. Research Assistant, Mr N Johnson.
16. **R D Boyle and J M Forbes**, £49300, ADAS/MAFF, 1994: *A poultry house, multi-camera automatic tracker to assist in poultry behaviour monitoring*. Research student, Mr D Sergeant.
17. **R D Boyle** £2500, ULIS, 1995: *Automatic decoding of tachograph discs*. Research Assistant, Ms N Hill.

18. **H R Kirby** and R D Boyle, £78388, EPSRC, 1995-97: *Dynamic traffic monitoring using neural networks*, Research assistant, Mr M S Dougherty.
19. **R D Boyle**, £7.5K, BBSRC, 1995-98: *Low level tracking for the 'robotic sheepdog'* (CASE award to supplement EPSRC quota studentship). Research student, Mr N Sumpter.
20. **R D Boyle**: £1000, Sasakawa Foundation, 1998, *Travel support for Mr N Sumpter, Tokyo, MVA98*.
21. **E Berry**, R D Boyle and D J A Scott: £140K, EPSRC, 1999-2002: *Automatic generation of 3D anatomical models*, Research fellow, Dr A Bulpitt.
22. **M Bell, H Chen and R D Boyle**: £97K, EPSRC, 2000-2002: *Real Time Traffic Information Systems*.
23. **R Hutchinson, R D Boyle et al.**: £78K, EPSRC, 2000-2002: *Analysis system using planar array spectrometry (ASPAS)* (the EPSRC LINK scheme). Research Fellow, Dr R Peterson.
24. **R D Boyle**: £5K, IRISYS and SIRA, 2002: *Analysis of flame properties using IR imaging*. Research Fellow, Dr R Peterson.
25. **R D Boyle**: £5K, IRISYS and SIRA, 2002: *Analysis of flame properties using IR imaging* (renewal). Research Fellow, Dr R Peterson.
26. **D Agius**: £193K, AHRB, 2002-2005: *Reconstructing the Quseir Arabic Documents*.

Teaching and service related

1. **R D Boyle** and B M Smith, £10000, EHE Initiative, University of Leeds, 1992: To assist in the development of teaching initiatives within the School of Computer Studies.
2. **R D Boyle**, £2000, University of Leeds Academic Development Fund, 1992: *Computer Assisted Learning for advanced pattern recognition*. Research assistant, Mr S J Hanlon. Successful project to develop software to introduce complex topics into an undergraduate module via visual presentation.
3. **B M Smith** and R D Boyle, £2000, University of Leeds Academic Development Fund, 1992: *Computer Assisted presentation of recruitment material*. Research assistant, Mr A Bull. Successful project to develop software to aid in undergraduate recruitment, particularly of women and other under-represented minorities.
4. **R D Boyle and T G Gough**, £1000, Higher Level Skills Project, 1993: To participate in an employer survey to determine needs for syllabus change.
5. **R D Boyle**, £4000, EHE and Records of Achievement Initiative, University of Leeds, 1993: *Recording learning and achievement for undergraduate students within the School of Computer Studies*.
6. **R D Boyle and B M Smith**, £5000, University of Leeds Academic Development Fund, 1993: To continue development of teaching initiatives within the School of Computer Studies.
7. **R D Boyle** (and J Prescott, S Rowett, N Silver), £1500, University of Leeds Academic Development Fund, 1993: *Mounting of the BIT-94 conference in Leeds, March 1994*.
8. **R D Boyle** £1200, University of Leeds Academic Development Fund, 1994: *Generation of an electronic prospectus* Research Assistant, Mr J Finch.
9. **R D Boyle** £1200, University of Leeds Academic Development Fund, 1994: *The use of electronic bulletin boards in teaching*. Research Assistant, Mr R Wade.
10. **R D Boyle** and W Griffiths, £5000, EHE, University of Leeds, 1994: *Encouraging undergraduate students from the School of Computer Studies into applying for and taking an industrial 'year out'*.
11. **R D Boyle** £1500, University of Leeds Academic Development Fund, 1995: *The use of electronic bulletin boards in teaching*. Research Assistant, Mr R Wade.

12. **S A Fincher**, R D Boyle et al., £250K, HEFCE Fund for the Development of Teaching and Learning, 1996-1999 (with Universities of Kent, Manchester, OU, Southampton, Teesside, York): *EPCOS – Effective Project Work in Computer Science*.
13. **B Zoltowski**, R D Boyle et al., ECU600K, European Community, 1998-2001 (with Universities of Kalmar (Sweden), Lodz (Poland), Madrid (Spain), Pisa (Italy) Strathclyde, Ulster: *Redesign of syllabus and teaching at the Lodz technical faculty*.
14. **R D Boyle**: £5000, University of Leeds Academic Development Fund, 1997: *Establishment of C & G accreditation for industrial placements*.
15. **R D Boyle**, A Roberts and M Hanson: £4635, Millennium Fund, 1998-2000 *Dissemination of Internet expertise among Year 9/10/11 school-children*.
16. **R D Boyle et al.**: £19K, EPSRC, 2000: *Modern imaging modalities* (the EPSRC ‘Public Understanding of Science’ initiative).
17. **R D Boyle and J R Davy**: £5K University of Leeds, 2000-2002: *Widening participation: analysis of applicants’ choice*.
18. **R D Boyle and M A C Clark**: £1250, LTSN-ICS, 2002: *The value of A-level computing*.
19. **R D Boyle**: £24K, EPSRC, 2002: *Computing on the buses* (the EPSRC ‘Public Understanding of Science’ initiative).
20. **R D Boyle**: £4370, HEFCE (University of Leeds) 2002: *Promotional material in minority languages* (in association with EPSRC ‘Public Understanding’ award).
21. **E Minton** and R D Boyle: £2760, HEFCE (University of Leeds) 2002: *Computer Science master-classes for F.E.*
22. **M A C Clark and R D Boyle**: £85K, Teaching Quality Enhancement Fund 2002-2004: *Novel MSc and CPD for SMEs*.
23. **R D Boyle**: £8K, White Rose Centre of Entrepreneurship, *Enterprise in CS*.
24. **R D Boyle**: £400K, HEFCE 2005-2010, *Centre of Excellence in Teaching and Learning*.

5 Miscellaneous other

5.1 Talks and addresses given

1. February 1982: *VMS: Internals and Externals*, given to the Leeds University Computer Society.
2. October 1st 1982: *Experiences in developing Local Area Network software*, given to a one day conference celebrating 25 years of Computing at Leeds University. This talk was subsequently given by C Pattinson to the IUCC conference at Glasgow, September 1983.
3. 19th September 1986: *Computer Vision*, given to a one day conference on Computer Graphics at Leeds University.
4. 6th March 1987: *Computer Vision* given to the Bradford University M.Sc. course.
5. 1st April 1987: *The Sun workstation as an Image Processing tool*, given to the Sun User Group in Manchester.
6. 22nd February 1988: *Simulated Annealing applied to Stereo Vision*, given to the Department of Computer Studies Visualisation Group.
7. 27th April 1989: *Neural Nets*, given to the Leeds University Artificial Intelligence Research group.
8. 22nd June 1989: *Trans Basic*, given to ICX89, First International Conference on Advanced Computing (Unix), Valparaiso, Chile.
9. 26th-28th June 1989: *Neural Networks*, invited course given to the Department of Electronic Engineering, Universidad Tecnica Federico Santa Maria, Valparaiso, Chile.
10. 27th April 1989: *Handwritten Word Recognition using Neural Nets*, given to the Leeds University Artificial Intelligence Research group.
11. 18th September 1989: *Applications of neural networks to contextual script recognition*, given to the Microcomputer Centre, University of Dundee.
12. 23rd March 1992: *Recognition of Ellipses in Combustion Chamber Images*, given to University of Leeds Vision Group.
13. June 1992: *The use of neural networks to recognise and predict traffic patterns*, given by M S Dougherty to the 6th World Conference on Transport Research, Lyon.
14. April 1994: *Dealing with the media*, Postgraduate workshop given to AISB, Leeds, April 1994.
15. 6th/7th July 1994: An introduction to Neural networks, given to EPSRC workshop on the uses of Neural Networks in Transport.
16. 20th September 1994: *Specification and implementation of an 'Active Learning' Facility*, given to the Active Learning Technology Conference, University of Hull.
17. March 1995: *Tutorial on modern optimisation methods*, given with B M Smith and A Wren to an ORS workshop.
18. March 1995: *Studies of Mixture Preparation in a Spark Ignition Engine using Interferometric Laser Imaging for Droplet Sizing (ILIDS)*, given by S Skippon to the SAE Congress.
19. 11th March 1995: *Changing Learning Culture with Electronic Bulletin Boards*, given to CAL-95, Cambridge.
20. 4th April 1995: *Dealing with the media*, Postgraduate workshop given to AISB, Sheffield, April 1995.
21. 1st September 1995: *Bringing professionalism to Computer Science*, given to the 3rd Annual Conference on the Teaching of Computer Science, Dublin.

22. 11th September 1995: *Tutorial on Neural Nets and Computer Vision*, given with D C Hogg to BMVC-95, Birmingham.
23. 14th September 1995: *Electronic Bulletin Boards as an aid to teaching*, given to CSDN workshop on teaching Computer Science, London.
24. November 1995: *Low and High Level Approaches to OMR*, given by K C Ng to the IEE/BMVA Colloquium 'Document Image Processing for Multimedia Environment', London, 9th November 1995.
25. November 1995: *Automated Optical Music Score Recognition and its Enhancement using High-level Musical Knowledge*, given by K C Ng to the XI Colloquium on Musical Informatics, Bologna.
26. 15th December 1995: *Process gain without content loss using CMC*, given to an SDDU Workshop on Process gain without content loss at the University of Leeds.
27. September 1996: *Generating motivation in new students of IT*, given to the 4th Annual Conference on the Teaching of Computer Science, Dublin.
28. January 9th 1998: *Non-technical issues in UG project work*, given to the EPCOS workshop, University of Leeds.
29. April 8th 1998: *Non-technical issues in undergraduate CS project work*, given to the 'Project 98' workshop, University of Sheffield.
30. April 29th 1998: *Flexible Assessment Criteria*, given to the EPCOS workshop, University of Teesside.
31. March 24th 1999: *Jam yesterday, Jam tomorrow*, given to the Mathematics and Computing Faculty, University of Ulster.
32. June 1999: *The University in the Inner City*, given to ACM ITICSE conference, Krakow, Poland.
33. June 1999: *Curriculum development and change in an international context*, given to ACM ITICSE conference, Krakow, Poland.
34. September 1999: *Computer Science projects - what is a laboratory anyway?*, given to the 'Project 99' workshop, University of Exeter.
35. February 2000: *We track animals too*, given to IPOT 2000, Birmingham.
36. 4th April 2000: Guest speaker at the University of Keele Computer Science 'Teaching and Learning Awayday'.
37. July 2000: *Do it themselves*, given to ITICSE-2000, Helsinki, Finland.
38. July 2000: *Teaching delivery issues - Lessons from Computer Science*, given to IUT-2000, Frankfurt, Germany.
39. July 2000: *The characteristics of successful innovation*, given to IUT-2000, Frankfurt, Germany.
40. 25th April 2001: Co-Chair, CPHC workshop on QAA, Keele University.
41. 30th May 2001: Invited speaker at Leeds Metropolitan University workshop on QAA.
42. 11th June 2001: *What makes them succeed?*, given to the School of Continuing Education, University of Leeds.
43. 6th August 2001: *Do it themselves*, given to ICEE-2001, Oslo, Norway.
44. 7th August 2001: *ICLP - making them more than Engineers*, given to ICEE-2001, Oslo, Norway.
45. 13th March 2002: *Lectures in Computer Science - Why bother?* Staff Development session run for the Department of Computing, University of Ulster.
46. 26th March 2002: *Telematics and networked learning*, Given to the Lifelong Learning Institute seminar, University of Leeds.

47. 14th May 2002: *What are we? Who are we?* Given to the Department of Computer Science, University of Uppsala, Sweden.
48. 1st August 2002: *Computer Scientists: From Innovators to Laggards*, Given to SSGRR(S) 2002, L'Aquila, Italy (with M A C Clark).
49. 27th August 2002: *The Computer Science A-level*, Given to LTSN-ICS Annual Conference, Loughborough, UK (poster presentation).
50. 11th June 2003: *Whom shall we put on the postage stamps?*, Given to University of York Department of Computer Science.
51. October 2003: *Masters benchmarking in CS*, Chair. A 1-day workshop for Heads of computing to discuss Masters strategy.
52. 4th March 2004: *Success predictors in Computer Science*, Panel at SIGCSE Symposium, Norfolk, VA, USA.
53. 6th March 2004: *CS++: Content is not enough*, Paper at SIGCSE Symposium, Norfolk, VA, USA.
54. 28th June 2004: *If Diversity is an Issue, is E-Learning the Solution?*, Paper at ITiCSE 2004, Leeds.
55. 31st March 2005: *A-level computing and preparation for HE*, Paper at ISSEP 2005, Klagenfurt. (with M A C Clark).
56. 31st August 2005: *Ethics in CS project work*, Workshop at the 2004 Conference of HEA-ICS, York (with A Irons).
57. November 2006: *Computer Science in English high Schools: We lost the S, now the C is going*, Paper at ISSEP 2006, Vilnius. (with M A C Clark).
58. July 2008: *Neither washing machine science nor rocket science, but computer science*, Keynote address to ITICSE 2008, Madrid, July 2nd 2008.
59. October 2008: *Seeing the invisible: approaches to looking within paper*, invited talk at 'Text comparison and digital creativity', Text comparison and digital creativity, Amsterdam.

5.2 Conference organisation

1. 10th April, 1986: 'Applications of Industrial Vision', Leeds, organised for the northern chapter of the BPRA.
2. 14th April, 1987: 'Computer Vision', BCS Displays Group, University of East Anglia. Arranged full day of speakers, chaired and gave introductory address.
3. September 22nd - 24th, 1992, British Machine Vision Conference, Leeds, UK. Conference co-organiser with Prof. D C Hogg. Member of paper selection committee.
4. March 17th 1993, 'Script Recognition', organised with Dr A C Downton on behalf of the BMVA and IEE.
5. March 1994, 'BIT-94', organised with J Prescott, S Rowett, N Silver on behalf of JETAI (Europe) at the University of Leeds.
6. January 1998, 'Non-technical issues in project work', Leeds, organised for the EPCOS consortium.
7. July 2001, Organising committee member for ACM ITICSE-01, Canterbury UK. Co-ordinator of Working Groups. Editor of ACM SIGCSE bulletin on final reports.
8. October 2002, Organiser for CPHC-LDG workshop on the Computer Science and IT curriculum, Open University, Milton Keynes.

9. June 2003, Organising committee co-chair for ACM ITICSE-03, Greece.
10. October 2003, Organising committee chair for CPHC workshop on Masters benchmarking in CS, London.
11. June 2004, Organising committee Chair for ACM ITICSE-04, Leeds, UK.
12. 30th March 2007: *50th Jubilee of Computing at the University of Leeds*, a day with VIP lunch (attendance 100), lecture program (led by A Herbert, Microsoft Research), and alumni reception, attended by > 300.
13. 25th April 2007: *Inaugural meeting of the CS project co-ordinators network*, Co-organised with HEA-ICS, University of Leeds.

5.3 Reviewing and refereeing activities

I have reviewed or refereed over many years for:

Journals: *ACM Crossroads, AI Journal, Artificial Intelligence, Dento Maxillo Facial Radiology, Digital Humanities Quarterly Educational Technology and Society, Electronics Letters, EURASIP Journal on Applied Signal Processing, IEE Electronics Letters, IEE Proceedings on Vision, Image and Signal Processing, IEEE Transactions on IP, IEEE Transactions on PAMI, IEEE Transactions on SMC, IEEE Transactions on VT, Image and Vision Computing, International Journal for Engineering Education, International Journal of Sustainable Engineering, ITALICS (e-Journal of the LTSN-ICS), Journal of American Society of Agricultural Engineers, Journal of Computer Science Education, Medical Engineering and Physics, NCAF newsletter, Neural Computing and Applications, Pattern Recognition Letters, Physics Letters A.*

Conferences: Parallel Processing for Computer Vision and Display (Leeds 1988), British Machine Vision Conference (Leeds 1992), 4th Annual Conference on the Teaching of Computing (Dublin 1996), 5th Annual Conference on the Teaching of Computing (Dublin 1997), ACM ITICSE 2000 (Helsinki), 8th Annual Conference on the Teaching of Computing (Heriot-Watt 2000), ACE 2000: Australasian Computing Education Conference (December 2000). ACM SIGCSE 2001: ACM Symposium on CS Education (Charlotte, February 2001), 9th Annual Conference on the Teaching of Computing (UNL 2001), ACM SIGCSE 2002: ACM Symposium on CS Education (N Kentucky, February 2002), 10th Annual Conference on the Teaching of Computing (Galway 2003), IRMA 2003, Information Resources Management Association Conference 2003, Philadelphia, ACM SIGCSE 2003: ACM Symposium on CS Education (Las Vegas, February 2003), 2003 Information Resources management Association Conference (Philadelphia), ACM SIGCSE 2004: ACM Symposium on CS Education (Norfolk Virginia, March 2004). ICPR 2004, International Conference on Pattern Recognition 2004, Cambridge, 13th Annual Conference on the Teaching of Computing (York 2005), ACM SIGCSE 2005: ACM Symposium on CS Education (St Louis, Louisiana, March 2005), ACM ITICSE 2005 (Lisbon), ICAPR/IPC 2005, (Bath), ICER 2005, (Seattle), ACM ITICSE 2006 (Bologna), ACM ITICSE 2007 (Dundee), Informatics Education Europe 2008 (Venice), ACM SIGCSE 2009: ACM Symposium on CS Education, International Conference on Computer Vision Theory and Applications 2009 (Lisbon),

Publishers: Butterworths, Chapman and Hall.

Grants: Austrian Science Fund (analogous to EPSRC), BBSRC, Czech Science Foundation, EPSRC (formerly SERC), LTSN ICS development awards, Leverhulme Trust, PPP Healthcare Trust, University of Manchester Research Support Fund.

Other: *Data processing* magazine.

5.4 Prizes awarded

1. Awarded K M Stott prize for research in mathematics, Department of Mathematics, University of York, 1978.
2. Supervisor of project, 'Reconstruction of axisymmetric images', Mr Stuart Butterfield, 1991, awarded the Buckley prize for best project, School of Computer Studies, University of Leeds.
3. Supervisor of project, 'PC manipulation of METEOSAT images', Mr Roderick Sturdy, 1991, runner up, Business Software Design Competition, 1991 (organised by Computer Associates, BCS and Coopers & Lybrand Deloitte).
4. Co-winner, BMVC-92 poster prize, 'Segmentation of Music Primitives', K C Ng and R D Boyle.
5. Supervisor of project, 'British Information Technology Day 1994', Mr Steven Rowett, 1994, awarded the Buckley prize for best project, School of Computer Studies, University of Leeds.
6. Supervisor of project, 'Prepare to recognise Hindi', Ms Stephanie Fountain, 1995, winner, Softwright innovation award, 1995 (organised by Softwright).
7. Supervisor of project, 'A client-server based medical imaging database system and its applications', Mr Neil Sumpter, 1995, runner up, Softwright innovation award, 1995 (organised by Softwright).
8. Silsoe Research Institute Director's Progress Prize awarded to Neil Sumpter (et al.) for work on the Robotic Sheepdog (PhD) project.
9. 'PFE', Mr Stephane Jaeger, 2000, awarded the Buckley prize for best project, School of Computer Studies, University of Leeds.
10. 'Detecting Lameness in Livestock using Resampling Condensation and Multi-stream Cyclic Hidden Markov Models', D R Magee and R D Boyle, awarded the Best Industrial Paper prize at the 2000 British Machine Vision Conference.
11. 'Providing Responsiveness, Efficiency in Network Utilization and Fairness for Layered Multicast', S Puangpronpitag, R D Boyle and S Sanguanpong, 'Best Paper' prize in *Communication Technologies and Applications* session of The 10th International Conference on Information Systems Analysis and Synthesis, 2004.
12. 'Hide and Seek: Robust Digital Watermarking', S Wilkinson, awarded the national SET prize for best UK Computer Science project, 2005.
13. 'Techniques to automate DEMRI studies of the MCP joint', O Kubassova, awarded the inaugural University of Leeds Sir Peter Thompson Enterprise Award (£5000) to develop commercially ideas emerging from the supervised PhD project.

5.5 Membership of professional and other bodies

Member BCS, 1987-2007; regular member of BCS review panels. Fellow of the BCS, 2007-.

Member, BPRA (now BMVA), 1986-date.

Treasurer, Northern Chapter BPRA (BMVA), 1990-1992.

CEng status awarded, 1989.

Member, *ACM SIG Computer Science Education* 2000-date.

Member, *Institute for Learning and Teaching*, 2000-dissolution.

5.6 Examination activities

External examiner – higher degrees:

1. N H Kodikara, ‘Rule based boundary segmentation of digital angiograms’, Ph.D, UMIST, 1988.
2. T P Ellison, ‘The use of Hough transforms for the detection of stellate lesions in mammographic images’, M.Sc, Manchester, 1988.
3. F A Murray, ‘An investigation into the segmentation of images of cells in metaphase taken from bone marrow preparations’, M.Sc, Manchester, 1988.
4. G Manos, ‘Segmenting radiographs of the hand and wrist using computer vision’, Ph.D, Dundee, 1991.
5. T K L Goh, ‘Object Cues from Edge Segments’, M.Sc, Manchester, 1991.
6. C F Walshaw, ‘Skeletal Maturity Assessments’, M.Sc, Manchester, 1991/92.
7. N S Ndoro, ‘User Interface Design and Implementation for Co-operative Working Systems’, M.Sc., UMIST, 1993.
8. A Al-Taani, ‘Automation of the TW2 bone-age assessment method’, Ph.D, Dundee, 1994.
9. P Huang, ‘Automatic gait recognition via statistical approaches’, PhD, Southampton, 1999.
10. G German, ‘Design and Application of Neural Network Classifiers to Complex Geographic Databases’, PhD, Curtin (Australia), 1999.
11. S J Caulkin, ‘Generating synthetic abnormalities in digital mammograms using statistical models’, PhD, Manchester, 2002.
12. P Katsande ‘Road Follower’, PhD, UMIST, 2002.
13. A French ‘Visual Tracking: from an individual to groups of animals’, PhD, Nottingham, 2005.
14. S Matos, ‘Automatic detection and analysis of cough sounds’, PhD, Leicester, 2007.
15. H Flayeh, ‘Traffic and road sign recognition’, PhD, Napier, 2007.

External examiner – other:

1. The Open university: distance delivered project work. 2000-2001.
2. City College Thessaloniki, Greece, 2003-2005.
3. University of Northumbria, Newcastle, 2003-2007.
4. University of Dundee, 2004-2007.
5. University of Reading, 2006-2009.

Internal examiner – higher degrees:

1. L J Manning, ‘Design and analysis of computational models for programmable VLSI processor arrays’, Ph.D, Leeds, December 1988.
2. H Wang, ‘An Architecture for High Performance Image Processing and its Application for Edge Detection Algorithms’, Ph.D, Leeds 1991.
3. M Kara, ‘Development of Distributed Scheduling Systems with an Application to Office Automation’, Ph.D, Leeds 1991.
4. J Hughes, ‘Automatically acquiring a classification of words’, Ph.D, Leeds 1993.

5. U Jost, 'Probabilistic language modelling for speech recognition', MSc (by research), Leeds, 1995.
6. S Fletcher, 'Model based segmentation of medical images', Ph.D, Leeds, 1995.
7. X Shen, 'Acquisition of 3D shape models from image sequences', Ph.D, Leeds, 1995.
8. S Butterfield, 'Reconstruction of extended environments from image sequences', Ph.D, Leeds, 1997.
9. J Ferneyhough, 'Operation of qualitative spatio-temporal representations from visual input', Ph.D, Leeds, 1997.
10. A Baumberg, 'Learning deformable models for tracking human motion', Ph.D, Leeds, 1996.
11. A Heap, 'Learning deformable models for object tracking', Ph.D, Leeds, 1998.
12. N Johnson, 'Learning object behaviour models', Ph.D, Leeds, 1998.
13. S Rowett, 'Effective CIT support for professional HE and development', Ph.D, Leeds, 1999.
14. A Gauthier, 'Semi-automatic clustering for assisting user navigation of a hyperspace', MSc by research, Leeds, 1999.
15. S Curtis, 'Constraint satisfaction approaches to driver scheduling', Ph.D, Leeds, 2000.
16. V Sudhani, 'Resonstructing the Circle of Willis from MRA Data (A scientific visualization perspective)' MSc, Leeds, 2000.
17. A Galata, 'Learning variable length Markov models of behaviour', Ph.D, Leeds, 2001.
18. S Hassan, 'Simulation-based performance evaluation of TCP-friendly protocols for supporting multimedia', applications in the Internet', Ph.D, Leeds, 2002 and 2003 (examined twice).
19. R Sari, 'Performance Evaluation of Active Network-based Unicast and Multicast Congestion Control Protocols', Ph.D, Leeds, 2003 and 2004 (examined twice).
20. C Lucas, 'Prediction of Protein Function Using Statistically Significant Sub-Structure Discovery', Ph.D, Leeds, 2006.

5.7 Extra-mural activities

1. University of Leeds SCR Social Secretary, 1982-1984.
2. Leeds District Labour Party Computer Officer, 1984-1985.
3. School AUT representative, 1985-2001.
Local committee member 1985-1987, 1994-1998.
National Council delegate.
4. *Computing and New Technology: An Introductory Course*: An Adult Education course, run for computing illiterates from a range of educational backgrounds, 1986. Given under the auspices of the University's Adult Education department.
5. School governor, Lincoln Green Primary School, 1986-1989; Agnes Stewart Church of England High School, 1987-1990; Quarry Mount Primary School, 1988-1990; Abbey Grange Church of England High School, 1990-1992; Notre Dame RC High School, and VI Form College, 1993, Lawnswood High School, 2000-2001.
6. Organiser, School 5-a-side football tournaments, 1987-1992; School cricket team, 1988-1992.
7. Member, Leeds West Community Health Council, February 1989-March 1991.
Vice Chair, April 1990-March 1991.

5.8 Leisure activities

Civic architecture and history; member of Leeds Civic Trust (1989-), The Victorian Society (1991-), Leeds Medical and Dental History Society (1993-).

Local politics; active member of Labour Party since 1983. Served as treasurer, membership secretary and secretary of Branch party. Chair, Leeds Central Constituency LP 1989. Secretary, Leeds NW Constituency LP 1996-99. Candidate (defeated) in District and Metropolitan Council elections.

Founder member and secretary of the Ford-Maguire Leeds radical and socialist history association (1994-).

Rugby League, in particular Leeds RLFC; member, Rugby League Supporters Association (1991-6).

Theatre at all levels; experience of performing and directing.

Sport: casual player of badminton, cricket and squash. Casual swimmer (competitive swimmer for university, 1976-78). Competitive bridge (member, EBU and Garforth Bridge Club [lapsed]).

Gardening: I have reglazed an immense 1930s greenhouse and dug many holes. I have also moved some tons of horse manure.

6 Publications

6.1 Books, parts of books, videos, and websites

- [1] C D F Miller and R D Boyle. *Unix for Users*. Blackwell Scientific Publications, 1984. 220pp.
- [2] C D F Miller and R D Boyle. *Usare l' Unix*. La Nuova Italia Scientifica, 1986. 179pp; Italian translation of *Unix for Users*.
- [3] R D Boyle and R C Thomas. *Computer Vision: A First Course*. Blackwell Scientific Publications, 1988. 210pp.
- [4] C D F Miller, R D Boyle, and A J Stewart. *Unix for Users*. Blackwell Scientific Publications, second edition, 1990. 250pp.
- [5] D C Hogg and R D Boyle, editors. *Proceedings of the British Machine Vision Conference, Leeds, UK, September 1992*. Springer Verlag, 1992. 612pp.
- [6] M Sonka, V Hlavac, and R D Boyle. *Image Processing, Analysis and Machine Vision*. Chapman and Hall, July 1993. 555pp.
- [7] R D Boyle and S J Hanlon. Hidden Markov Models – an online tutorial. http://www.comp.leeds.ac.uk/roger/HiddenMarkovModels/html_dev/main.html, 1995.
- [8] K C Ng, D Cooper, and R D Boyle. Extension of the MIDI File Format: Expressive MIDI - expMIDI. In Eleanor Selfridge-Field, editor, *Beyond MIDI – The Handbook of Musical Codes*, pages 80–98. MIT, August 1997.
- [9] M Sonka, V Hlavac, and R D Boyle. *Image Processing, Analysis and Machine Vision*. Brooks Cole, Pacific Grove, CA, 2nd edition, 1999. 750pp.
- [10] S A Fincher, M Petre, M A C Clark, R D Boyle, P Capon, G Evans, K Mander, and W Milne. *Computer Science Project Work: Principles and Pragmatics*. Springer Verlag, 2001. 267pp.
- [11] R D Boyle and P Coltman et al. Whatever became of X-rays? Modern imaging modalities. University of Leeds, 2001. A video produced with an EPSRC grant under the ‘Public Understanding of Science’ programme.
- [12] R D Boyle, editor. *ACM SIGCSE Bulletin, Vol 33(4)*. ACM, December 2001. Reports of the ITICSE-2001 working groups.
- [13] R D Boyle. Hidden Markov Models. In J M Meij, editor, *Dealing with the data flood: Mining data, text and multimedia*. Netherlands Study Centre for Technology Trends, The Hague, Netherlands, 2003.
- [14] A Roberts and R D Boyle. IT/Community partnerships in an Inner City University. In J Lazar, editor, *Managing IT/Community Partnerships in the 21st Century*, pages 70–87. Idea Group, 2002.
- [15] R D Boyle. Computing on the buses. <http://www.morethanyouthink.com>, 2003. A website and posters produced with an EPSRC grant under the ‘Public Understanding of Science’ programme.
- [16] M Sonka, V Hlavac, and R D Boyle. *Image Processing, Analysis and Machine Vision*. Posts and Telecommunications Press, China, Chinese edition, 2004. ISBN 7-115-11496.
- [17] R D Boyle A McGettrick, R Ibbett, J Lloyd, G Lovegrove, and K Mander, editors. *Grand Challenges in Computing: Education*. BCS, 2005. 26pp.
- [18] R D Boyle. Pre-university issues. In R D Boyle A McGettrick, R Ibbett, J Lloyd, G Lovegrove, and K Mander, editors, *Grand Challenges in Computing: Education*, pages 18–20. BCS, 2005.
- [19] E Berry, R D Boyle, A J Fitzgerald, and J W Handley. Time Frequency Analysis in Terahertz Pulsed Imaging. In I Pavlidis, editor, *Computer Vision beyond the Visible Spectrum*, chapter 9, pages 290–329. Springer Verlag, 2005.

- [20] H Al-Hiary, R D Boyle, K C Ng, and A Regourd. The "Mahdiyya" Qur'an project. <http://www.comp.leeds.ac.uk/mahdiyya-quran>, 2007. University of Leeds, UK and Louvre, Paris, France. We acknowledge the assistance and permission of the University of Leeds Library Special Collections.
- [21] M Sonka, V Hlavac, and R D Boyle. *Image Processing, Analysis and Machine Vision*. Brooks Cole, Pacific Grove, CA, 3rd edition, 2008. 829pp.
- [22] H Al-Hiary, R D Boyle, and K C Ng. The Leeds Arabic texts project. <http://www.comp.leeds.ac.uk/arabictxts>, 2008. University of Leeds, UK, We acknowledge the assistance and permission of the University of Leeds Library Special Collections.

6.2 Journal and conference papers

- [1] R D Boyle. On a problem of R L Graham. *Acta Arithmetica*, 34:163–177, 1978.
- [2] R D Boyle. Reconstructing some bipartite graphs from their spanning trees. *Journal of Combinatorial Theory, series B*, 29(2):272–275, 1980.
- [3] P G Williams, H R Kirby, F O Montgomery, and R D Boyle. Evaluation of video recognition equipment for number plate matching. In *Proceedings of Seminar D, PTRC, September 1988, Bath, UK*, pages 229–235, 1988.
- [4] P G Williams, H R Kirby, F O Montgomery, and R D Boyle. Evaluation of video recognition equipment for number plate matching. In *Proceedings of the Second IEE International Conference on Road Traffic Monitoring, London, UK, February 1989*, 1989.
- [5] A P McCann, R D Boyle, and A Shaw. Trans-Basic: A portable compiler for a widely used commercial language. In E Olguin, H Bosch, P Carvajal, and J Belaustegui, editors, *Proceedings of the First International Conference on Advanced Computing, Universidad Tecnica Federico Santa Maria, 1989*. UTFSM, June 1989.
- [6] R C Thomas, S J Hanlon, and R D Boyle. Directed reading. In *Proceedings of the 1st Annual Conference of the Australasian Society for Cognitive Science, New South Wales University*. Ablex Publishers, 1990.
- [7] R C Thomas and R D Boyle. Recognition of handwritten Pascal source text. In *Proceedings of ACNN '91, Sydney NSW*, pages 271–274. University of Sydney, 1991.
- [8] Q Zhang, Q R Wang, and R D Boyle. A clustering algorithm for data-sets with a large number of classes. *Pattern Recognition*, 24(4):331–340, 1991.
- [9] Q Zhang and R D Boyle. A new clustering algorithm with multiple runs of iterative procedures. *Pattern Recognition*, 24(4):835–848, 1991.
- [10] J E F Baruch, A J Crolla, and R D Boyle. Developments in compression techniques for COSMOS/SuperCOSMOS data. In H T MacGillivray and E B Thompson, editors, *Digitised Optical Sky Surveys, 1991*, pages 153–165. Kluwer Academic, 1992.
- [11] S J Hanlon and R D Boyle. Syntactic knowledge in word level text recognition. In R Beale and J Finlay, editors, *Neural Networks and Pattern Recognition in HCI*. Ellis Horwood, 1992.
- [12] S J Hanlon and R D Boyle. Evaluating a Hidden Markov Model of syntax in a text recognition system. In D C Hogg and R D Boyle, editors, *Proceedings of the British Machine Vision Conference, Leeds, UK, September 1992*, pages 462–471. Springer Verlag, 1992.
- [13] K C Ng and R D Boyle. Segmentation of music primitives. In D C Hogg and R D Boyle, editors, *Proceedings of the British Machine Vision Conference, Leeds, UK, September 1992*, pages 472–480. Springer Verlag, 1992.
- [14] M S Dougherty, H R Kirby, and R D Boyle. The use of neural networks to recognise and predict traffic congestion. *Traffic Engineering and Control*, 34(6):311–314, June 1993.

- [15] K C Ng and R D Boyle. A note to the Center for Computer Assisted Research in the Humanities (CCARH) Technical Research Survey on Optical Recognition of Musical Notation: A Survey of Current Work. In Eleanor Selfridge-Field, editor, *Computing in Musicology: An International Directory of Applications*, volume 9, page 121. CCARH, 193.
- [16] H R Kirby, R D Boyle, M S Dougherty, and S D Clark. Recognition of road traffic patterns using neural networks. In J A Powell and R Day, editors, *Informing Technologies for Construction, Civil Engineering and Transport*, pages 54–63. Brunel University, and SERC, 1993.
- [17] M S Dougherty, H R Kirby, and R D Boyle. Using neural networks to recognise, predict and model traffic. In G Ambrosino, M Boero, and M Bielli, editors, *AI in Traffic Engineering*, pages 233–250. VSP, 1994.
- [18] N B Venkateswarlu, S Balaji, P S V S K Raju, and R D Boyle. Some further results of three stage ML classification applied to remotely sensed images. *Pattern recognition*, 27(10):1379–1396, 1994.
- [19] A R Glover, S M Skippon, and R D Boyle. Interferometric laser imaging for droplet sizing (ILIDS): A method for droplet size measurement in sparse spray systems. *Applied Optics*, 34:8409–8421, 1995.
- [20] N B Venkateswarlu and R D Boyle. New segmentation techniques for document image analysis. *Image and Vision Computing*, 13(7):573–583, 1995.
- [21] R D Boyle. Bringing professionalism to computer science. In S Alexander and P Magee, editors, *Proceedings of the 3rd Annual Conference on Teaching Computer Science, Dublin City University*, pages 31–36. CTC, Dublin City University, August 1995.
- [22] K C Ng and Boyle R D. Recognition and reconstruction of primitives in music scores. *Image and Vision Computing*, 14(1):39–46, 1996.
- [23] K C Ng, R D Boyle, and D Cooper. Low and high level approaches to optical music score recognition. In *Proceedings of the IEE Colloquium on Document Imaging and Multimedia Environments*, pages 3.1–3.6, Savoy Place, London, WC2R 0BL, November 1995. IEE.
- [24] K C Ng, R D Boyle, and D Cooper. Automated optical music score recognition and its enhancement using high-level musical knowledge. In *Proceedings XI Colloquium on Musical Informatics*, pages 167–172, Bologna, November 1995.
- [25] K C Ng, D Cooper, and R D Boyle. Automatic detection of tonality using note distribution. *Journal of New Music Research*, 25:369–381, 1996.
- [26] R D Boyle and A M Jenkins. Generating motivation in new students of IT. In R O'Connor and S Alexander, editors, *Proceedings of the 4th Annual Conference on Teaching Computer Science, Dublin City University*, pages 127–131. CTC, Dublin City University, August 1996.
- [27] K C Ng, D Cooper, and R D Boyle. Handwritten music-manuscript recognition. In *International Computer Music Conference – On the Edge*, pages 354 – 357, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, August 1996.
- [28] D M Sergeant, J M Forbes, and R D Boyle. Computer vision as a tool for monitoring behaviour. *Occasional Publication of the British Society of Animal Science*, 20:77–79, 1996. BSAS Symposium, Leeds, UK, September.
- [29] R D Boyle. Darton, Pontefract and Beyond: An exploration by rail. *Transgressions*, pages 94–89, 1997.
- [30] H Chen, R D Boyle, F O Montgomery, H R Kirby, and M S Dougherty. Motorway incident detection using PCA. In *Proceedings of the IEE Colloquium on Incident Detection and Management*, pages 1/1 – 1/5, London, July 1997.
- [31] N Hill, R D Boyle, and E Berry. A deformable model using probabilistic labelling and statistical relaxation to segment MR volumes. In A Clark, editor, *Proceedings of the British Machine Vision Conference*, Colchester, UK, pages 350–359, 1997.

- [32] N Sumpster, R D Boyle, and R D Tillet. Modelling collective animal behaviour using extended PDMs. In A Clark, editor, *Proceedings of the British Machine Vision Conference*, Colchester, UK, pages 242–251, 1997.
- [33] R D Boyle. Landslide: Labour was robbed. *Leeds Labour Active*, page 14, September 1997.
- [34] R D Boyle and M A C Clark. Non-technical issues in undergraduate CS project work. In M Holcombe, A Stratton, S Fincher, and G Griffiths, editors, *Proceedings of the ‘Project 98’ workshop*, Sheffield, UK, pages 117–128, London, April 1998. Springer Verlag.
- [35] N Hill, R D Boyle, and E Berry. A quantitative evaluation of automatic rigid registration of knee volumes. In E Berry, editor, *Proceedings of MIUA 98*, Leeds, pages 37–40, University of Leeds, UK, July 1998.
- [36] D M Sergeant, R D Boyle, and J M Forbes. Computer visual tracking of poultry. *Computers and Electronics in Agriculture*, 21(1):1–18, 1998.
- [37] R D Boyle. Scaling additional contributions to Principal Components Analysis. *Pattern Recognition*, 31(12):2047–2053, 1998.
- [38] H Chen, R D Boyle, F O Montgomery, and H R Kirby. Unsupervised learning for motorway incident detection. In *Proceedings of the Workshop on Engineering for Intelligent Systems*, Tenerife, February 1998.
- [39] H Chen, R D Boyle, H R Kirby, and F O Montgomery. Identifying motorway incidents by novelty detection. In *Selected Proceedings of the 8th World Conference on Transport Research*, Antwerp, July 1998.
- [40] D R Magee and R D Boyle. Building shape models from image sequences using piecewise linear approximation. In *Proceedings of the British Machine Vision Conference*, Southampton, volume 2, pages 398–408, September 1998.
- [41] N Sumpster, R Vaughn, R D Tillet, R D Boyle, and A J Bulpitt. Learning models of animal behaviour for a robotic sheepdog. In *Proceedings of the IAPR Workshop on Machine Vision Applications*, Tokyo, Japan, November 1998.
- [42] M A C Clark and R D Boyle. A personal theory of teaching computing through final year projects. In *Proceedings of ‘Project ’99’*, Exeter. Springer Verlag, 1999.
- [43] K C Ng, D Cooper, E Stefani, R D Boyle, and N Bailey. Embracing the composer: Optical recognition of handwritten manuscripts. In *Proceedings of the International Computer Music Conference, Beijing*, 1999.
- [44] B Zoltowski, R D Boyle, and J R Davy. Curriculum and teaching delivery change in an international context. In *Proceedings of the 4th Annual SIGCSE/SIGCUE Conference*, pages 33–35, Krakow, Poland, 1999. ACM.
- [45] R D Boyle and A Roberts. The university in the inner city. In *Proceedings of the 4th Annual SIGCSE/SIGCUE Conference*, pages 119–122, Krakow, Poland, 1999. ACM.
- [46] D R Magee and R D Boyle. Building class sensitive models for tracking applications. In *Proceedings of the British Machine Vision Conference*, Nottingham, volume 2, pages 594–603. BMVA, September 1999.
- [47] D R Magee and R D Boyle. Feature tracking in real world scenes (or ‘how to track a cow’). In *Proceedings of the IEE Colloquium on Motion Analysis and Tracking*, London, May 1999. IEE.
- [48] M A C Clark and R D Boyle. A personal theory of teaching computing through final year projects. *Journal of Computer Science Education*, 9:200–214, 1999.
- [49] J Currie-Little, M Granger, R D Boyle, J Gerhardt-Powals, J Impagliazzo, C Janik, N Kubilus, S Lippert, W M McCracken, G Paliwoda, and P Soja. Integrating professionalism and workplace issues into the CIT curriculum. *SIGCSE Bulletin*, January 2000. Report of the ITICSE working group, Krakow, Poland, June 1999.

- [50] M A C Clark and R D Boyle. The characteristics of successful innovation. In *Proceedings of 'Improving University Learning and Teaching' 25th International Conference*, pages 294–299, Frankfurt, Germany, July 2000.
- [51] J E Carter and R D Boyle. Teaching delivery issues – lessons from computer science. In *Proceedings of 'Improving University Learning and Teaching' 25th International Conference*, pages 237–242, Frankfurt, Germany, July 2000.
- [52] R D Boyle. Do it themselves. In *Proceedings of the 5th Annual SIGCSE/SIGCUE Conference*, page 180, Helsinki, Finland, July 2000.
- [53] A J Bulpitt, E Berry, R D Boyle, D J A Scott, and D Kessel. A deformable model, incorporating expected structure information, for automatic 3D segmentation of complex anatomical structures. In *Proc. Computer Assisted Radiology and Surgery (CARS 2000)*, pages 572–577, San Francisco, June 2000.
- [54] A J Bulpitt, E Berry, R D Boyle, D J A Scott, and D Kessel. Integrating expected structure information into a deformable model for automatic 3D segmentation of complex anatomical structures. In *Proc. MIUA, 2000*, pages 103–106, 2000.
- [55] A J Bulpitt, R D Boyle, and J M Forbes. Monitoring behaviour of individuals in crowded scenes. In *Proceedings of the 3rd International Conference on Methods and Techniques in Behavioural Research*, pages 28–30, Nijmegen, Netherlands, August 2000.
- [56] D R Magee and R D Boyle. Spatio-temporal modeling in the farmyard domain. In H Nagel and F Lopez, editors, *Proc. IAPR International Workshop on Articulated Motion and Deformable Objects*, pages 83–95, Palma de Mallorca, Spain, September 2000. Springer Verlag.
- [57] D R Magee and R D Boyle. Detecting lameness in livestock using ‘re-sampling condensation’ and ‘multi-stream cyclic hidden Markov models’. In *Proc. British Machine Vision Conference*, pages 332–341, Bristol, UK, 2000. Winner of Best Industrial Paper Award.
- [58] J Handley, A Fitzgerald, T Loeffler, K Seibert, E Berry, and R D Boyle. Potential medical applications of THz imaging. In *Proceedings of MIUA, 2001*, pages 17–20, 2001.
- [59] J Handley, A Fitzgerald, E Berry, and R D Boyle. Wavelet analysis in medical terahertz pulsed imaging. In *Proceeding of the First International Conference on Biomedical Imaging and Sensing Applications of THz Technology (BISAT2001)*, 2001. Poster.
- [60] R D Boyle. Doing it themselves: experiences across the curriculum. In *Proc. Intl. Conference on Engineering Education*, Oslo, Norway, August 2001. Publication by CD and WWW <http://fie.engr.pitt.edu/icee/>.
- [61] R D Boyle and M A C Clark. Making them more than Engineers. In *Proc. Intl. Conference on Engineering Education*, Oslo, Norway, August 2001. Publication by CD and WWW <http://fie.engr.pitt.edu/icee/>.
- [62] C J Needham and R D Boyle. Tracking multiple sports players through occlusion, congestion and scale. In *Proc. British Machine Vision Conference*, pages 93–102, Manchester, UK, 2001.
- [63] R D Boyle, J E Carter, and M A C Clark. What makes them succeed? Entry, progression and graduation in Computer Science. *Journal of Further and Higher Education*, 26(1):3–18, 2002.
- [64] J E Carter and R D Boyle. Teaching delivery issues – lessons from computer science. *Journal of Information Technology Education*, 1(2):65–77, 2002.
- [65] M A C Clark and R D Boyle. From innovators to laggards: Computer scientists and e-learning. In *Proc. SSGRR(S), 2002* published on CD, L’Aquila, Italy, 2002.
- [66] D R Magee and R D Boyle. Detecting lameness in livestock using ‘re-sampling condensation’ and ‘multi-stream cyclic hidden Markov models’. *Image and Vision Computing*, 20:581–594, 2002.

- [67] J Handley, A Fitzgerald, E Berry, and R D Boyle. Wavelet compression in medical terahertz pulsed imaging. *Physics in Medicine and Biology*, 47(1):3885–92, 2002.
- [68] J Handley, A Fitzgerald, E Berry, and R D Boyle. Approaches to segmentation in medical terahertz pulsed imaging. In A Houston and R Zwiggelaar, editors, *Proceedings of MIUA, 2002*, pages 157–160, 2002.
- [69] C J Needham and R D Boyle. Performance evaluation metrics and statistics for positional tracker evaluation. In *Proceedings of the International Conference on Computer Vision Systems*, number 2626 in LNCS, pages 278–289, Graz, Austria, 2003. Springer Verlag.
- [70] E Kosba, V Dimitrova, and R D Boyle. Fuzzy student modelling to advise teachers in web-based distance courses. In U Hoppe, F Verdejo, and J Kay, editors, *Proc. 11th Conference on AI in Education*, pages 458–460, Sydney, Australia, 2003.
- [71] E Kosba, V Dimitrova, and R D Boyle. Using fuzzy techniques to model students in web-based learning environments. In V Palade, R Howlett, and L Jain, editors, *Proc. 7th International Conference on Knowledge-Based Intelligent Information and Engineering Systems*, pages 222–229, Oxford, 2003. Springer Verlag. Published as LNCS 2774. Session on ‘AI Techniques in Web-Based Educational Systems.
- [72] Z Ibrahim, V Dimitrova, and R D Boyle. SAIC: A computational approach for supporting children’s conceptual understanding. In *AIED2003 supplementary proceedings*, pages 65–70, 2003.
- [73] S Puangpronpitag, R Boyle, and K Djemame. Performance evaluation of layered multicast congestion control protocols: FLID-DL vs. PLM. In *Proc. International Symposium on Performance Evaluation of Computer and Telecommunication System (SPECTS)*, Montreal, Canada, 2003.
- [74] S Puangpronpitag, R Boyle, and K Djemame. Explicit rate adjustment: an efficient congestion control protocol for layered multicast. In *Proc. 11th IEEE International Conference on Networks (ICON)*, pages 179–184, Sydney, Australia, 2003.
- [75] S Puangpronpitag, R Boyle, and S Hassan. Explicit rate adjustment for multi-rate multicast congestion control using the TCP equation and packet-pair probe. In M Ismail, H Azhar, A Abdalla, and K Anuar, editors, *Proc. 9th Asia-Pacific Conference on Communications*, pages 797–801, Penang, Malaysia, September 2003.
- [76] S Puangpronpitag and R Boyle. Performance comparison of explicit rate adjustment with other MRMCC protocols. In S Jarvis, editor, *Proc. 19th UK Performance Evaluation Workshop*, pages 142–153, Warwick, UK, 2003.
- [77] S Puangpronpitag, R D Boyle, and K Djemame. Performance evaluation of layered multicast congestion control protocols: Flid-dl vs. plm. *Simulation Series*, 35(4):428–435, 2003.
- [78] J Handley, A Fitzgerald, E Berry, and R D Boyle. The short time Fourier Transform applied to terahertz pulsed imaging. *Medical Physics*, 30(6):1541, 2003. Abstract. Delivered at AAPM annual meeting, San Diego.
- [79] E Berry, J Handley, A Fitzgerald, W Merchant, R D Boyle, N Zinov’ev, R Miles, J Chamberlain, and M Smith. Multispectral classification techniques for terahertz pulsed imaging: an example in histopathology. *Medical Engineering and Physics*, 26:423–430, 2004.
- [80] S Alexander, J Amillo, R D Boyle, M A C Clark, M Daniels, C Laxer, K Loose, and D Shinnors-Kennedy. Case studies in admissions to and early performance in computer science degrees. *SIGCSE Bulletin*, January 2004. Report of the ITICSE working group, Thessaloniki, Greece, June 2003.
- [81] J Handley, A Fitzgerald, E Berry, and R D Boyle. Discrimination between material in terahertz imaging using wide-band cross ambiguity. *Digital Signal Processing*, 14(2):99–111, 2004.
- [82] J W Handley, R D Boyle, and E Berry. Colour illustration on the cover. *Digital Signal Processing*, 14(2), April 2004.

- [83] E Kosba, V Dimitrova, and R D Boyle. Using fuzzy techniques to model students in web-based learning environments. *International Journal of AI Tools*, 13(2):279–298, 2004.
- [84] R D Boyle and M A C Clark. CS++: Content is not enough. In *Proceedings of 35th SIGCSE Symposium*, pages 422–426, Norfolk, Virginia, March 2004. ACM Press.
- [85] R D Boyle, N Roundtree, T Vilner, and B Wilson. Predictors for success in studying CS. In *Proceedings of 35th SIGCSE Symposium*, pages 145–146, Norfolk, Virginia, March 2004. ACM Press.
- [86] C J Needham and R D Boyle. Multi-resolution template kernels. In *Proceedings of ICPR, 2004*, pages 233–236, Cambridge, UK, 2004.
- [87] S Puangpronpitag, R Boyle, and S Sanguanpong. Providing responsiveness, efficiency in network utilization and fairness for layered multicast. In *Proceedings of the International Conference on Cybernetics and Information Technologies, Systems and Applications*, Orlando, USA, 2004. Best paper of those presented in the session: Communication Technologies and Applications.
- [88] E Minton, R D Boyle, and V Dimitrova. If diversity is a problem, is E-learning the solution? In *Proceedings of the ITICSE-04 Conference*, pages 42–46, Leeds, 2004.
- [89] Z Ibrahim, V Dimitrova, and R D Boyle. Capturing human teachers strategies for supporting schema-based cognitive tasks to inform the design of an intelligent pedagogical agent. In F N Akhras and B du Boulay, editors, *Proceedings of the ITS 2004 Workshop on Modelling Human Teaching Tactics and Strategies*, pages 5–14, Macei, Brazil, 2004.
- [90] E Kosba, V Dimitrova, and R D Boyle. Using student and group models to support teachers in web-based distance education. In L Ardissono, P Brna, and A Mitrovic, editors, *UM2005 User Modeling: Proceedings of the 10th International Conference*, pages 124–133, Edinburgh, Scotland, 2005. Springer Verlag. Also published in the Springer LNCS series, Volume 3538.
- [91] Z Ibrahim, V Dimitrova, and R D Boyle. Development and evaluation of a schema-based pedagogical agent to support children’s conceptual understanding. In *AIED-2005: The 12th International Conference on Artificial Intelligence in Education*, page (Poster), Amsterdam, 2005.
- [92] E M Kosba, V Dimitrova, and R D Boyle. The evaluation of an intelligent teaching advisor for web course management systems. In C-K Looi, G McCalla, B Bredeweg, and J Breuker, editors, *Artificial Intelligence in Education: Supporting Learning through Intelligent and Socially Informed Technology*, pages 370–377. IOS Press, 2005.
- [93] Z Ibrahim, V Dimitrova, and R D Boyle. A schema-based pedagogical agent to support children’s conceptual understanding. In *Workshop on Mixed Language Explanations in Learning Environments (XLANG)*, pages 51–58. AIED 2005, 2005.
- [94] A McGettrick, R D Boyle, R Ibbett, J Lloyd, G Lovegrove, and K Mander. Grand challenges in computing: Education – a summary. *The Computer Journal*, 48:42–48, 2005.
- [95] S Puangpronpitag, P Pruksasri, R D Boyle, and S Sanguanpong. Responsiveness and TCP-friendliness problems of multi-rate multicast congestion control protocols. In *Proceedings of the 4th International Conference on Asian Language Processing and Information Technology (ALPIT 2005)*, pages 107–112, 2005.
- [96] M A C Clark and R D Boyle. The transition from school to university: Would prior study of computing help? In R T Mittermeir, editor, *Proceedings of the International Conference on Informatics in Secondary Schools (ISSEP)*, volume 3422 of *Lecture Notes in Computer Science*, pages 37–45, Klagenfurt, Austria, 2005. Springer Verlag. At <http://www.springerlink.com/index/CRBK1B6NXD0VJX1T>.
- [97] O Kubassova and R D Boyle. Segmentation of 4D natural MR images based upon morphological image analysis and image geometry. In *Proceedings of the Postgraduate Research Conference in Electronics, Photonics, Communications, Networks and Computing Science - PREP’2005*, pages 186–188. EPSRC, 2005.

- [98] O Kubassova, R D Boyle, and M Pyatnizkiy. Bone segmentation in MCP MR data. In *Proceedings of ICAPR 2005*, pages 726–735, Bath, UK, August 2005. Springer Verlag. LNCS 3687.
- [99] J W Handley, N Cohen, R D Boyle, and E Berry. An empirical analysis of noise in pulsed terahertz systems. *Fluctuation and Noise Letters*, 6(1):65–76, 2006.
- [100] N Cohen, J W Handley, R D Boyle, S L Braunstein, and E Berry. Experimental signature of registration noise in pulsed terahertz systems. *Fluctuation and Noise Letters*, 6(1):77–84, 2006.
- [101] S Puangpronpitag, R Boyle, and S Sanguangpong. Explicit rate adjustment (ERA): Responsiveness, network utilization efficiency and fairness for layered multicast. *Journal of Systemics, Cybernetics and Informatics*, 4(6), 2006.
- [102] J Briggs and R D Boyle. What don't they know? In *Proceedings of the ITICSE-06 Conference*, page 343, Bologna, 2006.
- [103] O Kubassova and R D Boyle. Improved parameter extraction from dynamic contrast-enhanced MRI data in RA studies. In *Proceedings of the Joint Disease Workshop, 9th International Conference on Medical Image Computing and Computer Assisted Intervention, MICCAI*, volume 1, pages 64–71, 2006.
- [104] O Kubassova and R D Boyle. Novel method for quantitative evaluation of segmentation outputs for dynamic contrast-enhanced MRI data in RA studies. In *Proceedings of the Joint Disease Workshop, 9th International Conference on Medical Image Computing and Computer Assisted Intervention, MICCAI*, volume 1, pages 72–79, 2006.
- [105] M A C Clark and R D Boyle. Computer science in English high schools: we lost the S, now the C is going. In *Proceedings of the International Conference on Informatics in Secondary Schools (ISSEP)*, number 4226/2006 in LNCS, pages 83–93, Vilnius, Lithuania, 2006. Springer Verlag.
- [106] P Fullick, R D Boyle, M A C Clark, and R Pau. Young people's perceptions of CS as a university course. In *Proceedings of the 2nd International Conference on Informatics in Secondary Schools, ISSEP 2006*, page 701, Vilnius, Lithuania, November 2006.
- [107] O Kubassova, R D Boyle, and S Radjenovic. Quantitative analysis of dynamic contrast-enhanced MRI datasets of the metacarpophalangeal joints. *Academic Radiology*, 14:1189–1200, 2007.
- [108] E M Kosba, V Dimitrova, and R D Boyle. Adaptive feedback generation to support teachers in web-based distance education. *User Modeling and User-Adapted Interaction*, 17:379–413, 2007.
- [109] R D Boyle and A Irons. Teaching computer science: Ethics and projects. In M Quigley, editor, *Encyclopedia of Information Ethics and Security*, pages 208–213. Idea Group Reference, 2007.
- [110] O Kubassova, M Boesen, R D Boyle, M A Cimmino, K E Jensen, H Bliddal, and A Radjenovic. Fast and robust analysis of dynamic contrast enhanced MRI dataset. In *Proceedings of the 10th International Conference on Medical Image Computing and Computer Assisted Intervention*, pages 261–269. Springer Verlag, 2007.
- [111] R D Boyle and J Briggs. Making research internships work. In *Proceedings of the IEEE Conference 'Meeting the Growing Demand for Engineers and Their Educators 2010-2020'*, Munich, 2007.
- [112] O Kubassova, R D Boyle, M Boesen, M A Cimmino, and H Bliddal. Registration of dynamic MRI data and its impact on diagnostic process. In *Proceedings of the Workshop on Analysis of Functional Medical Images, 11th International Conference on Medical Image Computing and Computer Assisted Intervention, MICCAI*, pages 57–64, New York, September 2008.
- [113] G Qusteded, R D Boyle, and K Ng. Polyphonic note tracking using multimodal retrieval of musical events. In *Proceedings of the International Computer Music Conference (ICMC)*, Belfast, 2008. To appear.
- [114] R D Boyle. Neither rocket science nor washing machine science, but computer science. In *Proceedings of the ITICSE-08 Conference*, page 5, Madrid, 2006. Keynote address.

- [115] R D Boyle, R Neagle, and N D Efford. Evolving modes of student use - whither the VLE? In *Proceedings of Informatics Education Europe III*, Venice, 2008. 80-91.
- [116] H Ellwood, E Rivalta, T J Wright, K O'Shea, D C Hogg, and R D Boyle. Imaging dyke induced deformation in the lab. In *Proceedings of IAVCEI 2008*, Reykjavik, 2008. Poster: International Association of Volcanology and Chemistry of the Earth's Interior annual conference.

6.3 Publications to appear

- [1] R D Boyle. Who shall we put on the postage stamps? *Communications of the ACM*, 2009. To appear.
- [2] R D Boyle and H Hiary. Watermark location via back-lighting and recto removal. *International Journal of Document Analysis and Recognition*, 2009. To appear.
- [3] R D Boyle. Seeing the invisible: Computer science for codicology. In W T van Peursen, E Thoutenhoofd, and A van der Weel, editors, *Proceedings of the International Colloquium on the co-production of presence and meaning in digital text scholarship*, Amsterdam, October 2009. Royal Netherlands Academy of Arts and Sciences. Derived from an invited talk.

6.4 Submitted

6.5 Forthcoming

- [1] Seeing the invisible: approaches to looking within paper. In *Proceedings of the International Colloquium on the co-production of presence and meaning in digital text scholarship*, Amsterdam, October 2008. Royal Netherlands Academy of Arts and Sciences. Invited talk.

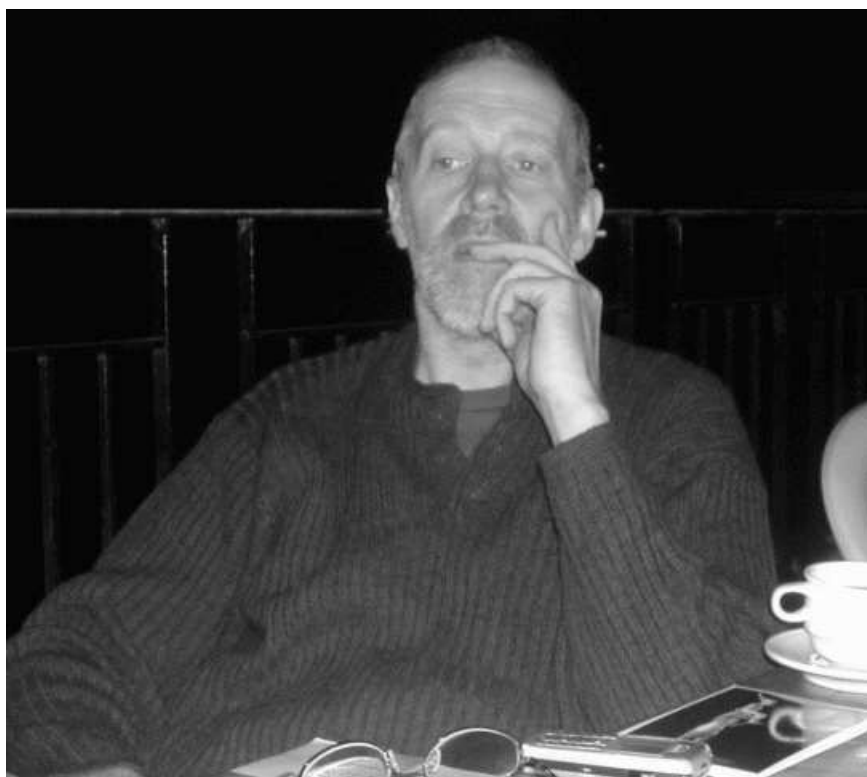
6.6 Other publications

- [1] R D Boyle. *Contributions to the Theories of Numbers and Graphs*. PhD thesis, Department of Mathematics, University of York, 1978.
- [2] P W Garratt, A P McCann, C D F Miller, and R D Boyle. Computer communication projects. Technical Report TR 149, Department of Computer Studies, University of Leeds, 1981.
- [3] P W Garratt, C D F Miller, and R D Boyle. Experiences in developing LAN software. Technical Report TR 190, Department of Computer Studies, University of Leeds, 1983.
- [4] R D Boyle. A fast inter-VAX link. Technical Report TR 211, Department of Computer Studies, University of Leeds, 1986.
- [5] R D Boyle. Use of a fast DR11-W inter-VAX link. Technical Report TR 212, Department of Computer Studies, University of Leeds, 1987.
- [6] R D Boyle, editor. *Artificial Intelligence Research at the University of Leeds*. LAIR, University of Leeds, 1987.
- [7] P G Williams, H R Kirby, F O Montgomery, and R D Boyle. Evaluation of video recognition equipment for number plate matching. Technical Report TR 88/1, School of Computer Studies, University of Leeds, June 1988.
- [8] R D Boyle and R C Thomas. Segmentation of cursive script. Technical Report TR 89/03, School of Computer Studies, University of Leeds, October 1989.
- [9] A P McCann, R D Boyle, and A Shaw. Trans-Basic: A portable compiler for a widely used commercial language. Research Report RR 89/14, School of Computer Studies, University of Leeds, 1989.

- [10] Q Zhang and R D Boyle. A new clustering algorithm with multiple runs of iterative procedures. Research Report RR 90/12, School of Computer Studies, University of Leeds, 1990.
- [11] Q Zhang, Q R Wang, and R D Boyle. A clustering algorithm for data-sets with a large number of classes. Research Report RR 90/20, School of Computer Studies, University of Leeds, 1990.
- [12] R C Thomas, S J Hanlon, and R D Boyle. Directed reading. Research Report RR 91/9, School of Computer Studies, University of Leeds, 1991.
- [13] S J Hanlon and R D Boyle. Syntactic knowledge in word-level text recognition. Research Report RR 91/29, School of Computer Studies, University of Leeds, 1991.
- [14] R D Boyle, editor. *Artificial Intelligence Research at the University of Leeds*. LAIR, University of Leeds, 1991.
- [15] M S Dougherty, H R Kirby, and R D Boyle. The use of neural networks for short-term traffic forecasting. Technical Report ITS Note 297, Institute for Transport Studies, University of Leeds, June 1991.
- [16] H R Kirby, F O Montgomery, and R D Boyle. Number plate identification techniques for O-D surveys of highway traffic. Technical Report ITS Note 308, Institute for Transport Studies, University of Leeds, February 1992.
- [17] M S Dougherty, H R Kirby, and R D Boyle. Models for traffic forecasting and control using neural networks. Technical Report ITS Note 313, Institute for Transport Studies, University of Leeds, March 1992.
- [18] M S Dougherty, H R Kirby, and R D Boyle. The use of neural networks for short-term traffic forecasting. Research Report ITS Working paper 361, Institute for Transport Studies, University of Leeds, June 1992.
- [19] H R Kirby, R D Boyle, and M S Dougherty. Recognition of road traffic patterns using neural networks. Technical Report ITS Note 319, Institute for Transport Studies, University of Leeds, May 1992.
- [20] R D Boyle. Specification and implementation of an 'Active Learning' Facility. Technical report, School of Computer Studies, University of Leeds, 1994. TR 94.8.
- [21] N B Venkateswarlu and R D Boyle. Some new initialisation techniques for LBG and moving clustering methods and their use for vector quantization of images. Research Report SCS 94.8, School of Computer Studies, University of Leeds, March 1994.
- [22] N B Venkateswarlu, S Balaji, P S V S K Raju, and R D Boyle. Some Further Results of Three Stage ML Classification Applied to Remotely Sensed Images. Research Report SCS 94.9, School of Computer Studies, University of Leeds, March 1994.
- [23] N B Venkateswarlu and R D Boyle. A new low complexity distance and its use for vector quantization of images. Research Report SCS 94.10, School of Computer Studies, University of Leeds, March 1994.
- [24] K C Ng and R D Boyle. Reconstruction of music scores from primitive subsegmentation. Research Report SCS 94.12, School of Computer Studies, University of Leeds, April 1994.
- [25] R D Boyle, J Jackson, and R J Wade. Changing learning culture with electronic bulletin boards. Research Report SCS 95.2, School of Computer Studies, University of Leeds, January 1995. Presented to *CAL-95, University of Cambridge, April 1995*. Submitted to *Computers in Education*.
- [26] R D Boyle. Bringing Professionalism to Computer Science. Research Report SCS 95.22, School of Computer Studies, University of Leeds, 1995. To be presented to the *3rd Annual Conference on the Teaching of Computing, Dublin City University, Ireland, September 1st 1995*.
- [27] R D Boyle. Exercising management among IT graduates. Research Report SCS 95.21, School of Computer Studies, University of Leeds, 1995. Submitted to *IEE Engineering Science and Education*.
- [28] K C Ng, R D Boyle, and D Cooper. Automatic Detection of Key Signature using Note Distribution. Research Report SCS 95.23, School of Computer Studies, University of Leeds, 1995. Submitted to *The Journal of New Music Research*.

- [29] K C Ng, D Cooper, and R D Boyle. Extension of the MIDI File Format: Expressive MIDI - expMIDI. Research Report SCS 95.27, School of Computer Studies, University of Leeds, 1997. Published in 'The Handbook of Musical Codes', Selfridge-Field, E. (CCARH, Stanford University) (ed.).
- [30] H R Kirby, R D Boyle, and M S Dougherty. Dynamic traffic monitoring using neural networks. Technical Report ITS Note 379, Institute for Transport Studies, University of Leeds, May 1995.
- [31] R D Boyle and A M Jenkins. Generating motivation in new students of IT. Research Report SCS 96.19, School of Computer Studies, University of Leeds, 1996. Given to 4th CTCS, Dublin, August 1996.
- [32] N Hill, R D Boyle, and E Berry. A deformable model using probabilistic labelling and statistical relaxation to segment MR volumes. Research Report SCS 97.23, School of Computer Studies, University of Leeds, 1997. Presented to BMVC 97.
- [33] N Sumpter, R D Boyle, and R Tillet. Modelling collective animal behaviour using extended PDMs. Research Report SCS 97.24, School of Computer Studies, University of Leeds, 1997. Presented to BMVC 97.
- [34] R D Boyle. Scaling additional contributions to Principal Components Analysis. Research Report SCS 97.40, School of Computer Studies, University of Leeds, 1997. Submitted to Pattern Recognition.
- [35] K C Ng, R D Boyle, and D Cooper. Domain knowledge enhancement of optical music score recognition. Research Report ESRRS 1991-01, Department of Music, University of Leeds, 1997.
- [36] D M Sergeant, R D Boyle, and J M Forbes. Computer visual tracking of poultry. Research Report SCS 98.02, School of Computer Studies, University of Leeds, 1998. Accepted for 'Computers in Agriculture'.
- [37] R D Boyle. Non-technical issues in undergraduate CS project work. In M Holcombe, editor, '*Project 98' workshop*', pages 15–24, Sheffield, UK, April 1998.
- [38] H R Kirby, F O Montgomery, and R D Boyle. Dynamic traffic monitoring using neural networks. Research Report TRI DTM/98/01, Transport Research INstitute, Napier University, 1998.
- [39] D R Magee and R D Boyle. Building shape models from image sequences using piecewise linear approximation. Research Report SCS 98.15, School of Computer Studies, University of Leeds, 1998. To be presented at BMVC 98.
- [40] D R Magee and R D Boyle. Improving class separation in principal component analysis using delta analysis. Research Report SCS 98.24, School of Computer Studies, University of Leeds, 1998. To be presented at BMVC 99.
- [41] D R Magee and R D Boyle. Spatio-temporal modelling in the farmyard domain. Research Report SCS 2000.03, School of Computer Studies, University of Leeds, 2000.
- [42] D R Magee and R D Boyle. Detecting lameness in livestock using 're-sampling condensation' and 'multi-stream cyclic Hidden Markov Models'. Research Report SCS 2000.08, School of Computer Studies, University of Leeds, 2000. To be presented at BMVC 2000.
- [43] R D Boyle, J E Carter, and M A C Clark. What makes them succeed? Entry, progression and graduation in Computer Science. Research Report SCS 2000.19, School of Computer Studies, University of Leeds, 2000. Journal of Further and Higher Education.
- [44] C J Needham and R D Boyle. Tracking multiple sports players through occlusion, congestion and scale. Research Report 2001.07, School of Computer Studies, University of Leeds, 2001. Published in Proc. BMVC 2001.
- [45] R D Boyle and M A C Clark. A-level computing: Its content and value. Research Report 2002.15, School of Computing, University of Leeds, 2002.
- [46] C J Needham and R D Boyle. Performance evaluation metrics and statistics for positional tracker evaluation. Research Report 2003.01, School of Computing, University of Leeds, 2003.

- [47] S Puangpronpitag, R D Boyle, and K Djemame. Performance evaluation of multi-rate multicast congestion control protocols: Dlid-dl vs. plm. Research Report 2003.07, School of Computing, University of Leeds, 2003.
- [48] J W Handley, A J Fitzgerald, R D Boyle, and E Berry. The short term fourier transform applied to terahertz pulsed imaging. Research Report 2003.09, School of Computing, University of Leeds, 2003.
- [49] R D Boyle. Who shall we put on the postage stamps? Research Report 2003.10, School of Computing, University of Leeds, 2003.
- [50] J W Handley, R D Boyle, and E Berry. Empirical analysis of noise in pulsed terahertz imaging. Research Report 2003.12, School of Computing, University of Leeds, 2003.
- [51] H Chen, A Chaudry, M C Bell, and R D Boyle. Rettis: Real-time traffic information system. Technical Report ITS Note 433, Institute for Transport Studies, University of Leeds, 2003.
- [52] O Kubassova and R D Boyle. Statistical analysis of DEMRI data of the MCP joint. Research Report 2006.05, School of Computing, University of Leeds, 2005.



December 2001, Luxor; contemplating immortality.