ALVEY CLUBS
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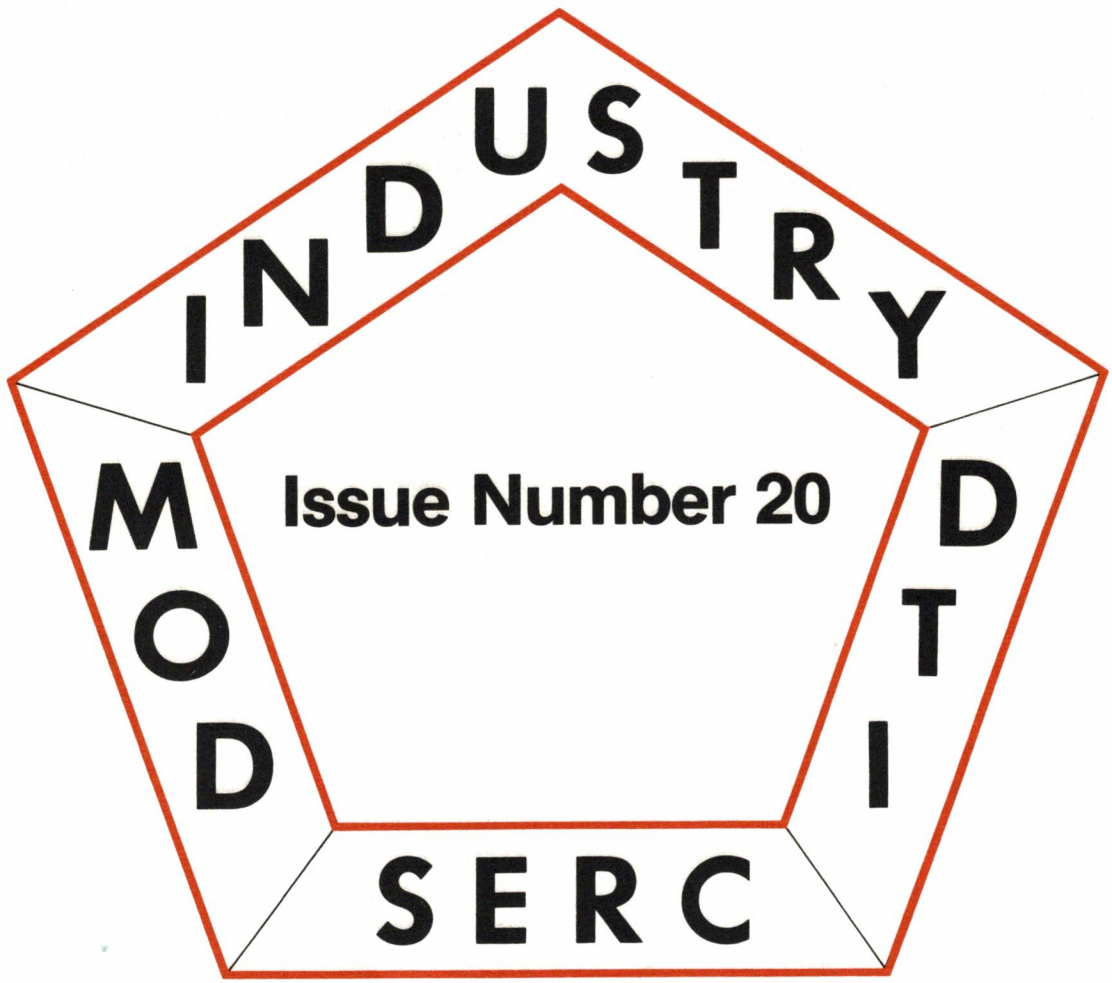
ALVEY NEWS



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ON-LINE ACCESS

This Newsletter will often give references to material stores in On-line Access: Various databases that will be established as the Alvey programme develops. Where these may be reached by authorised Alvey participants details will be given in this newsletter.

Alvey Facsimile Transmission No: 01-828 1503—Group III machine. Normally left on automatic receive mode.

The Alvey Directorate is not responsible for the opinions expressed in articles contributed to Alvey News by external parties.

FROM THE DIRECTOR'S CHAIR

The IT86 Committee has now presented its report to Ministers and is available from HM Stationery Office. The Committee, under its chairman, Sir Austin Bide, had 24 members drawn from the IT industry, major users and academics. Officials from DTI, MoD and SERC also took part. The Alvey Directorate provided much of the support for the Committee (see also April 1986 *Alvey News*, pp. 4 and 7, and this issue p. 12).

The proposals build on the work of the Alvey programme, but differ from it in certain important respects: The IT86 proposals include a programme of major IT application projects. And they see the programme as embracing the UK input to ESPRIT II, as well as containing a continuing national programme of R&D support. The Committee proposes a continuation of the Alvey approach to co-operative work, involving all parts of the IT community, including industry and academics, but extends this to include users wherever possible. The Committee sees the programme as being sponsored by DTI, MoD and SERC as with the Alvey programme, and this might be extended to support from other government departments and Research Councils if they have an interest in parts of the programme, such as the application projects.

Mr. Pattie, the Minister for Industry & Information Technology, has welcomed the report and has said that he intends to pursue the Government response to the report as a matter of urgency. He has said that he will sound out the views of interested parties in developing this response. So comments on the report from the IT community will be most welcome.

In coming to a decision Ministers will take into account the outcome of the discussions now in progress in the European Community about the size and content of ESPRIT II. Though many of the 12 nations see ESPRIT as a priority among the Commission's R&D programme, it is proving difficult to reach agreement on the size of the total budget to be provided for all these programmes, as well as the size and content of ESPRIT II. It may take some time to reach agreement, although there can be no doubt that an ESPRIT II programme will eventually emerge.

B. W. OAKLEY

NEWS FROM THE DIRECTORS

R. W. Witty Director (Software Engineering)

CHRISTMAS: PAST, PRESENT AND FUTURE

This Christmas will, for me, be the completion of nine years' continuous management of national IT programmes. The New Year will see me taking the advice of the ACARD report on 'Software' (see below) in respect of the need for managers to undergo re-education and re-training after so long a time away from active R&D work. I am therefore taking sabbatical leave in 1987 to improve my technical knowledge about some of the many developments which you have made in the past nine years. My sabbatical requires me to reluctantly relinquish my national management responsibilities. However, I am delighted that David Morgan of Plessey will be taking over as SE Director to see the Alvey SE Programme through into the 'Bide era'.

Seasonal greetings from the outgoing SE Director

Since Christmas 1977 I have run the SERC Distributed Computing Systems Programme, the SERC Software Technology Initiative and the Alvey SE Programme. RAL provided the first three IT programme co-ordinators. We three travelled far bearing gifts of mailshots, loan pools and a common base. Such infrastructure now seems to have become part of the fabric of all IT programmes. No one who was at the Coseners House just after Christmas 1981, when Alvey was born, will ever forget the experience! As one of the authors of the Alvey Committee Report I have had the rare privilege of being able to implement the strategy I helped to map out.

I would like to thank everyone in all sectors of the Alvey Community for the tremendous support and co-operation which they have given me over the past four years. I would also like to record my appreciation of the work of my colleagues in the Alvey SE Team for their tremendous service on behalf of the national interest. Unlike David Talbot the original SE Director, whose contribution to the Programme was outstanding, I am not 'retiring', to return from whence I came. I am going on a form of advanced training course. I am extremely grateful to Brian Oakley

whose wisdom is allowing me the opportunity to partake of this technical refreshment so that I might better serve the national interest in the longer term.

David Morgan took up his position as SE Director (Designate) on the 1st November 1986 and will succeed me as SE Director after Christmas 1986. Mr. Morgan is on secondment from Plessey Research and Technology where for the last three years he has been Research Director (Systems & Software) at the Roke Manor Research Laboratory and has been responsible for establishing a research centre in software-related skills. Programmes in software engineering, IKBS, image processing, CAD for self-test VLSI and human interface have been established. A company-wide programme to improve the engineering design technology used by the Plessey Company has been instituted.

Prior to that appointment Mr. Morgan has had a wide and varied experience of IT. After graduating from Imperial College in 1959 he joined Elliot Automation (now part of the GEC group) and became Chief Systems Engineer of the Space & Guided Weapons Division (1966). In 1968 he became the first Director of Computing, Westminster Hospital, and established one of the first research groups in the UK applying computers to problems of clinical medicine. In 1973 he moved to the DHSS to undertake day-to-day management of the NHS research programme into scientific and clinical medicine.

In 1978 he returned to the commercial world and joined Scicon Ltd., where he became Manager, Command & Control Systems Division and latterly, Manager, Defence Marketing Division, before joining Plessey in 1983.

Mr. Morgan has been involved with the Alvey programme since its inception as a member of the Formal Methods Advisory Group. He has also been involved with the ESPRIT programme and was Chairman of the Software Technology panel from 1982 to 1983.

In the Alvey Directorate he will continue the work of directing and co-ordinating the SE programme. Although the present heavily subscribed programme of project work has committed the majority of the budget, Mr. Morgan will be taking a particular interest in the follow through of the results of the Alvey programme and how they relate to the ESPRIT programmes 1 and 2 and any further programmes which may follow consideration of the ACARD and Bide Committee reports. The Bide Committee's report should be in this year's Christmas stockings.

Brian Oakley presents Ian Wand with the York Ada Compiler validation certificate

YORK ADA COMPILER

Nearly nine years ago, back in the stone-man age of national programmes I was involved in funding York University to build a compiler for a new programming language. This project has recently produced a major deliverable.

The University of York recently announced the completion of the first, wholly British, validated compiler for the Ada language. This is a splendid achievement. I would like to congratulate Prof. Ian Wand and his colleagues, not only for achieving this significant milestone, but also for their major contribution, over several years, through their role as the centre of the UK Ada community.

The York Ada Compiler was validated by the National Computer Centre, Manchester. The NCC was appointed by the Ministry of Defence last year as sole validation agents in the UK through a co-operation agreement between the MoD and the US Department of Defense.

The York Ada Compiler is only the second validated compiler in the world to be produced by an academic group. Written in C, the compiler comprises about 80000 source lines. With an object code size of about 450 kbytes, the York Ada compiler may be run on smaller computers—of around 2 Mbytes of memory—than most other Ada compilers currently available commercially.

Researchers at York, funded initially by the SERC's Software Technology Initiative and latterly by the Alvey Directorate, have been working on the construction of an Ada compiler since 1979. Two earlier, non-validated versions were produced, the second of which has been marketed by Software Sciences Ltd. The new, validated compiler is both hosted on and targetted at VAX/Unix systems. It will be made available shortly to academic institutions, but the general marketing will be the responsibility of the BTG, which will be seeking to appoint a commercial firm to take up the licence for sales exploitation. Official validation for York's Ada compiler means it is now eligible for use on contracts throughout the NATO countries, and consequently represents both a major commercial opportunity as well as a significant technical achievement, so again my congratulations to York.

ACARD REPORT ON 'SOFTWARE'

The recent ACARD report, 'Software: a vital key to UK competitiveness' (HMSO June 1986), continues to be the subject of discussion. Among the report's main recommendations are for an increase in the in-service education and training of both the users and suppliers of software; and an increased rate of application of software. The Government will be producing a formal reply to ACARD around the first quarter of 1987. The DTI is collecting views on the report's findings and recommendations so if your organisation has not yet made its views known please send them to Dr. M. Darnbrough, IT Division, DTI, 29 Bressenden Place, London.

The ACARD report continued several recommendations targetted at the professional institutions. I was delighted to be invited to participate in a recent IEE Colloquium on 'High integrity

systems', which discussed the ACARD report's findings and concerns over the public safety implications of software systems. Issues such as software quality and software safety are of concern to all IT users and suppliers; if you are not familiar with these issues then I urge you to read the ACARD report, and monitor current Government 'Quality' activities.

As stated in the Software Engineering Strategy, Alvey is concerned to raise the level of the quality of UK produced software; this concern was also expressed in the ACARD report. I am pleased to report that we are now working with our colleagues in DTI, IT Division, on this topic. IT Division, with some support from Alvey SE, is considering what further steps should be taken and a report will be presented at the next meeting of the Focus committee. Alvey considers this work an important part of the 'pull-through' activities, and it is pleasing to see the joint work between Alvey and DTI producing results.

SOFTWARE TOOLS DEMONSTRATION CENTRE, NCC, MANCHESTER

On the 25th September 1986, John Butcher MP, Parliamentary Under-Secretary of State for Industry, formally opened the new Software Tools Demonstration Centre at the NCC, Manchester. This is a new venture funded by the DTI. STDC's objectives are to encourage people to use appropriate software tools, and to promote awareness and understanding of software engineering methods. STDC has evaluated and installed a selection of software tools which prospective users may see demonstrated at this new, independent centre. The STDC is led by David Burns.

The Alvey SE Team has visited the STDC and sampled its demonstrations. The STDC is housed in a specially designed and constructed environment. It is a first-class place to conduct demonstrations. The NCC staff have all put in a tremendous amount of work into preparing the demonstrations. A full demonstration will take up to three hours and includes details of methods as well as the tools themselves. One demonstration will typically be given to between one and five people, so that the audience can ask plenty of questions and steer the demonstration towards their particular needs. Each software tool demonstrated by NCC has been thoroughly evaluated and tested before being accepted into the STDC portfolio; new tools are being added regularly.

In addition to the actual demonstrations, the STDC also produces reading material to accompany each tool. Other services include the development of an information base service, in association with the STARTS initiative, and a regular newsletter—which I recommend you obtain.

The Alvey SE programme is giving its full support to the STDC and I hope that you will pay them a visit soon and see for yourself what a fine team and facility is now available to help both vendors and users alike.

SOFTWARE ENGINEERING DEMONSTRATOR PROJECTS

As well as the STDC, the DTI recently anounced a further stepping up of its support for good software engineering practices, through a new idea: Software Engineering Demonstrator projects. These will be selected to demonstrate good software engineering practices and the use of software tools.

Making the announcement, John Butcher, MP, Parliamentary Under-Secretary of State for Industry, said: 'Promoting the use of good software engineering techniques is a cardinal feature of our policy towards software. This further initiative is aimed at increasing awareness within UK industry of the benefits of good software engineering practices. The essence of the initiative is that interested parties will be able to see for themselves the experiences of companies using software engineering tools and methodologies in real-life situations rather than under carefully controlled test situations. It joins the Software Products Scheme, the Alvey Software Engineering programme, the STARTS Initiative and the Software Tools Demonstration Centre as part of a coherent programme'.

For further information please contact my colleagues in Information Technology Division, DTI, 29 Bressenden Place, London SW1.

IT PROGRAMMES: PAST, PRESENT AND FUTURE

As Christmas 1986 draws near I am reminded, by DCS and STI, of IT programmes past. The present Alvey SE programme is running at full speed. However, the ACARD report has rattled our chains of complacency lest we bide too much time awaiting the arrival of the future IT programme.

May I close by wishing David Morgan every success for his term as Alvey SE Director and by wishing you all a happy and prosperous 1987.

BULLETIN BOARD

YORK'S ADA COMPILER RECEIVES VALIDATION

The race to write the first wholly British compiler for Ada, the new real-time language for embedded computer systems, has been won by the University of York's computer science department. Head of the department, Prof. Ian Wand announces that validation has now been received from the National Computer Centre for the York Ada Compiler which has been produced as part of the Alvey programme. The Manchester based NCC was appointed by the Ministry of Defence last year as sole validation agents in the UK through a co-operation agreement between the MoD and the US Department of Defense.

As only the second validated Ada compiler in the world written by an academic institution, the York Ada compiler has been designed primarily for use in the education market, but can also be applied in any context where large computer programs are needed to control equipment and apparatus. The new compiler written for Vax/Unix systems will be made available shortly to academic institutions, but the general marketing will be the responsibility of the British Technology Group, which will be seeking to appoint a commercial firm to take up the licence for sales exploitation. Official validation for York's Ada programme means the compiler is now eligible for contracts throughout the NATO countries, and consequently represents both a major commercial opportunity as well as a significant technical achievement, in its own right.

Researchers at York, funded by the Science & Engineering Research Council and the Alvey Directorate, have been working on the construction of an Ada compiler since 1979 and have released two earlier editions (0 and 1), the second of which has been marketed by Software Sciences Ltd. Work on the latest Ada compiler began following the production of the definitive language

report for Ada in 1983 since when York's compiler was completed to take in the demands of the full Ada language. According to Prof. Wand it has taken his team nearly 25 man-years of effort to produce.

Written in C, the compiler comprises about 80 000 source lines. With an object code of about 450kbytes, the York Ada compiler may be run on smaller computers—of around 2Mbytes of memory—than other Ada compilers currently available commercially.

Commenting on the validation, Brian Oakley, head of the Alvey Directorate in London said: 'This is good news for York, for the Ada academic users, and indeed for the UK IT community as a whole. The York team is to be congratulated'.

Prof. Wand confirmed that the department will continue its work with Ada and already has plans for the construction of a further version of the compiler for another computer.

SERC ANNUAL REPORT

The Alvey Programme had proved 'an incredibly successful enterprise' in bringing universities and industry together, Prof. E.W.J. Mitchell, Chairman of the Science & Engineering Research Council, said in London on the 14th October. Introducing the Council's annual report for 1985-96, he said that the programme was now starting to achieve results; the key question would be where were the Alvey enabling technologies being applied? The pressures were on interface problems and the applications of IT.

In the annual report, D.T. Shore, Chairman of the SERC Engineering Board, describes the rapid development of the Alvey Programme as 'an outstanding feature of the year' in information technology. He adds:

'Research outside the Alvey Programme has continued vigorously, with many more worthy proposals than can be supported from the funds available. Notable events during the year included: a successful conference of participants in the Council's programme on land mobile radio communications; the award, in conjunction with the Alvey Directorate, of a major series of grants to Edinburgh University to establish a laboratory for the study of the fundamentals of computer science; and the announcement of an extension to the Joint Optoelectronics Research Scheme (JOERS) following the success of this pioneering collaborative programme that was started in 1982'.

The SERC annual report also includes a review article on intelligent knowledge-based systems by Dr. David Thomas, until recently SERC Director of Information Technology and Alvey Director (IKBS and SERC Liaison). The report is available from HMSO at £5.

ESPRIT—1986 RESULTS

The results of the 1986 call for proposals are now known and it looks like UK organisations have done well in terms of participation. Details of the call were published in the Commission's Official Journal, No. C92 on the 18th April 1986, with a closing date for proposals to be submitted by 1st July 1986. The 1986 call was a limited one with only about 62 Mecu on offer, as most of the funds have already been allocated after the previous two calls, in 1984 and in 1985. The Commission received a total of 127 proposals; 65 of these involved UK organisations (see Table 1). There was no call for new proposals in Office Systems and only four proposals for gamma projects were received. The proposals were evaluated in accordance with the Commission's procedures, and after due consultations 19 proposals were approved for funding. UK organisations were involved in 15 of the approved projects with a 20·3% share of the funds (see Table 2).

Table 1 Proposals received

	Number received				Number with UK involvement			
	Type A	Type B	Gamma	Total	Type A	Type B	Gamma	Total
Microelectronics	2	21	—	23	2	14	—	16
Software Technology	3	26	—	29	2	10	—	12
Advanced Information Technology	7	36	—	43	4	19	—	23
Office Systems	—	—	4	4	—	—	4	4
Computer Integrated Manufacture	4	24	—	28	5	5	—	10
	16	107	4	127	13	48	4	65

Type A—Projects usually require large resources. Type B—Projects covered by 'research theme', usually requiring smaller resources. Gamma—signifies proposals for an extension of or addition to an existing project

Table 2 Proposals approved

	Contractor Types			No. of Proposals Approved		Funding		
	M	P	S	Total	UK involvement	Total (ecu)	UK share (ecu)	UK share in %
Microelectronics	—	3	—	2	2	20 816 268	5 646 554	27·1%
Software Technology	—	6	—	5	5	16 818 502	1 922 970	11·4%
Advanced Information Technology	5	9	—	8	7	20 127 566	5 867 224	29·1%
Office Systems	—	2	—	1	1	509 877	162 651	31·9%
Computer Integrated Manufacture	—	—	—	3	—	8 584 634	—	—
	5	20	—	19	15	66 856 847	13 599 399	20·3%

M—Main Contractor. P—Partner. S—Subcontractor

'INCREASING EFFECTIVENESS' OF ESPRIT

The future prosperity of European industry depended on successful collaborative programmes such as ESPRIT, Geoffrey Pattie, Minister for Industry & Information Technology, said in Brussels on the 1st October. Addressing delegates at the ESPRIT Conference IT Forum, the Minister said: 'The technology of information is the basic industrial technology of this age, and the European Community is poised to take advantage of the opportunities it offers'. The Community must form a natural base for collaborative industrial projects, and the success of ESPRIT had provided evidence that such collaboration was possible.

Work carried out under the Community programme must be in clearly identified market-led areas of R&D, Mr. Pattie said. 'I hope that the Council of Ministers will reach agreement on the Community R&D Framework Programme for 1987-91 by the end of this year. ESPRIT and related programmes in the areas of information technology and telecommunications are major elements of that Framework Programme'.

Mr. Pattie added: 'In its early years the ESPRIT programme was less effective than it might have been because the Commission, with its necessarily limited resources and its unavoidable distance from individual participants, was not able to promote the programme as effectively as individual countries could. I welcome the increasing effectiveness of the ESPRIT management committee, which aims to increase co-operation between the European Community and individual governments to promote programmes more widely'.

SOFTWARE TOOLS CENTRE

A national Software Tools Demonstration Centre, based at the National Computing Centre, Manchester, was opened by John Butcher, Industry Under-Secretary, on the 25th September. The new centre is funded by the Department of Trade & Industry at a cost of £3 million for an initial three years, after which the centre is expected to be self-supporting.

Main objectives of the centre are:

- To promote awareness of software development methods and tools.
- To provide industry with an independent environment in which to assess these methods and tools.
- To act as a shopwindow for tool providers and new developments from the Alvey and ESPRIT programmes.
- To act as a centre for information exchange and user feedback.

Mr. Butcher said that good software engineering was the key to the future development of the IT industry. The centre was being launched against a background of substantial investment in software engineering in the USA and Japan as well as Europe, and at a time when the ESPRIT and Alvey programmes were beginning to deliver potentially exploitable outputs. The aim of the new centre was to raise general standards and use of software engineering in the UK, giving guidance to software producers and users alike.

The manager of the new centre is David Burns, recruited from Software Sciences. Other related DTI initiatives include the Software Tools for Application to large Real-Time Systems (STARTS) programme, and the Software Engineering Demonstrator Scheme.

UK EXPERT SYSTEMS DEVELOPMENTS AT ES '86

As part of a continuing process of assessing the extent to which expert systems are being developed and applied in the UK, the Director (IKBS) has asked the Science Policy Research Unit to conduct a snapshot survey at Expert Systems '86 to be held in Brighton from the 15th to 18th December 1986. The intention is to emphasise the user viewpoint rather than that of the supplier of the technology and of course to extend well beyond the Alvey community. It is hoped to cover expert systems *in use* and *under development* by UK firms, preferably including their origin, objectives, size of team involved in development, number of rules (actual or expected) and shell or tools used in their construction. (Commercial confidentiality may be protected by using general phrases for origin and objectives.) This information will later form the basis of an article in a future issue of *Alvey News*.

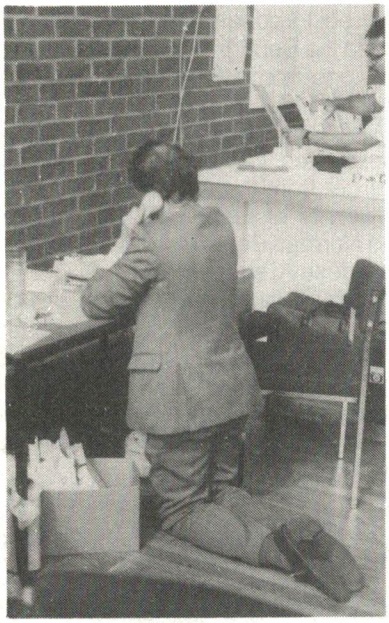
Contributions and notifications about user activities would also be very welcome from those not attending the conference, and should be sent to: Mr. A. G. Wheldon, Rutherford Appleton Laboratory, Chilton, Didcot, Oxon. OX11 0QX.

WORKSHOP ON CO-OPERATIVE DIALOGUE MANAGEMENT

The workshop on Co-operative Dialogue Management, held on the 7th-8th October at Hewlett Packard Research Labs., attracted a broad spectrum of interest. 25 minute presentations/discussions reflected both 'Formal' and 'Constructive' approaches stretching to many of the popular corners of AI (Planning, ICAI, NL, Expert Systems). Workshop sessions discussed: 'Co-operativity'; 'Front-end requirements'; 'Representation' and 'Natural language and Dialogue understanding'. The programme and participants are listed below. A full report is now available (see the Document Order Form).

A Co-operative Expert *Jackie Fenn (Logica)*
Explanation Facilities for Knowledge Based Systems *Sheila Hughes (Liverpool University)*
The Inferential Nature of Dialogue *Lesley Benjamin (Sussex University)*
The Interface Between Dialogue Models and User Models *Donia Scott (Philips)*
Plan Delegation in a Multi-Actor Environment *Colin Hopkins (British Telecom)*
The Use of Intonation in Computer Generated Dialogue *George Houghton (Sussex University)*
Planning Co-operative Discourse *Nigel Shadbolt (Nottingham University)*
VODIS: An Interactive Speech-Database Inquiry System *Richard Migendt (British Telecom)*
An English Interface to a Planning System *Steve Pulman (Cambridge University)*
Using NL Dialogue in Reasoning about Software Specifications *Jim Cunningham (Imperial College)*
A Theoretical Framework of Conflict and Co-operation in Dialogues *Julia Galliers (Warwick University)*
Head-Driven Phrase Structure Grammar and beyond *Dan Flickinger (Hewlett Packard Palo Alto)*
A Natural Language Interface for Medical Expert Systems *David Frost (Imperial Cancer Research Fund)*
Communication Failure in Dialogue *Ronan Reilly (St Patrick's College Dublin)*
Co-operative Database Query *Anne De Roeck (Essex University)*
'Dialogue Games' and 'Context Spaces' *Alison Petri-Brown (Sussex University)*
Analysis of Tutorial Dialogues *Mark Elsom-Cook (Open University)*
Applying Features of Conversation to HCI *Steve Draper (Sussex University)*
Workshop Discussion *Chair: Karen Sparck-Jones (Cambridge University).*

Other participants were: *Kate Stainton-Ellis (Edinburgh University); Jon Howes (Ferranti); George Kiss (Open University); Robin Fawcett (Wales Polytechnic); and Phil Stenton, Bill Sharpe and Alison Kidd (Hewlett Packard).*



Following the publication of the above picture in the August issue of *Alvey News*, we have received the following from R.A. Chorley of Tewkesbury:

Poor Dep. Sec. kneels at the foot of the wall,
Has one more try for an outgoing call—
Hush, hush, whisper who dares,
Whilst Brian Oakley is saying his prayers.

God bless Alvey—I know that's right—
Wasn't it fun in Brighton last night?
The wine was cool and the dinner was hot,
But to make this call I quite forgot.

If I close my ears a little bit more
I can't hear the chap who's shouting next door.
I'd love to have an acoustic hood
—Oh, God bless Maggie, and make her good.

If I had a hood I could curl up small
And not be disturbed by the noise at all;
I could kneel and dream of Alvey 2,
And of all the further work to do.

Poor Dep. Sec. kneels at the foot of the wall,
Has one more try for an outgoing call—
Hush, hush, whisper who dares,
Whilst Brian Oakley is saying his prayers.

For the above research project, Mr. Chorley receives an Alvey grant of two bottles of claret.

HCI '87 CALL FOR PAPERS

Authors wishing to submit papers for the proceedings of HCI '87 (which takes place on the 7th to 11th September 1987) should submit brief abstracts by the 16th January 1987. Abstracts should consist of a single page with: name(s), organisation, contact address, title of paper, list of key words/phrases (no more than six), and abstract (about 200 words, single-line space).

As the conference wishes to represent the current state of HCI the abstracts will be categorised and this will form the basis for the final selection of papers in different areas of HCI. Abstracts will not be refereed, but authors will receive comments and be informed about the probable category of their paper.

Papers should be submitted by the 6th March 1987 and will be refereed by at least two independent referees. Referees will be looking, in particular, for a high standard of technical expertise. As well as research papers, HCI '87 wishes to include papers from industry and commerce on system design, product development, evaluation and organisational support. Papers (four copies) should be about ten pages of A4 in single-line space format, although papers both longer and shorter than this will not be precluded.

Authors of those papers accepted to appear in the proceedings of HCI '87 will be notified in May, and camera-ready papers should be supplied by the 5th June 1987.

Material should be submitted to: HCI '87 Conference, BISL, 13 Mansfield Street, London W1M 0BP, tel. 01-637 0471.

ADVANCED ROBOTICS CENTRE

The Department of Trade & Industry is to set up an Advanced Robotics Research Centre which will develop and integrate key advanced robotics technologies, including advanced sensors, integrated systems architecture, artificial intelligence and forms of mobility.

Candidate locations for the centre (from which a final choice will be made by next summer) are:

—The Turing Institute, Glasgow
—UKAEA, Harwell
—Imperial College, London
—The Welding Institute, Abingdon
—Salford University Business Services
—Wimpey Laboratories, Hayes
—Cranfield College of Manufacturing
—Royal Signals & Radar Establishment, Malvern
—Royal Armament R&D Establishment, Chertsey
—The University of Edinburgh
—ERA Technology, Leatherhead.

The centre is expected to be a self-contained unit, with 20-25 industrial partners. It will be jointly funded by the DTI for 3-5 years, as part of the Department's Advanced Robotics (AR) initiative. As well as conducting its own R&D programme, the centre will provide technical consultancy and advice to companies and academics involved in the AR initiative.

Further information: R. Egginton, Mechanical Engineering & Manufacturing Technology Division, DTI, Room 547, Ashdown House, 123 Victoria Street, London SW1E 6RB.

IMAGE PROCESSING WITHIN THE ALVEY PROGRAMME

A one-day colloquium organised by IEE Professional Group E4 (Electronic Image Processing) is to be held at Savoy Place, London, on Tuesday, 27th January 1987. The colloquium will give a representative view of the spectrum of image processing and image interpretation projects in both the Intelligent Knowledge Based Systems and Man-Machine Interface Alvey Directorates through a number of presentations from many of the key researchers in the programme. For further details and registration forms please contact: The Secretary (ref. LS(D)A), IEE, Savoy Place, London WC2R 0BL, tel. 01-240 1871, ext. 269 or 283.

ESPRIT CONFERENCE 86 VIDEOCASSETTES

The ESPRIT Conference is the major public event of the ESPRIT programme. It is therefore of interest to all participants in current ESPRIT projects, and also all others who would be interested in ESPRIT work. However, the restricted number of places available meant that not all who could benefit from attendance were able to do so.

The Plenary Sessions and the Open Forum at this year's ESPRIT Conference were recorded and these are available for purchase on videocassette so that they can reach a far wider audience. There are 11 videos available. These cover:

1. The IT Forum (approximately three hours recording) incorporating the speeches of:

M. Carpentier, Director General DG XIII
K. H. Narjes, Vice President of the CEC
D. de Benedetti, Chairman Ing. C. Olivetti & Co. SpA
K. Luft, Chairman Nixdorf AG FR Germany
J. M. Cadiou, Director Information Technologies ESPRIT DG XIII
G. Pattie, President of the Research Council, Minister for Information Technology, United Kingdom

2. The Plenary Sessions (nine tapes of one hour recording each) covering the presentations on the following projects:

(i) Towards a silicon compilation system for VLSI digital signal processing.

(ii) Knowledge based realtime supervision in CIM—the workcell controller.
(iii) A basis for a portable common tool environment.
(iv) Message passing architectures and description systems.
(v) Broad site local wideband communication system.
(vi) Document editing and entry based on the standardised office document architecture.
(vii) Using a KBS in telecommunications.
(viii) Software environment for the design of open distributed systems.
(ix) Strategic project for European CMOS technology research and exploitation.

3. The Conference Highlights (approximately three hours recording) covering the main items of the Conference Plenary Session Programme.

The tapes are available in VHS format, on PAL or SECAM, and can be obtained (prices £95 each for the three hour tapes, £45 each for the one hour tapes) from: Sales Administration, The National Computing Centre Ltd., Oxford Road, Manchester M1 7ED, United Kingdom, Fax 061-228 2579, Telex 668962 NCC MANG.

POPLOG ENHANCEMENT PROJECT

The Alvey project for enhancements to the Poplog Expert Systems development environment (IKBS 007: Systems Designers, University of Sussex) has been completed successfully and has achieved its aim of a compatible version of Poplog across Alvey IKBS Unix hosts, namely GEC 63, Vax and Sun. The publicly available documents, resulting from the project, are

(*a*) The Poplog virtual machine
(*b*) Poplog introductory user guide
(*c*) VED user manual.

These are available from Graham Thwaites, Systems Designers plc (tel: 0276 686200). A book 'POP-11, A Practical Language for Artificial Intelligence' (Barrett, Ramsay and Sloman) has been published by Ellis Horwood Ltd.

Poplog is sold by Systems Designers on Sun and Vax at favourable terms to Alvey users.

AISB-87

AISB-87, to be held at the University of Edinburgh from the 6th to 10th April 1987, will be the sixth conference held by the Society for the Study of Artificial Intelligence and the Simulation of Behaviour. The conference will focus on work in AI and Cognitive Science and will comprise a two-day tutorial programme followed by a three-day technical programme with concurrent commercial exhibition. A poster exhibition will also be held at which research groups may provide an informal written or pictorial presentation of their work.

The conference programme will cater for 300 participants from industry and academia. 20 selected papers, dealing with subjects relevant to AI or the Simulation of Behaviour, will be presented during the three-day programme. Subjects may include computer vision, robotics, cognitive modelling, learning and memory, natural language processing, problem solving and inference, social and philosophical implications of AI, and the man-machine interface. In addition, there will be three invited talks, given by Pat Hayes of Schlumberger Research, Dave Rummelhart of the University of California, and Derek Sleeman of the University of Aberdeen.

The two-day tutorial programme takes place on Monday, 6th and Tuesday, 7th April. The aim is to provide a practical tutoring environment with substantial time available to use modern AI hardware, so numbers will be restricted to 50-60 people who will be divided into small tutorial groups by field of interest. Each group will be led by a teacher or researcher distinguished in the field of study of the group. In addition to the formal aspect of the tutorial programme, a tutorial banquet will also be held.

The technical programme opens on Wednesday, 8th April and closes on Friday, 10th April. Each day follows a similar format comprising an invited talk followed by presentations of submitted papers. On Friday afternoon there will additionally be a talk by an invited

ABERDEEN'S AI EXPANSION

A major research thrust in artificial intelligence has been initiated at the University of Aberdeen as part of an expansion of the Department of Computing Science. Prof. Derek Sleeman has returned to the UK from Stanford University to head the Department, new members of staff have been appointed (including several from the United States), and additional computing equipment has been installed.

Prof. Sleeman's research team on intelligent teaching systems at Aberdeen comprises Dr. Rosemary Martinak and Eammon Kelly (both from Stanford) and Joyce Moore (from the University of California at Berkeley). Two postgraduate students also have joined the Department from US universities, one from Stanford and one from Carnegie Mellon in Pittsburgh.

Mrs. Pat Fothergill (formerly Ambler) has moved to Aberdeen as a senior lecturer from the AI Department of the University of Edinburgh. Robert Ward and Norman Paton also have joined the Aberdeen AI staff, who include Dr. Peter Gray (project manager of Alvey IKBS Project 073, 'An object-based knowledge base for a formulation expert system') and two Alvey-supported research assistants. Further additions to the Aberdeen staff are due early in 1987.

Aberdeen University's AI group, headed by Prof. Derek Sleeman. Front row: Norman Paton, Rosemary Martinak, Joyce Moore, Colin Campbell. Middle row: Roly Lishman, Sandy Murray, Peter Gray, Derek Sleeman, Pat Fothergill, Robert Ward, Martin Stacey. Back row: David Moffat, Eammon Kelly, Harry Coin

visionary speaker followed by the conference prize giving and farewell. The commercial exhibition will be open throughout the technical programme and located in the foyer of the conference building.

On Thursday evening the conference banquet takes place in the Upper Library of Edinburgh University's Old College. This will begin with a sherry reception, and the menu features some interesting traditional Scottish dishes.

For registration forms and further information, contact the local arrangements chairman: Dr. J. Hallam, Department of Artificial Intelligence, University of Edinburgh, 5 Forrest Hill, Edinburgh EH1 2QL, tel. 031-667 1011, ext. 2557.

SILICON ON INSULATOR—CURRENT STATUS AND FUTURE POTENTIAL

IEE Professional Group E3 (Microelectronics and semiconductor devices), the Institute of Physics Electronics Group and the Alvey Directorate have jointly organised a tutorial meeting entitled 'Silicon on insulator—current status and future potential' to be held at the IEE, Savoy Place, on Wednesday, 11th March 1987.

This one-day tutorial meeting will comprise a series of invited review papers by key collaborators in Alvey and ESPRIT-supported projects detailing the advantages of SOI for advanced integrated circuit products and the current status of the various contending techniques. Further details are available from the Secretary, Ref: LS(DA), IEE, Savoy Place, London WC2R 0BL, or telephone 01-240 1871, ext 269.

Note to Authors

Authors of articles for *Alvey News* are requested, when submitting their articles for publication, to provide a 50-word summary for publication at the head of the article so that a non-specialist may readily appreciate the scope and general level of the material contained in the article.

Editor

BAe's VISION DEMONSTRATOR

A demonstrator machine designed to simulate aspects of biological vision was exhibited by British Aerospace at the international air show at Farnborough in September. Known as VISIVE, the system was developed at the company's Sowerby Research Centre at Filton, Bristol, where it is being used as a multi-purpose tool for vision research.

The Sowerby Centre is managing Alvey Project MMI/IP 007 (Object identification from 2D images), a £4 million, three-year project on which eight organisations are collaborating. The participants are BAe, Marconi Command & Control Systems, Standard Telecommunication Laboratories, RSRE, Bristol University, Reading University, the Rutherford Appleton Laboratory and Surrey University. Project manager is Mick Brown of BAe.

Aim of the Alvey project is to explore the problem of automatically finding and identifying specified objects in a complicated environment from a two-dimensional image. Typical long-term areas of application are in robotics, earth resources and military surveillance systems. The research is focused on establishing methods of general applicability.

The project began in January 1985 with a programme of basic research into both high-level and low-level vision processes. Segmentation techniques have been studied, and exemplar software for a resistor colour-code reading system has been developed. Conceptual graphs are being studied as a possible object knowledge representation, together with reasoning with uncertainty. Complementary work covers geometric modelling. A prototype inductive learning system for vision has been developed.

BAe has a history of vision research going back over many years. According to the company, the VISIVE research tool can extract the necessary information from an image many times faster than the most powerful mainframe computer.

In computer vision systems, huge amounts of data must be analysed and structured into representations that a computer can handle. Objects and surfaces in the image must be located and labelled so that they can subsequently be recognised. Ambiguous and frequently noisy data must be dealt with and, ultimately, real-time operation with near-human performance will be required.

The demonstrator uses principles similar to those underlying human vision. Biological vision possesses useful features which can be incorporated into advanced computer vision systems. These include noise reduction and edge encoding to high accuracy in terms of contrast, orientation, and spatial location. Human vision also can extract information on motion, colour and stereo depth.

The problem of extracting this information can be seen as one of transforming image input data into more manageable forms that can be handled by the computer. The human visual system provides a useful model for manipulating these data. The BAe work is not confined to software simulations; it has proved possible to engineer hardware devices based on human vision principles.

Computer vision analysis involves three key problems:

(i) Encoding the raw data from some sensor device.

(ii) Manipulating the encoded data to provide information which can be interpreted by a computer.

(iii) Interpreting the information to enable the computer to take some sort of purposeful action, such as missile guidance, tracking or navigation of a robot.

VISIVE addresses the first of these problems. BAe researchers believe that Problems (ii) and (iii) can be made much simpler if the quality of the encoded raw data is better than has hitherto been the case in simple vision systems.

The demonstrator system has a spatial resolution of 128x128 pixels, operating on 256 grey levels (8 bit) and running at approximately 10 frames per second. In common with biological vision, it uses hexagonally sampled input data. According to BAe, this has significant advantages over more conventional square sampling matrices.

Processing power of the demonstrator is equivalent to one billion additions per second. Higher-performance systems could be built if required; the current demonstrator was designed primarily for research with an emphasis on flexibility and low cost.

Images are converted in the hard-wired VISIVE machine to the 128x128 pixel resolution and passed to a group of microprocessor computing units. Algorithms used in these units have been developed to assess the tonal variations between pixels to identify edge points, to determine the relative strengths and orientations of these edge points, and to associate contiguous edge points with one another to establish the boundaries of objects.

INFORMATION TECHNOLOGY A PLAN FOR CONCERTED ACTION

IT86 Committee report published

A plan of action for the information technology industry, which includes the suggested close involvement of IT users, is recommended in the report of the IT86 Committee, available through HMSO. The Committee, chaired by Sir Austin Bide and comprising 21 representatives of the IT industry and academic bodies, was set up last February to consider how to improve the competitiveness of the IT industry and users, and how to improve the provision and application of IT in the UK (see April 1986 *Alvey News*, pp.4 and 7).

The main recommendations of the report are:

- A scheme of collaborative IT applications—the Applications Scheme
- A focused programme of collaborative IT research projects to support IT applications needs—the Research Effort
- Measures to promote technology transfer, widespread adoption of IT and the development of IT skills.

The Government would be expected to contribute £125 million over five years to the Applications Scheme which is expected to generate larger investment in industry in excess of £500 million.

The Committee estimates that the new research programme would cost in the region of £550 million and suggests that £300 million of this should come from the Government, although a part would be the Government's contribution to the anticipated second phase of the European Strategic Programme for Research and Development in Information Technologies (ESPRIT), which is currently being discussed by the European Community.

Funding of projects under the Applications Scheme would be at variable rates according to the risks involved in each project. The funding of participants in the Research Effort would be on the same basis as the Alvey programme of pre-competitive, collaborative research in IT, 50% contribution to industry's costs and 100% to academic participants.

The Committee proposes additional measures to promote awareness of Information Technologies. Further measures for education and training are also considered necessary to promote the required manpower and business skills for the effective use of the new technologies. This is taken up in the projects identified by the Committee under the Applications Scheme. The Committee suggests that related activities in this area should be closely co-ordinated with the proposed programme.

Industry is expected to play a major role in the new programme. However, the report stresses the part to be played by Government both as an influential user of information technologies and for its role as sponsor, helping to finance the proposed work.

The recommendations are designed to build on the successful features of the five-year Alvey programme. Alvey has, however, already committed all its funds and will soon begin to run down unless a new programme is started. The Committee feels that it is essential to continue this work which has resulted in a close partnership between universities and industry and has provided a focal point for the IT community to share expertise and discuss common problems.

The report sets out in detail what is required in terms of the Applications Scheme and the Research Effort.

Applications Scheme: The scheme is aimed at stimulating the development of new projects and services through the exploitation of IT research. The Committee envisages a series of projects which, in addition to their intrinsic value, will demonstrate how users and suppliers can collaborate in IT systems development. Great emphasis is placed on the involvement of users in the product development process so that research work can be turned into marketable products. The close involvement of users is seen as having significant economic benefits by improving industrial competitiveness. The Committee suggest that the direction of the Applications Scheme should be determined by identifying sectors important to the UK economy and targeting on their IT needs, and sets out eight specimen projects to illustrate the approach suggested.

Research Effort: Three broad categories are identified which would provide the focus for the new programme. Research providing support for the application projects is the first. This is aimed at meeting 'technology gaps' which are exposed in pursuing such projects. The second is new generic research arising from wider opportunities identified in the pursuit of the applications projects. Thirdly, the report suggests longer-term generic research not necessarily related to applications projects but nevertheless focused on specific areas which would be defined at the outset. The report also identifies three market opportunities: Communications, Advanced Information Processors and Workstations. A further significant feature is the stress put on the European dimension.

The European dimension: The report stresses the need to make the fullest possible use of European Programmes such as ESPRIT, Race and Eureka. A national programme effort is considered vital to enable UK companies to contribute at European level and to reap the benefits of wider collaborative work. But programmes such as ESPRIT are seen to have benefits where the costs and skills required for projects require greater resources than one company can offer, where a broader or varied technological capability is needed or where development of standards is important. The second phase of the ESPRIT programme has some features in common with the Committee's suggested programme of application projects. With this in mind the report recommends development of the mechanisms for ensuring UK involvement in ESPRIT.

Speech and vision research at Malvern

By Kenneth Owen

A key resource in UK research into pattern processing—embracing the analysis of both speech and image data—is located at the Royal Signals & Radar Establishment (RSRE) at Malvern, Worcestershire. Scientists from RSRE and from the former Joint Speech Research Unit (JSRU) at Cheltenham helped to formulate the speech and image parts of the Alvey Man-Machine Interface strategy document, and have continued to be active in Alvey, ESPRIT and IT86 plans and projects.

The Joint Speech Research Unit moved to Malvern in November 1985 and was combined with the RSRE speech-research group to form the present RSRE Speech Research Unit. This unit provides a focus for the UK's long-term strategic speech technology research through its internal research programmes and through collaboration with industry, the universities and other research institutions.

The commonality in techniques between speech processing and machine vision is recognised and exploited at RSRE by grouping both the speech unit and the Machine Vision Unit together within the establishment's Pattern Processing and Machine Intelligence Division. This in turn is part of the establishment's Signal Processing Group. RSRE is a Ministry of Defence Establishment, but the pattern-processing research receives funding also from the Department of Trade & Industry.

Pattern processing

Andrew Sleigh is head of the Pattern Processing and Machine Intelligence Division at RSRE. At the time the Alvey Programme was mounted, he recalls, the UK speech research community was small enough to be well integrated and was addressing a substantially coherent area of technology. The image-processing and machine-vision activity, by contrast, was much more fragmented and embraced a wide variety of participants and research topics. One of the major achievements of the Alvey Programme has been to help establish a strong infrastructure and national community in vision research, bringing teams in industry, universities and government research centres into much closer contact than existed before.

Speech and image processing fall naturally together under the 'pattern processing' umbrella, Mr. Sleigh explains. In each case there are data which one is trying to interpret; there are models of the things one is looking for in that data; and there are various techniques—statistical, representational—which have relevance to both speech and image.

Domain-specific issues, however, are very different—and not only because of the much lower bandwidth involved in speech signals. Speech is produced with the intention that other people will understand it; this is not usually the case with images.

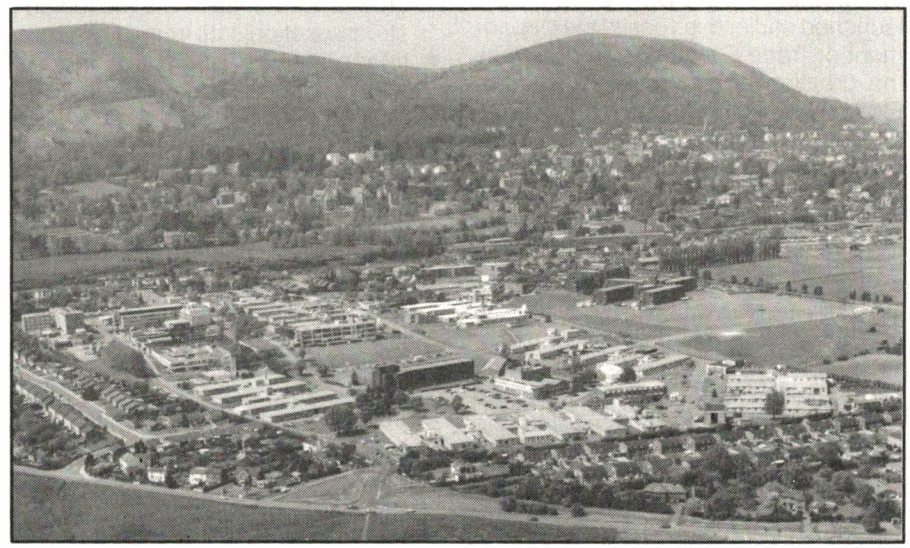
Several strands of RSRE's work are relevant to the Alvey areas of speech and image processing, Mr. Sleigh notes. First, there is a long history of speech and image research in its own right at Malvern, plus the work of the former JSRU which is now also Malvern-based. Secondly, the establishment's work in radar processing draws on common principles and similar techniques. Thirdly, there is the related work on processing architectures, involving for example ICL's Distributed Array Processor (DAP) and the Inmos transputer.

Though the RSRE is a Ministry of Defence establishment, this does not unduly restrict the availability of the speech and image research. 'Though we do work on classified programmes', Andrew Sleigh says, 'a large amount of the work is enabling technology, which is not normally classified unless there is a direct military significance.

'Most of the speech and machine-vision work is related to techniques rather than to applications, and is unclassified. And, indeed, most of it is 50% funded by the Department of Trade & Industry. That reflects the common relevance of much of the work we do here—it clearly is relevant to military priorities, but the enabling technology is exploitable by industry. We are funded on that basis, and we exploit very strongly.'

The establishment exploits in a number of ways. There are its continuing inputs to the Alvey Programme and projects; its long-standing direct links with civil as well as defence industry; and a programme of industrial attachments under which scientists from industry come to Malvern to work as members of RSRE research teams, later returning to their companies. The establishment also funds research at a number of UK universities.

In machine vision, Mr. Sleigh says, the main issues being addressed at RSRE



RSRE, Malvern

relate to how to take an image in a form suitable for intermediate representation; and, secondly, how to use that representation to form some hypothesis as to what is going on in that image. In the area of representation, international progress is continuously monitored and various techniques are analysed and assessed against RSRE applications, both military and civil.

And the establishment is researching specific ways to improve some of the available representation techniques—for example, in texture analysis and in using prior knowledge to give more robust edge-finding.

One focus for this type of work is Alvey Project MMI/IP 007, concerned with object identification from 2D images. In this three-year, £4 million project, RSRE is collaborating with seven other organisations in seeking generally applicable methods—a challenging task in view of the broad objective, the number of collaborators, and the multiple lines of research that are involved. Certainly each line of research is valuable in its own right, but the aim of the Alvey project is a co-ordinated collaboration which hopes to achieve more than the sum of the constituent parts.

In assessing the UK's total research effort in speech and machine vision, Mr. Sleigh is realistic in pointing to the relatively small numbers of people involved. The United States, Japan, France and Germany each has a much stronger activity in this field. But the UK research community includes internationally recognised experts, and there are encouraging signs that pattern processing has become an accepted topic in university teaching and research in Britain.

In looking ahead, Mr. Sleigh is enthusiastic about the potential of a new collaborative initiative which was launched earlier this year by the Department of Trade & Industry. This involves the creation of a number of National Electronics Research Initiatives (NERIs), the first two of which have just been set up at the Royal Signals & Radar Establishment. One of these is for silicon microsystems and the other, significantly, is for pattern recognition.

The pattern-recognition NERI began life on the 3rd November at Malvern with a defined three-year programme. Research staff on secondment from ten companies plus RSRE scientists make up a team of about 16 people—so gaining the benefits of critical mass and a single-site project with clear objectives. Exploitation of the results by industry is given high priority.

The team is addressing two main issues. First, to investigate what are known as self-learning machines, or distributed networks, and in particular their application to speech and vision problems (this is discussed later in this article). Secondly, to work on the integration of the various machine-vision processes—in effect, to try to provide a glue that could help in assembling complete systems from Alvey-supported research components.

Other relevant RSRE connections mentioned by Andrew Sleigh include inputs to the IT86 Committee, and participation in ESPRIT including the transputer supernode (supercomputer) project.

For image processing, he notes, available computing power remains a limitation, though a decreasing one. Most RSRE research tends to use standard machines such as VAXs. For real-time work, special-purpose chips (such as edge-finding chips) or special machines such as ICL's DAP or the Logica-developed DIPOD are used.

Machine vision

Automatic interpretation of images is an increasingly important objective, for both military and civil purposes. Applications include precision robotics, industrial and medical screening, security and autonomous vehicle control. To achieve human-like machine vision is a very tough problem, and the Machine Vision Unit at RSRE, headed by Jim Sherlock and John Radford, is concentrating on methods which can apply various types of prior knowledge to constrain this task.

Among the current lines of research are:

- *Optical flow.* Use of motion in images to separate objects from background, and deduce 3D motion and structure of objects from 2D images.
- *Image feature analysis.* Development of algorithms which can extract image features such as object edges, corners, and regions of similar texture.
- *High-level scene inference.* Application of IKBS and machine-intelligence techniques to describe complex objects in terms of constituent sub-shapes, and perform inference on incomplete and possibly conflicting image feature data.
- *Image-processing architectures.* The development and exploitation of high-performance architectures is regarded as vital to meet the computational demands of real-time machine vision. Research is well advanced into various architectures, including transputer arrays, the ICL DAP and the Logica DIPOD, which enable complex algorithms to be assessed and demonstrated at realistic speeds.
- *Autonomous vehicle guidance.* The control and guidance of autonomous vehicles is being used to drive the integration and exploitation of machine-vision techniques, and a demonstration vehicle is being built. This complements a related initiative at the Royal Armaments Research & Development Establishment.

Speech research

The Speech Research Unit at Malvern is headed by John Bridle and Roger Moore. Its overall objectives are:

- To provide a national centre of expertise in speech technology research for the MoD and UK industry.
- To develop techniques for advanced automatic speech recognition and high-quality speech synthesis through research into advanced algorithms for speech pattern processing.
- To exploit techniques for advanced speech pattern processing by encouraging the development of suitable speech-technology products and applications.
- To encourage the development of suitable national and international standards for the assessment of advanced speech-processing algorithms and speech-technology equipment.

The unit's research methodology was outlined by Moore and Bridle in a recent paper to the Institute of Acoustics. Over the past 30 years, they note, there have been many approaches—phonetic, knowledge-based, pattern-recognition, statistical and pragmatic—to the problem of automatic speech recognition.

Speech synthesis, in contrast, has followed a steadier course. The higher levels in text-to-speech systems reflect a traditional view of the linguistic and phonetic descriptions of speech signals; and the lower levels are usually based on electrical analogues of the human vocal tract.

Both recognition and synthesis have now reached a watershed, the authors argue. Further progress in speech synthesis will need recognition-type techniques to analyse quantities of natural speech. Conversely, highly structured models such as those used for synthesis will be needed in recognition.

The aim is to achieve high-accuracy, many-talker, large-vocabulary speech recognition in a harsh environment; and high-quality, high-intelligibility, variable-talker speech synthesis. To do this, a central theory of speech pattern processing will probably need to be established.

Such a theory should be mathematically rigorous, computationally tractable, and should make effective use of available information about the structure and use of human speech and language. The underlying philosophy of the RSRE Speech Research Unit is firmly based on developing such a theory.

The approach is founded on information theory and on speech pattern modelling. Information about speech and speech patterns is encoded in a suitable model, and appropriate algorithms are used to compute the output of the model for a specified input—for recognition or synthesis.

Research is grouped into five main areas:

- Speech signal processing.
- Acoustic-phonetic modelling of speech patterns to discriminate between similar-sounding words.
- Linguistic processing to capture and exploit statistical patterns in high-level linguistic constraints and differences between talkers.
- Pattern-processing principles.
- Speech systems.

The first three areas are directly related to speech pattern modelling, while the fourth provides the theoretical underpinning for the whole programme. The fifth area provides a working hardware and software environment for the research, and an interface between this fundamental research and the systems-oriented applications research conducted elsewhere.

The unit's work has contributed directly to a number of industrial products including: the Logos speech recogniser from Logica; the SR128 and Macrospeak from Marconi; a connected word recogniser with PA Technology; and speech spectrograph and speech synthesiser with Loughborough Sound Images.

RSRE speech scientists also are participating in two Alvey MMI/speech projects. Together with Logica, the National Physical Laboratory, Smiths Industries and University College London, they are developing tools, methodologies and standards for performance assessment of speech recognition devices.

In the second Alvey project, they are working with Sindex Speech Technology, University College London, and the School of Oriental and African Studies, to develop a Chinese (Mandarin) speech-to-text and text-to-speech system.

John Bridle succeeded John Holmes as head of the Government's Joint Speech Research Unit last year, and now is joint head, with Roger Moore, of the RSRE Speech Research Unit. Mr. Bridle concentrates on fundamental principles (applicable both to speech and vision), while Dr. Moore's area is specifically speech research, from signal processing to linguistic constraints.

Both scientists have worked for many years on the automatic acquisition of structured statistical models for speech recognition. Now Mr. Bridle is keenly interested in self-learning machines or adaptive networks, which he defines as 'systems that can acquire an internal structure suitable for solving a pattern-recognition job simply by being exposed to sufficient examples'.

'We're talking of interactions between lots and lots of processors, something that is massively parallel, sub-symbolic, and has some method of adapting to repeated patterns so as to modify its behaviour to be appropriate for the job. The reason for calling them self-learning machines is that this adaptive behaviour results from a mechanism which is actually part of the machine, as opposed to running some algorithm on a computer. These things can be thought of as actually realisable in hardware directly. It looks as if they could be very important indeed'. Hence the choice of this topic as one part of the work of the new pattern-recognition NERI at Malvern.

A substantial part of the Alvey speech research is being applied in the Plessey/Edinburgh University large-scale demonstrator, aimed at producing a speech-input word processor and workstation. John Bridle is part of the monitoring team for that project, and the Speech Research Unit is in touch with the Edinburgh team, but there is an interesting difference in approach to speech recognition between Malvern and Edinburgh.

'In simple terms', says Mr. Bridle, 'we're working from the bottom end and they're working from the top end, conceptually. Another way of characterising this difference of philosophies is the relative emphasis you give to the use of knowledge and the use of algorithms. We're strong "algorithms first" people, and they're "knowledge first".

'We think it's more important to be able to write down mathematically what our assumptions about speech are, and then apply those optimally, than it is for our assumptions to be true. We know our assumptions are not true. We think we understand the ways in which they are not true. But we believe that it's only by being specific about our assumptions that we can do anything at all.

'So we say: "How are we going to devise techniques for using assumptions of this sort which are more compatible with what we believe to be the true structure of speech than our current methods are?" We're moving from optimum mathematical computation techniques—which are compatible only with travesties of speech knowledge—towards a situation where they are more compatible with what we think is really going on. Not that we believe anyone really knows what's going on in speech perception. Perception is a great mystery.'

To work from the other direction, trying to find a way to apply linguistic knowledge, is equally valid, Mr. Bridle agrees. 'Obviously, we hope to meet in the middle.' He tends to group other research teams in one or other of the two camps: Bell Labs and IBM Labs go for algorithms, for example, while MIT and Carnegie-Mellon prefer the knowledge approach.

The Alvey MMI strategy document, published in 1984, grouped image processing and speech processing together under the generic term 'pattern analysis'. This grouping is now firmly established at the RSRE Malvern, where a common 'pattern-processing' discipline underlies a significant national resource.

On my way back by train from Malvern, I encountered what would be the ultimate test of a successful automatic speech recogniser—British Rail station announcements at Reading, which defied human interpretation. The Alvey Chinese project might help. Synthesis would be simpler.

For further information:

- A full review of the Alvey MMI programme including speech and vision is given by Chris Barrow, former Alvey MMI Director, in the 1986 Alvey Programme Annual Report.
- Project details are included in the Annual Report Poster Supplement.
- The Alvey Director now responsible for the speech and vision parts of the MMI programme is Keith Bartlett.
- For further details of the RSRE work, contact Andrew Sleigh, Pattern Processing and Machine Intelligence Division, Royal Signals & Radar Establishment, St. Andrews Road, Great Malvern, Worcestershire WR14 3PS (tel. 06845 2733).

SURVEY OF EQUIPMENT USED BY ALVEY PROJECTS

by Ken Hartley, Rutherford Appleton Laboratory

INTRODUCTION

During the past summer a survey of the hardware, software and communications systems which are actually used by Alvey Projects has been carried out at the request of the Alvey Infrastructure Steering Committee. The object was to see how much uniformity there is across the programme, whether a common base exists and to obtain the users' views on the quality of their equipment. A questionnaire was prepared and sent out to all project managers at the end of June, asking for responses by the 1st August. The response was very encouraging, even though forms were still being returned in late October.

COVERAGE

In all 202 completed forms were received. Of these nine arrived after the analysis was completed, but have subsequently been added to the database. A further 13 said that it was not relevant to the project either because no equipment is used (some Alvey 'projects' involve paying for a consultant or visiting lecturer), the equipment used did not fall into any of the categories mentioned (for example, some VLSI projects) and others because no equipment had yet been purchased or used. This left 180 forms to be analysed.

Some forms described more than one project—entries were then made for each project mentioned. Some of the large projects returned forms from each of the collaborating organisations—these were combined into a single entry. These projects will carry a greater weight in the final analysis, but the effect should not be statistically significant. Responses were obtained from 161 out of a total of 300 projects (both collaborative and 'uncle') giving a coverage of 54%, which for a survey of this kind is very good. The response was quite uniform across the four enabling technologies, whilst the Large Scale Demonstrators and Infrastructure & Communications achieved a 100% response. The results should therefore be truly representative of the programme as a whole.

THE QUESTIONNAIRE

The intention was to create a form which was easy to fill in and yet which gave the required information. The respondent was asked to list the equipment used (not necessarily bought) by his or her project under ten different headings listed. He or she was also asked to assess the quality of each item as good, indifferent or poor. On reflection it would have been better to use average rather than indifferent. Some respondents found the need to go outside this range, including some items that would have been rated as much worse than poor! Others tried to indicate shading by carefully placing ticks within or between boxes. In the interests of uniformity these have all been allocated to G/I/P categories. In a few cases the assessment was missing; this has consistently been recorded as I. Although this is probably not what was expected there are so few instances that the conclusions are not affected.

The data discussed below all refer to the number of projects using a particular item, not the number of copies of that item in use. Thus, for example, the first entry in Table 1 means that 89 projects use Vaxes, not that 89 Vaxes are used by the 161 projects which responded. The data are stored in an INFO database. Each record contains the project number, category, name of item and an assessment.

The responses suggest that in some cases there was confusion between software support tools and other software packages, so these have been combined in the analysis. Some people thought that hardware support equipment/monitors included VDUs and terminals, which is not what was intended. There was some confusion in the responses in the communications categories, which suggests that some of the respondents were not clear about the differences between, for example, a network, the services offered over the network and the protocols used to implement those services.

CATEGORY 1—HARDWARE

Table 1 summarises the responses in this category. The first two entries are not unexpected, but note that there are also 16 MicroVaxes which could have been added to the Vaxes. On the other hand it must be remembered that each Sun record probably represents more than one machine—each record refers to a project, not a computer. The entries for ICL, IBM, PDP 11, Xerox and Hewlett Packard all contain various machine types. It is interesting to note the number of personal computers—PCs, BBC, Macintosh and so on—which are being used. The general level of satisfaction is reasonably high, with the exception of the GEC Series 63, Perq, PDP 11 and Whitechapel.

It was expected that there would be a wide range of machines used, but a total of 76 is rather high. On the other hand the figures mean that Vaxes are used by 55% of projects and Suns by 39%.

Table 1 Hardware Systems

Item	Records	G	I	P
Vax	89	70	19	0
Sun 2 and 3	72	53	17	2
ICL	20	12	5	3
GEC Series 63	17	5	9	3
IBM PC	16	12	4	0
MicroVax II	16	10	6	0
Macintosh	12	11	1	0
Perq 1 & 2	11	2	5	4
Orion	9	9	0	0
Whitechapel	9	2	6	1
BBC Micro	7	6	1	0
IBM	7	4	0	3
PDP 11	7	2	2	3
Xerox	7	6	1	0
Hewlett Packard	6	5	1	0
Apollo	5	4	1	0
GEC 4000	4	4	0	0
Masscomp 5500	4	4	0	0
Prime	4	4	0	0
Alice	3	3	0	0
Apricot	3	2	1	0
Sequent Balance	3	3	0	0
54 Others	64	-	-	-
76	385	-	-	-

CATEGORY 2—OPERATING SYSTEMS

The results are summarised in Table 2. Given the number of different computers found above it is encouraging that so few operating systems are in use. It was expected that Unix would dominate the list and that many of the Vaxes would run DEC's VMS. Remember that the figure of 132 means that 132 out of 161 projects—82%—use Unix, though they may use other

systems as well. It is slightly surprising that 25% of Unix users rated it as less than good. Clearly Unix is a unifying theme over a wide range of machines. Unfortunately no less than 17 different versions of Unix were specifically mentioned, including Berkeley 4.1 and 4.2, System V (Releases 2 and 3), Version 7 and 8 and nine proprietary versions. Berkeley 4.2 is by far the most popular—53 out of 132 mentions—and is rated as good by 91% of its users.

Table 2 Operating Systems

Item	Records	G	I	P
Unix	132	99	31	2
VMS	61	50	9	2
VME	11	5	4	2
MS-DOS	10	3	7	0
PC-DOS	7	2	4	1
BBC	3	1	2	0
CMS	3	1	1	1
Interlisp	3	3	0	0
Primos	3	3	0	0
24 Others	28	-	-	-
33	261	-	-	-

Table 3 Programming Languages

Item	Records	G	I	P
C	82	68	13	1
Prolog	60	43	16	1
Lisp	46	28	16	2
Pascal	46	26	16	4
Fortran	40	30	7	3
Pop-11	14	14	0	0
Basic	9	4	4	1
ML	9	4	4	1
Occam	6	4	2	0
Parlog	5	5	0	0
Ada	3	1	2	0
C++	3	3	0	0
Algol	3	2	1	0
31 Others	46	-	-	-
44	372	-	-	-

CATEGORY 3—PROGRAMMING LANGUAGES

A wide variety of languages is again found but in this case the list is not dominated by one or two items but rather by 'the big five'. Together they account for 74% of the responses. Given the wide variety of work carried out under the Alvey programme this is not too surprising—some languages are clearly more suitable for some work than others. It is interesting to see Fortran and Basic so high on the list. Generally, most users are reasonably happy with their language, with Pop-11 rated as being particularly good. Interlisp seemed to cause respondents some trouble as there were also mentions of it in Categories 2, 4 and 5.

As with Unix, this uniformity of response breaks up when the different flavours of Prolog and Lisp are considered—ten different versions of Prolog and seven of Lisp were mentioned by name. Others may be in use, but were not specified. The contrast with C, Fortran and Pascal is most striking—respondents using these languages felt no need to mention the source of their compiler.

CATEGORIES 4 AND 5—OTHER SOFTWARE

As mentioned earlier, it appeared that the differences between these two categories were not clearly defined and so several pieces of software were found in both categories. It therefore seemed more sensible to combine the responses. The results were predictable, with a total of 143 different items being mentioned, 96 of them only once! Only Poplog (33) and Emacs (ten) were mentioned ten or more times. Users' views of Poplog were mixed—16 rated it good, 17 indifferent.

It seems surprising that so few responses mentioned debuggers, database management systems and word processing/text formatting, but this may simply mean that they are being used but were not recorded. It is interesting to see NFS in this list—it may be an error, but it may actually mean that it is seen simply as a tool rather than a piece of communications software.

It is clear that this is an area which is urgently in need of attention, if the advantages of a common set of support software are accepted.

CATEGORY 6—HARDWARE SUPPORT EQUIPMENT/MONITORS

The responses clearly showed that the question was badly phrased. It had been the intention to gather information about test equipment, network monitoring tools and so on, and this is how it was interpreted by some respondents. Others probably saw the word 'monitor' and so replied with information about colour and black and white graphics systems, VDUs and all sorts of other peripherals. There were, in fact, only a handful of items of the type expected, mainly VME test equipment and LAN monitors. Almost all were rated as 'good'.

CATEGORY 7—NETWORKS

The responses are summarised in Table 4. The number of different items is much smaller than in previous categories, which reflects the more limited choice available, whilst the need to communicate with incompatible machines rules out many manufacturer-specific products. The large number of Vaxes means that DECNET is a notable exception to this. Respondents mentioned Janet, PSS and sometimes Janet/PSS. It is probable that these refer to the same thing; however, when a combination of the two appeared, separate records were entered. Thus the totals for these items contain a lot of overlap and cannot simply be added. What is clear is that not all Alvey machines were on a wide area network (unless respondents forgot to mention it!). It is also clear that Cambridge Ring is used on far fewer sites than Ethernet, but that its users are very pleased with it.

Table 4 Networks

Item	Records	G	I	P
Ethernet	61	52	9	0
Janet	42	26	14	2
PSS	39	20	18	1
DECNET	12	5	6	1
Arpanet	8	4	4	0
Cambridge Ring	8	8	0	0
UUCP	7	3	4	0
Appletalk	3	3	0	0
Bitnet	3	3	0	0
Oslan	3	2	1	0
15 Others	17	-	-	-
25	203	-	-	-

CATEGORY 8—COMMUNICATIONS HARDWARE

Far fewer responses were obtained than in Category 7, which suggests that the sample is incomplete. York Box heads the list, but with only 20 mentions; of those only six rated it as good. The other single items mentioned most frequently are the GEC Campus Switches and Camtec/JNT Pads, both of which are highly regarded.

CATEGORY 9—COMMUNICATIONS SOFTWARE

31 different items were mentioned, giving a total of 98 responses. No single item is dominant but the three front runners were the JNT's Coloured Books (23), Sun's NFS (17) and DECNET (ten). In each case roughly half of the respondents rated it as good. It was interesting to note seven mentions of Kermit, which is probably the last resort of those wishing to communicate when all other means fail!

CATEGORY 10—COMMUNICATION SERVICES

The responses are summarised in Table 5. Not surprisingly the list is dominated by Alvey and Janet Mail. The assessment of Alvey Mail is really alarming, with 80% rating it as indifferent or poor. Janet mail fares rather better,

but even so 35% are dissatisfied with it. BT Gold does even worse with nobody (in a much smaller sample) rating it as good.

Table 5 Communication Services

Item	Records	G	I	P
Alvey Mail	51	10	23	18
Janet Mail	34	21	12	1
DEC Mail	6	3	2	0
Arpanet	5	4	1	0
BT Gold	5	0	4	1
Unix Mail	5	4	1	0
UUCP	5	5	0	0
Sendmail	4	1	3	0
Usenet	3	2	1	0
18 Others	22	-	-	-
27	140	-	-	-

COMMENTS

Respondents were invited to add any further comments they wished to make on the reverse of the form. Such comments were received from almost a third of those projects which replied, but most of them merely extended or explained the assessments given. It is not practicable to summarise the comments here as they covered many and various topics including communications problems, the need for a software tools infrastructure and the design of the form. Some of the more interesting comments are reproduced below, whilst making no claims that they are representative or 'fair':

'One of the worst systems we have used since the 1960s. It is exactly what the fifth generation effort is meant to be combatting'.

'It is generally the case that as an industry we are incapable of producing usable software'.

'I have ticked "good" in all cases because it meets our expectations rather than because it is necessarily wonderful'.

'My indifferent markings stem from customers at large being treated as beta-test vehicles'.

'In spite of these difficulties the project will succeed!' (They appear to have had too little of the wrong equipment forced on them.)

One or two minor points were noted which are perhaps worthy of comment. For example, one response contained the following items under Communication Services:

17 Pence Stamp	G
12 Pence Stamp	P

It was also noted that two projects were each using only a single computer—one a BBC micro, the other a Macintosh. It is therefore possible to refute the claim that all Alvey projects involve huge expenditure on equipment. On the other hand one project included references to Alice, Apricot, ICL 3930, Intel MDS, Macintosh, Orion, Sequent Balance, Stride, Sun, and three different models of Vax.

Finally, the author was interested (and a little concerned) to find references to Hartley Autozap hardware and software on one form.

CONCLUSIONS

With over half the projects responding there is a good chance that the results are representative of the whole community. The picture which emerges is of a community using a wide variety of equipment but with most projects using Vaxes or Suns running Unix, with a substantial VMS subculture. Programmers overwhelmingly use C, Prolog, Lisp, Pascal and Fortran. The machines generally use ethernet for local area networks and Janet/PSS for wide area communication. The latter indicates that industrial collaborators are not great users of WANs.

There are clearly a number of problems. First, too many varieties of key software—Unix, Prolog and Lisp—are in use. Secondly, software tools are not being widely used and, where they are used, there is no dominant choice. Finally, in a programme which is based on collaboration between different sites wide area communications are not universally used and are not highly rated by those who use them. Alvey Mail, in particular, is disliked by most of its users.

These conclusions could probably have been predicted from the outset. At least the results serve to quantify personal impressions.

Finally, the author would like to thank Janet Smith for her valiant efforts in transferring information from the forms into the database.

Copies of the full report are available, price £5—See the Document Order Form.

SOFTWARE QUALITY AND CERTIFICATION

From its inception the Alvey Software Engineering programme has maintained, as a central focus of its policy, the need to increase the quality of the software produced by the UK-based IT industry. By quality we mean providing customers with exactly what they want, when they want it and at a price they can afford. In all sectors of industry non-price factors such as good design, technological innovation, reliability and prompt delivery—in short, quality—are being recognised as important factors to be considered when manufacturing and selling products or providing services; not only as a means of improving competitiveness, but also as a means of saving money.

Many IT companies have quality-assurance systems in place and it is heartening to note a growing trend within the software industry in the use of certification for such systems. One such company is Praxis plc, which reports elsewhere in this issue of *Alvey News* (see p.19) on its experience of certification under BS5750.

The 1982 White Paper 'Standards, Quality and International Competitiveness' set out the Government's views on the importance of a strong standards system, the need to develop an increased awareness of the importance of quality in order to meet customer demands, and the vital role which quality management systems and certification can play in demonstrating quality achievements. Within DTI the Standards and Quality Policy Unit has

overall responsibility for following up the White Paper and leading within Government, on work in this area. Since the publication of the White Paper a number of objectives have been pursued and actions put in place to build on the framework set out.

Among these actions mention should be made of the strong promotion of BS5750 as an important mechanism through which UK industry can adopt effective quality management systems. BS5750 is the UK standard for quality management systems and allows firms to be assessed to ensure that their quality management systems meet the principles on the standard. Work is also in hand in the international and European arenas on an international standard, ISO9000, which will embody similar principles to BS5750. In support of this policy, DTI has published its 'Register of Quality Assessed United Kingdom Companies' and also provides financial assistance to help firms put into place systems based on BS5750 or an equivalent standard.

Certification ensures that the quality management system of a firm is organised in line with modern practice, that regular testing of products helps to promote product design and that the standards involved are improved by feedback of certification experience. For the users, certification will give greater confidence in the capability of a company and the integrity of its products or services, save inspection failure and warranty costs, increase industrial efficiency and help to raise the overall quality of the marketed product.

The Government believes it is vital that certification schemes are available to all sectors of UK industry, particularly exporting industry, to clearly develop their quality achievements. The software industry is no exception to this and we at Alvey would urge companies to seriously consider the use of quality management systems certified to BS5750.

In 1985 the National Accreditation Council for Certification Bodies was launched to enhance the status of certification bodies by ensuring a consistent quality in their performance and to act as a focus for the development of mutual recognition arrangements with equivalent systems in other countries. Such an accreditation system does much to give customers confidence in the independent certification bodies. The first accreditation certificate was awarded to Lloyds Register Quality Assurance Ltd. on the 18th March 1986 and the second to the Certification Authority for Reinforcing Steel on the 21st October 1986. Work towards a European policy on the mutual recognition of testing and certification services is well underway.

We at Alvey strongly encourage companies within the software industry to consider the experience of Praxis and to consider the importance of the use of such devices as the national 'quality tick' mark on their stationery. As the first paragraph of this article said, quality is about customer satisfaction and without customer satisfaction we cannot hope to have a thriving UK Software Industry.

For further details on BS5750 contact the Standards Division, BSI, Park Lane, London (01-629 9000). Details of the DTI schemes for the introduction of assessment to BS5750 may be obtained from PERA at Melton Mowbray (0664 501501). The DTI Register of Quality Assessed UK companies is available from HMSO. Details of Alvey projects in this area are published in the Alvey Annual Report.

BS5750: STANDARD FOR SOFTWARE QUALITY ASSURANCE

by Chris Miller, Praxis Systems plc

INTRODUCTION

A key element in the future competitiveness of the UK software industry will be its ability to deliver high-quality systems and services. The industry has seen significant improvements in its ways of working over the past few years. The increasing use of mathematically based formal methods (VDM, Z), the availability of software test harnesses and tools (LDRA Testbeds, Malpas, Spade) will help to take some of the risk out of software development. The availability of personal computers has offered basic project planning tools to managers to help control the development process better.

Whilst all these elements make significant contributions in controlling the quality of software, it is important to recognise the need to control the overall development process within a *quality system.*

WHAT IS BS5750?

BS5750 is the British Standard for Quality Systems which specifies requirements to 'establish, document and maintain an effective and economical quality system to ensure and demonstrate that products and services conform to specified requirements'.

The purpose of BS5750 is not to lay down hard and fast rules about how a company's quality system should operate. A company should know its own business; BSI does not seek to tell people how they should be running it. BSI does expect a supplier to document what it is doing to meet the requirements of BS5750 and demonstrate that it follows BSI's quality system. In other words, it requires a supplier to be consistent in doing what it says it does.

The standard provides a generalised model for a quality system independent of any particular industry. It is, however, biased towards manufacturing, showing its pedigree of the Ministry of Defence Def Stans 05/21 and 05/24. The standard was first issued in 1979.

The standard consists of six parts:

Part 1: Specification for design, manufacture and installation
Part 2: Specification for manufacture and installation
Part 3: Specification for final inspection and test
Part 4: Guide to the use of Part 1
Part 5: Guide to the use of Part 2
Part 6: Guide to the use of Part 3.

BS5750: Part 1 specifies 19 requirements for a quality system that is needed for design, development, manu-

facture, installation and field trials. Parts 2 and 3 specify subsets of, and qualifications to, the 19 requirements as appropriate.

The 19 requirements in Part 1 come under the following headings:

—Quality system
—Organisation
—Review of the quality system
—Planning
—Work instructions
—Records
—Corrective action
—Design control
—Documentation and change control
—Control of inspection, measuring and test equipment
—Control of purchased material and services
—Manufacturing control
—Purchaser supplied material
—Completed item inspection and test
—Sampling procedures
—Control of non-conforming material
—Indication of inspection status
—Protection and preservation of product quality
—Training.

Although some of these headings look a little strange in the context of software, they do illustrate the scope of Part 1 of the standard. It is concerned with the complete *process* of software development and the *people* who carry it out, rather than concentrating on the *output* of the software development process.

BSI also assesses companies to BS5750 under a national Registered Firms Scheme. Successful assessment results in the company being registered as a Firm of Assessed Capability in the BSI Buyers Guide.

These assessments are carried out against one of the three parts of BS5750 using Quality Assessment Schedules (QASs) which make specific requirements appropriate to different industries and sectors within industries.

QASs are drawn up with the participation of major suppliers, purchasers, trade associations and invited individuals. There are currently two schedules, 3302/79 and 3302/80, which are specific to software development and cover Part 1 and Part 2, respectively.

Assessment under BSI's Registered Firms Scheme falls into three stages:

- The company's quality manual is submitted for assessment against the relevant part of BS5750 and the appropriate QAS. This ensures that the supplier has taken account of all the requirements.
- The company is audited against its quality manual. The purpose of the audit is to check that the supplier is carrying out work in conformance with the company quality system.
- The company is subject to unannounced surveillance visits to ensure continued compliance with the quality system.

Lloyd's Register provides a similar assessment service to BSI although it operates a series of 'sector schemes' which fulfil the same purpose as the BSI's QASs. A number of organisations, including British Telecom, carry out assessments to BS5750 on their suppliers.

The series of draft ISO standards on quality management and quality assurance (ISO 9000 to ISO 9004) was based on BS5750 and incorporates revisions following discussions between ISO members. BSI intends to reissue BS5750 incorporating improvements made by ISO.

BSI is currently in the process of drafting BS5750: Part 0, Guide to Principal Concepts and Applications, which is based on ISO 9000 and BS4891, A Guide to Quality Assurance. Part 0 describes procedures for use by companies for internal quality management purposes, in contrast to Parts 1 to 3 which describe requirements for external quality-assurance purposes.

WHAT DOES BS5750 HAVE TO OFFER?

A purchaser: A purchaser will be looking to a computer system supplier who can provide the best guarantees of being able to deliver high-quality products and services; in other words, the supplier who can consistently deliver what is wanted, when it is wanted and within budget.

By using a supplier assessed to BS5750, a purchaser can be confident in the supplier's ability to deliver to specification. A purchaser is relieved of the time and cost of conducting his own assessment and will know that the supplier is subject to periodic surveillance visits by BSI to ensure continued compliance. We see increasing evidence that purchasers are qualifying potential suppliers on, amongst other things, their operation of an assessed BS5750 Quality System.

An important facet of BS5750 is the visibility that a purchaser is given of the supplier's quality system to provide assurance of satisfactory progress. Flexibility to respond to changes in requirements in a controlled manner is also a key part of BS5750.

A supplier: Software suppliers are faced with a number of external pressures to ensure that they can consistently deliver to specification. Large purchasers of computer systems will increasingly require their suppliers to operate to an approved quality system. As has been described, suppliers will see this as the best way they can be assured of success.

Widespread reliance on computer systems at the heart of the most sensitive areas of business brings pressures on suppliers to perform to specification. Sectors such as electronic funds transfer, electronic shares dealing, railway signalling systems, and power-station control systems demand high-quality software. The cost of failure in any of these systems is so unacceptably high that it is unprofessional to approach them without confidence in the process and the people that are inherent in the development of them.

As well as opportunities for marketing and public relations exploitation on successful registration, there are a number of internal opportunities which are no less important.

The process of BS5750 registration provides an excellent focus on quality with a well-defined objective, bringing tangible benefits and corporate kudos.

The main part of BS5750 assessment is the audit of the company's software development process. We accept, as a matter of financial professionalism and discipline, that a company's accounts are subject to an external audit, but we are less than disciplined about external audits of our software development processes. Knowing that the quality system will be subject to external audit and continued surveillance, the supplier should be directed towards establishing controls that are effective to follow and monitor.

Above all, however, adopting a BS5750 quality system which is successfully audited will give a supplier the ability to control the development process, giving:

—reduced lifecycle costs
—cost-effective and workable mechanisms
—greater controls and reduced risks
—fewer surprises
—an ability to monitor the above.

WHAT IS INVOLVED?

Before embarking on a programme of development and registration of a quality system against BS5750, there are a number of decisions a supplier has to take.

First, the scope of the quality system needs to be defined in terms of the functional areas of the company to be affected. Is the design or support function to be included? This will determine the most appropriate part of BS5750 to be assessed against.

Secondly, the site at which the quality system is to be operated needs to be established, as work performed off-site is not covered by BSI registration.

Thirdly, it may be that a company wishes to exclude certain areas of work from the quality system. A predominantly product-oriented company may decide that it is inappropriate to bring small amounts of consultancy under the same quality system, or a software services company may consider it appropriate to have a single, low-volume product within the same scheme.

Finally, a supplier needs to decide on the most appropriate quality-assessment schedule (QAS) to be used, as this will give specific guidelines on the requirements that a quality system has to meet.

From a purchaser's point of view, when selecting a supplier who offers BS5750 registration, the same considerations will be important to ensure that the assessed quality system will actually be used on the purchaser's work.

Implementing a quality system to BS5750 registration is a substantial undertaking which needs to be committed to, planned and managed to the same level as a software development of similar importance. The development of an effective quality system should follow the steps outlined below with the emphasis on the needs of the business and the requirements of BS5750:

- Establish the policy, objectives and organisation of the quality system within the context of the company's business strategy. It is very important that the quality system evolves as the company grows.
- Design a structure for the quality manual which suits the needs of the users of the quality system: the software developers. They need to know what there is to help them do their job better.
- Produce the standards and procedures through extensive involvement from the developers, drawing on their experiences and requirements when they have real problems to solve.
- Review all the standards and procedures before giving them to the developers to use in anger.
- Audit the quality system in operation through the examination and debriefing of projects and their use of the standards and procedures.
- Review the audit findings and establish a corrective action plan to refine the quality system before being assessed by BSI.

SUMMARY AND CONCLUSION

BS5750 as a quality-system standard has had little exposure as a discipline that the software industry is prepared to impose on itself. There is evidence that the use of this standard will be imposed by purchasers rather than from within the industry.

The use of a BS5750 quality system brings a supplier tangible benefits from reduced costs and a greater degree of control giving, in turn, increased confidence and reassurance.

BS5750 provides a *framework* for a company quality system. It is not a guarantee of success. It has to be related to the supplier's business and culture. Its requirements have to be mapped onto the underlying processes within a software development organisation. However, it does force a supplier to think very carefully about how quality controls can be applied to software development, which reveals valuable insights into the most cost-effective ways of working.

There is strong evidence that lack of investment in industrial and scientific research is blunting our competitive edge in world markets. An opportunity open to the UK software industry is to exploit a niche market by establishing a worldwide reputation for delivering high quality. In this context, it is extremely important that we have internationally recognised standards for software quality.

The national standard for quality systems, BS5750, which was used as the basis for the ISO 9000 series of quality standards, gives us an opportunity to position the industry in the direction of the market niche for high-quality systems and services. Like any standard, BS5750 can be considerably enhanced and improved through extensive use. Adoption of BS5750 by purchasers and suppliers alike can only enhance the UK software industry's reputation.

SECOND ALVEY-SPONSORED WORKSHOP ON DEEP KNOWLEDGE

The second Alvey-sponsored workshop on deep knowledge was held at Selwyn College, Cambridge, from the 15th to 17th April 1986, with the theme 'Practical experiences with deep knowledge'. The programme centred on six case studies, split equally between academic and industrial presenters. Half the case studies covered the *design* of deep knowledge systems; the other half covered *implementation* issues. Three parallel groups each examined two of the case studies, with plenary reporting sessions.

Case Study 1 was titled 'Fault diagnosis in process plant based on structure and function of components'. This problem dealt with diagnosis of faults in a gravity-fed water rig consisting of five tanks, interconnected by pipes controlled by valves. A diagnostic expert system has been implemented for this task, and the discussion covered the problem and the solution together.

Case Study 2 addressed issues in 'Mechanical health monitoring and modelling physical systems'. The example problem covered the detection and diagnosis of performance degradation in diesel engines. Although current work on the project is at a relatively early stage, a number of interesting aspects have emerged. Because a complete solution to the problem could prove very difficult, the discussion focused on detection of degradation, and largely ignored diagnosis.

Case Study 3 dealt with a flow-soldering diagnostic expert system. The problem tackled is the diagnosis of faults in printed circuit boards which have undergone flow soldering. Earlier attempts to solve the problem using a shallow rule-based approach had proved unsatisfactory. The group discussed several possible approaches

to the problem using 'deep knowledge'. The solution eventually adopted in an implemented system (which was demonstrated at the workshop) used a causal model of the process.

Case Study 4 was titled 'Deep knowledge modelling in robotics'. The group discussion centred on a simple latch mechanism. This proved a useful example of the type of mechanical object which we deal with naturally every day. However, it is far from trivial to express the knowledge required to understand and manipulate such mechanisms in a computable form.

Case Study 5 involved diagnosis of the causes of alarms on a process plant, i.e. how can a computer system advise the operators of a process plant what physical fault has caused a particular alarm, or group of alarms, to be set off. One solution had already been found and implemented—most of the discussion was about the principles involved, possible alternative solutions, and the factors involved in choosing between them.

Case Study 6 covered 'Haemodynamic regulation' as an example of a continuous understanding system. Although a full implementation is not planned at this stage, a model of this example could form part of a larger system, capable of linking observable symptoms with the processes that gave rise to them. The problem was an unsolved one; various perspectives on it were presented and discussed.

The workshop programme also included two very useful tutorials. The first, given by Ben Kuipers (University of Texas at Austin), covered the concepts of qualitative reasoning; the second, by Janet Efstathiou (Queen Mary College), dealt with inference under uncertainty.

A full report on the workshop proceedings is available, which includes copies of the briefing materials and slides used in the tutorial presentations (see the Alvey Document Order Form on the inside back page of this issue).

Tony Morgan
Cambridge
September 1986

Advanced Information Technology Calendar

15-18 December 1986
Brighton

Expert Systems 86
Contact: Clearway International Medical & Scientific Meetings Ltd., Conference House, 9 Pavilion Parade, Brighton BN2 1RA. Tel: 0273 694079/ 695811

16-17 December 1986
London

Seminar on AI Methods in Statistics
Contact: Mrs. Julie Valentine, Unicom Seminars, Brunel Science Park, Uxbridge, Middx. Tel: 0895 56484

17-18 December 1986
Glasgow

Short Course on Conceptual Programming
Contact: Marena Drysdale, The Turing Institute, George House, 36 North Hanover Street, Glasgow G1 2AD
Tel: 041-552 6400

19 December 1986
IEE, London

Colloquium on Diagram Manipulation for Software Engineering
Contact: Kate Gingell, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871

5-7 January 1987
Farnborough

Third Deep Knowledge Based Systems SIG Workshop
Contact: Atta Badii, Organising Committee DKBS3, Central Research (AI) PP1, Schlumberger Electronics (UK) Ltd., Victoria Road, Farnborough, Hants GU14 7PW
Tel: 0252 544433, ext. 2300

5-9 January 1987
Loughborough

Essential Mathematics for Software Engineers
Contact: Short Course Unit, Sheffield City Polytechnic, 33 Collegiate Crescent, Sheffield S10 2BP.
Tel: 0742 665274, ext. 3273

8-9 January 1987
University of Surrey

Second Workshop of the Alvey KBS Club SIG on Explanation
Contact: Dr. G. Nigel Gilbert, Alvey DHSS Demonstrator Project, Hut 10, University of Surrey, Guildford, Surrey GU2 5XH.
Tel: 0483 504440

14 January 1987
London

Conference on Information Technology and People: Designing for the Future
Contact: Dr. D.J. Oborne, Department of Psychology, University College of Swansea, Singleton Park, Swansea SA2 8PP
Tel: 0792 205678, ext. 4219

14 January 1987
IEE, London

Colloquium on The Impact of ASICs on Equipment Design
Contact: Kate Gingell, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871

19 January 1987
IEE, London

Colloquium on Formal Methods and Human-Computer Interaction
Contact: Kate Gingell, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871

27-28 January 1987
London

Conference on Artificial Intelligence in the Dealing Room
Contact: Sarah Kennedy, Institute for International Research, 44 Conduit Street, London W1R 9FB
Tel: 01-434 0301

20 February 1987
IEE, London

Discussion Meeting on Software Engineering—the Future
Contact: Andrew F. Wilson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 260

3-6 March 1987
London

International Open Systems Conference
Contact: Online International, Pinner Green House, Ash Hill Drive, Pinner, Middx. HA5 2AE.
Tel: 01-868 4466

4 March 1987
Barbican, London

One-day Seminar on Applying OSI: MAP and TOP in integrated manufacturing
Contact: Online International Ltd., Pinner Green House, Ash Hill Drive, Pinner, Middx. HA5 2AE. Tel: 01-868 4466

5 March 1987
IEE, London

Colloquium on The Use of Expert Systems in Control
Contact: Lorna Richardson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 330

6 March 1987
University of Essex

Alvey Sponsored Workshop on Formal Semantics in Natural Language Processing
Contact: Barry Lowden, Workshop Co-ordinator, Department of Computer Science, University of Essex, Wivenhoe Park, Colchester CO4 3SQ.
Tel: 0206 862286, ext. 2426

17-18 March 1987
London

4th Annual Conference on Expert Systems in Medicine
Contact: Rosamund da Gama, Institute of Measurement & Control, 87 Gower Street, London WC1E 6AA
Tel: 01-387 4949

27 March 1987
IEE, London

Colloquium on Evaluation Techniques for Interactive Systems Design: I
Contact: Lorna Richardson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 330

1-3 April 1987
Bournemouth

Second International Conference on Command, Control, Communications and Management Information Systems
Contact: Conference Department, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 222

6-10 April 1987
Edinburgh

AISB-87: Conference on Artificial Intelligence and the Simulation of Behaviour
Contact: Dr. J. Hallam, Department of Artificial Intelligence, University of Edinburgh, 5 Forrest Hill, Edinburgh EH1 2QL.
Tel: 061-667 1011, ext. 2557

7 April 1987
IEE, London

Colloquium on Software Engineering— the Importance of Documentation
Contact: Andrew F. Wilson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 260

10 April 1987
IEE, London

Colloquium on Hierarchical Interconnection Technology
Contact: Andrew F. Wilson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 260

13 April 1987
IEE, London

Colloquium on Distributed Database Systems
Contact: Ms Gail Byrne, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 269

14-16 April 1987
Leicester Polytechnic

International Conference on Automating Systems Development
Contact: David Benyon or Steve Skidmore, School of Mathematics, Computing and Statistics, Leicester Polytechnic, PO Box 143, Leicester

27-29 April 1987
Amsterdam

CHDL 87—8th International Symposium on Computer Hardware Description Languages and their Applications
Contacts: Mr. P. Ploeger and Mrs. N. Gajentaan, Stichting Informatica Congressen, Paulus Potterstraat 40, 1071DB, Amsterdam, Netherlands.
Tel: +31 20 620681

12 May 1987
IEE, London

Colloquium on MASCOT in Real-Time Systems
Contact: Ms Gail Byrne, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 269

13 May 1987
IEE, London

Colloquium on Expert Planning Systems—a New Application for Control Theory
Contact: Lorna Richardson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 330

18-22 May 1987
Paris

Third Electronic Image Symposium
Contact: Isabelle Chardonnet, CESTA, 1 rue Descartes, 75005 Paris, France
Tel: +33(1) 46.34.32.98

20 May 1987
IEE, London

Lecture on Expert Systems in Biotechnological Control
Contact: Lorna Richardson, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 330

22 May 1987
IEE, London

Colloquium on Reusable Software Components
Contact: Ms Gail Byrne, IEE, Savoy Place, London WC2R 0BL.
Tel: 01-240 1871, ext. 269

2-4 June 1987
London

Third International Expert Systems Conference and Exhibition
Contact: Learned Information Ltd., Woodside, Hinksey Hill, Oxford OX1 5AU.
Tel: 0865 730275

15-18 June 1987
London

The International ISDN Conference
Contact: Online International Ltd., Pinner Green House, Ash Hill Drive, Pinner, Middx. HA5 2AE.
Tel: 01-868 4466

15-19 June 1987
Eindhoven, Netherlands

European Conference on Parallel Architectures and Languages
Contact: Either Prof. J.W. de Bakker, Centre for Mathematics and Computer Science, Kruislaan 413, 1098SJ Amsterdam, Netherlands, or Prof. Ph. Treleaven, Department of Computer Science, University College London, Gower Street, London WC1E 6BT, England

16-18 June 1987
London

Networks 87—The European Computer Communications Conference and Exhibition
Contact: Online International Ltd., Pinner Green House, Ash Hill Drive, Pinner, Middx. HA5 2AE.
Tel: 01-868 4466

23-25 June 1987
Wembley, London

KBS87: Knowledge Based & Expert Systems Show
Contact: Online International Ltd., Pinner Green House, Ash Hill Drive, Pinner, Middx. HA5 2AE.
Tel: 01-868 4466

23-25 June 1987
London

Software Tools 87
Contact: Online International Ltd., Pinner Green House, Ash Hill Drive, Pinner, Middx. HA5 2AE.
Tel: 01-868 4466

13-17 July 1987
Manchester

1987 Alvey Conference and Exhibition
More details later

23-28 August 1987
Milan

International Joint Conference on Artificial Intelligence
Contact: Alan Bundy, Department of Artificial Intelligence, University of Edinburgh, 80 South Bridge, Edinburgh EH1 1HN.
Tel: 031-225 7774, ext. 242

24-28 August 1987
Amsterdam

Eurographics 87, Computer Graphics Conference
Contact: Eurographics 87, c/o Organisatie Bureau Amsterdam bv, Europaplein 12, 1078 GZ Amsterdam, Netherlands

2-4 September 1987
Edinburgh

First European Conference on Speech Technology
Contact: David Cowan or Gale Wright, Technical Media Services Ltd., 62 Kelvingrove Street, Glasgow G3 7SA.
Tel: 041-332 6636

7-11 September 1987
Exeter

HCI '87 Conference
Contact: BISL, 13 Mansfield Street, London W1M 0BP.
Tel: 01-637 0471

21-25 September 1987
West Berlin

Seventh International Conference on Distributed Computing Systems (ICDCS '87)
Contact: Dr. P.F. Linington, Head of Joint Network Team and Network Executive, Rutherford Appleton Laboratory, Chilton, Didcot, Oxon. OX11 0QX.
Tel: 0235 446737

23-25 September 1987
Como, Italy

International Conference on Reliability and Robustness of Engineering Software
Contact: Computational Mechanics Institute, 52 Henstead Road, Southampton SO1 2DD.
Tel: 0703 221398

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