BMVA News

BMVA News[1] is published every three months. Contributions on any activity related to machine vision or pattern recognition are eagerly sought. These could include reports on technical activities such as conferences, workshops or other meetings. Items of timely or topical interest are also particularly welcome; these might include details of funding initiatives, programmatic reports from ongoing projects and standards activities. Items for the next edition should reach the editor by 30th July 1999.

Contents

[1] The British Machine Vision Association and Society for Pattern Recognition is a Company limited by guarantee, No. 2543446, registered in England and Wales. Registered Office: Granta Lodge, 71 Graham Road, Malvern, WR14 2JS. The Association is a non-profit-making body and is registered as charity No. 1002307.

Student Bursaries

In order to encourage impoverished students to present work at national and international conferences, the BMVA issues bursaries to help cover the travel and conference costs.

A small number (4) such bursaries, of up to £300 each, are issued annually.

In return for this magnanimity, the recipient is expected to write a report on the conference for inclusion in the newsletter.

To be eligible, you must be

1. A student,

2. Presenting work at an important conference,

3. Having a hard time raising funds to go

To apply for such a Student Bursary, write to the secretary enclosing

1. a copy of the paper you are to present

2. a breakdown of anticipated costs and details of your request (up to £300)

Applications will be reviewed by the committee.

Successful applicants will be sent the agreed funds upon receipt by the committee of

1. proof that the conference was attended and

2. a review for the newsletter.

BMVC Bursaries

Special provision for student bursaries for BMVC (usually covering the cost of the conference itself) are arranged each year by the BMVC organisers. For details, contact the current organisers or look at the BMVC web pages.

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Letters to the Editor

Thank you for your request for anecdotes, following our success in getting two nominations for in the "unlikely" image analysis category (BMVA News, Nov 99)

I had a disgusting introduction to animals when working on "image analysis for cow teat inspection". For this work, I had been lent a very expensive colour camera from another project, along with threats of death should it come back damaged. The image capture in the milking parlour was proceeding as planned, until cow no. 5 entered the stall with a bad attack of diarrhoea. Within seconds, the room was full of corrosive spattering liquid, and the only thing I could use to protect the lens was myself and my lab book. "That's nothing", growled the farm hand through the spray, "you should see one that's got a cough at the same time".

On another occasion, John Marchant and Paddy Schofield were weighing pigs via a remote image system, and were surprised when the screen went suddenly dark. After some head scratching, they realised that this was simply due to a failed light bulb, and Paddy went down to the pig pen to replace it. However, the light bulb had not only failed, but had fallen from the roof into the straw below, where the pigs had eaten it.

Thus we see the great advantage of restricting one's research to standard images: Lena has never yet been known to eat the vision system.

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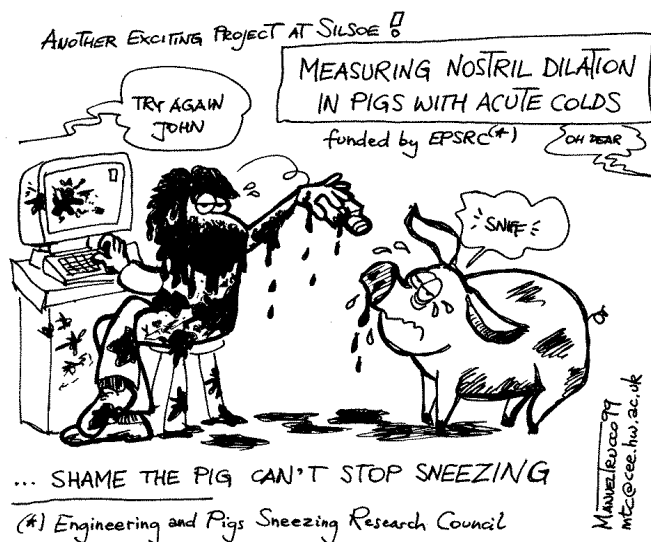
Your categorisation of the robotic sheepdog as "most useless" application [bmva news 9(2)] i am afraid betrays your chauvinistic middlesex origins.

Yorkshire, as is well known, is a wool county. Applications for sheepdogs of all persuasions are legion.

As they say, "horses for courses" [which leads me on to my next idea ...].

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A Natural History of Vision

Nicholas J. Wade

The MIT Press, 1998

Hardback, 466 pages

Though enticing, the title of this volume is slightly misleading. Rather than being an essay in the History of Science, it is primarily a source book of quotations. The quotations cover the period until 1840 when vision moved from the natural environment to the laboratory. Prior to this transition, writings on vision were primarily descriptions of observed phenomena (how things looked), rather than measurements of visual capabilities.

The volume is organised into nine chapters: light and the eye, color, subjective visual phenomena, motion,

binocularity, space, and illusions. These chapters are further sub-divided into 67 sub-sections. Each sub-section is introduced with a very nice historical survey followed by the quotations organized chronologically. Although the author is explicit that his main aim is not to write history of science ("there are many good texts available"), the introductions are excellent and I'm sure that for many readers they will be as useful as the quotations themselves.

The text of the book is accompanied by black and white illustrations of original diagrams of apparatus, anatomy and appearances which are made reference to in the quotations. Many of these are classics which the reader will recognise as they thumb through this large format book. More unusually, Wade has included portraits of many of the authors of the quotations. Whatever one may think of his justification for this ("It is not clear to me what the portraits add to understanding the material presented, but it is equally evident that my motivation to find portraits was immense."); their small marginal format makes them unobtrusive.

To conclude, clearly the volume is the result of a labour of love: but none the worse for it. Some readers will find pleasure from skimming its contents. Others will find it a valuable source for adding extra colour and context to lectures.

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ICPR 1998

The 14th International Conference on Pattern Recognition was held in August 1998 in Brisbane, Queensland, Australia, the first time the conference has been held in the southern hemisphere! This was the culmination of a long planned programme by the Australian Pattern Recognition Society since 1990 to bring the premier pattern recognition conference to Australia. Australia has a small pattern recognition community but managed admirably to put on such a large conference in an excellent venue on the south bank of the Brisbane River very close to the centre of the city. The numerous hotels and restaurants made extra-conference socialising and discussions pleasurable.

The conference followed the typical three day format of plenary sessions and paralle specialist sessions which made full use of the latest audio-visual technology. The writer was grateful that, without advanced notice, he could use a laptop with animations for his presentation. Poster sessions were successfully held along with a special session of unrefereed poster papers sponsored by Boeing. This session had a similar format to that used at BMVC in Surrey where cheese and wine were supplied. The posters were very popular and made a contribution to the success of the conference.

There were many invited talks. The K. S. Fu was given by J.-C. Simon on handwriting recognition which included demonstrations of his software for bank note analysis. Alex Pentland did an illuminating talk on research at the Media Lab using a laptop and many MPEG'd videos. Torfinn Taxt talked about medical applications and Henry Tirri stepped in at quick notice to help us all understand minimum description length applications. Nicholas Ayache discussed computer vision for medical image analysis and finally Hans Knutsson described advances in learning multidimensional signal processing. All the invited talks were stimulating and provoked many questions and discussions.

Radically, for a conference of such a size these days, the proceedings were in two volumes with the printing of very high quality. Papers restricted to three pages each meant the proceedings only weighed around five kgs., eliminating any excess baggage problems – the bane of the modern conference goer. Three pages per paper might be seen as a disadvantage but then many of the papers are also available via the web as longer technical reports.

The conference covered the usual topics with increasing emphasis on surveillance, human monitoring and multimedia applications. The increasing speed and performance of modern computers meant that there were videos of real time or near real time systems reported.

Overall then a very successful conference that was excellently organised, well attended (600+ delegates) containing excellent publications showing advancing progress in pattern recognition and related areas.

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CIR 99

The Challenge of Image Retrieval Conference Newcastle upon Tyne, 25–26 February 1999

Some of the most exciting research challenges lie in the area of image data management. The second UK conference on Image Retrieval marked an endeavour to reconcile the gap between researchers and practitioners in the fast-growing field of content based image retrieval (CBIR). The conference brings together both groups in order to promote the mutual understanding and co-operation so critical to the provision of effective solutions for the management of image collections.

Sixty-nine delegates attended in all, with representatives from many organisations based throughout the UK and in Ireland, France and the States. The conference incorporated a variety of invited presentations which fell into three main groupings; novel applications of CBIR, new CBIR techniques and new approaches to image data management. A final session discussed the impact of emerging standards for image retrieval.

The opening session was led by Dr John Eakins and Margaret Graham of the Institute for Image Data Research based within the University of Northumbria. They set the scene by discussing the key conclusions from their review of the current state of the art in CBIR technology. Both primitive and semantic level retrieval techniques were discussed, and in relation to one of the fastest growing areas of research – that of video retrieval. A key point made was that rather than having to decide between either traditional text retrieval or current CBIR methods, a hybrid system could incorporate useful aspects of both in a combination of the two approaches. It was made clear, however, that more structured attempts to evaluate the effectiveness of hybrid systems are a necessity.

The keynote address from Michael Swain of Cambridge Research Laboratory, Compaq Computer Corporation began the second day of the conference. Drawing attention to the colossal growth of multimedia on the World Wide Web, he discussed the need for effective search engines for the millions of users wishing to navigate their way through such material each day. The development of two search engines was then discussed; Alta Vista's Photo Finder and WebSeer, developed at the University of Chicago. The challenges facing the developers included finding text that is relevant to image content, categorising images, searching for similar images and (with Photo Finder) indexing millions of images. Plans for the future include extending Photo Finder to include the indexing and retrieval of video material, now a major focus for many CBIR software developers.

The content of the three sessions devoted to the presentation of research papers ranged from the very technical where specific automatic image classification and retrieval techniques were discussed, through to evaluation and user requirements studies, the user-centred approach being highlighted as essential to the successful development of future image storage and retrieval systems.

CBIR applications discussed covered three systems currently under development. Users of image retrieval systems provided the focus of two studies; one considering the challenges involved in developing a system to support the retrieval or re-use of educational materials, whilst the other investigated appropriate interface design and evaluation. An application being developed at the University of East Anglia was also presented where algorithms utilised in computer vision systems are being used to filter email and web traffic in an attempt to automatically identify and block pornographic material. The implications for large corporations in particular were highlighted.

New techniques covered during the second session included colour indexing, particularly in relation to solving the problem of how colour perception depends upon type of illumination, retrieval via shape when the shape undergoes simple geometric transformations and a trademark image retrieval system using multiple features.

The new approaches to image data management included novel techniques for automatic scene classification through analysis of images' power spectra; structured navigation combining a visual browsing tool with current query-based methods, automatic shot boundary detection to analyse video content; and the development of a flexible architecture for content and concept based multimedia exploration, using a multimedia thesaurus allowing navigation via semantic content.

The final session discussed the impact of emerging standards for image retrieval. Alan Lock of the Technical Advisory Services for Images (TASI) discussed the importance of standards, presenting the anticipated benefits (such as ease of data transfer and exchange and consistency of cataloguing and searching) as well as the disadvantages (standards may be too limiting or require specialist training). Michael Day

of the UK Office for Library and Information Networking spoke about metadata formats and emerging standards as a means of effectively organising and retrieving digital images. Particular reference was made to a number of existing projects and initiatives, particularly the Dublin Core initiative. Edward Hartley of the University of Lancaster drew the formal presentations to a close with his overview of the new MPEG-7 standard and its potential impact. MPEG-7 aims to provide a framework to progress multimedia retrieval so that it has similar access flexibility to that currently expected from text.

In addition to the formal presentations, there were also system demonstrations and poster presentations for viewing throughout the two days.

A number of themes arising from the conference included:

• Hybrid image retrieval techniques (those using a combination of text and images in indexing and retrieval) may be more effective than CBIR alone.

• There is a need for systems that allow the classification and retrieval of information via semantic content (such as the depiction of a particular event) as well as low-level attributes (such as colour, texture and shape). The presentation on automatic scene classification indicated one promising line of approach.

• The need to focus on end user and customer requirements was emphasised. A user-centred design approach is paramount if appropriate systems to support users in the management of their information needs are to be developed. There is therefore a need for further investigation into issues such as:
  • Interface design and evaluation
  • Adequate system evaluations
  • User requirements analyses in context

• The growing interest in the indexing and retrieval of video data reflects the need to provide a method of managing large collections of video material in a variety of contexts including the WWW and educational archives.

• Emerging standards such as MPEG-7 could have a major impact in the future.

The conference was organised by the Institute for Image Data Research (IIDR), University of Northumbria at Newcastle. Sponsorship of the event was provided by IIDR, The British Computer Society Information Retrieval Specialist Group, The British Library Research and Innovation Centre, The Institute of Information Scientists and The Robert Gordon University, Aberdeen. The URL for the Conference series is: http://www.unn.ac.uk/iidr/cir/.

Papers from the conference will be published shortly in the British Computer Society's Electronic Workshops in Computing series (formerly published by Springer) URL: http://www.ewic.org.uk/ewic/. The preliminary proceedings of the conference are available in paper form at a cost of £15. If you would like a copy, or any further information about the work of the Institute, please contact the administrators at:

> The Institute for Image Data Research
> University of Northumbria at Newcastle
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> Tel: 0191 27 4646
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> URL: http://www.unn.ac.uk/iidr

Vision in the Media

This one day BMVA technical meeting, held in the British Institute of Radiology, London on the 10th March 1999, aimed to provide a broad view of the use of vision, graphics and related technologies in the visual broadcast industry from members of both the research and industrial communities. The opening talk, "Television in the 21st Century" was given by Richard Storey (BBC Research and Development) and served as an excellent introduction to the day's discussion by presenting the anticipated needs of the broadcast media from an industry viewpoint. The talk started by presenting the current model of film and television production and studied their limitations; although huge financial investment in traditional productions is currently a route to success, this is not necessarily a sustainable route to long-term industry growth. Further to this, only one sort of linear, fixed narrative experience with 2D images and sound is generally being supplied to an audience with increasingly higher expectations of 3D display and interaction, as being provided by VR and video games vendors. Broadcasters will need to diversify into new, more interactive and immersive entertainments for the industry to survive. This poses both technical and creative questions. Technological development will require engineering of 3D scene generation and understanding. Creatively, scripts will need to be replaced by more general scenario designs where a sense of story is built into the environment in such a way that viewers interacting with the environment will experience a realistic plot unfolding around them. In the discussion following this talk it became

clear that the general feeling from the audience (33 of whom were from academia, 12 from industry) was that the greatest challenges lie in the creative authoring side, and the generation of virtual worlds which respond realistically to users' behaviour.

The next three talks reverted to the more traditional subject matter of BMVA meetings, the discussion of vision algorithms; each providing some aid to video production/post-production. The first of these talks, entitled "Motion and Colour-based Segmentation Tools for the Post Production Applications" was given by Graeme Jones (Kingston University). Graeme outlined a set of algorithms whose aim is to improve the productivity of special-effects houses by automating a large part of the work involved in, say, segmenting foreground and background out of a sequence of images, along with a mosaicing algorithm to piece together the backgrounds extracted from an image sequence so that previously unseen views may be generated with foreground activity superimposed. The method hinged on estimating foreground and background motions induced by object and camera motion (with colour being used as an extra cue). In the two examples shown, an actress was separated from the background in a sequence, and estimated background motions were used to register a set of images into a mosaic, producing a novel panoramic shot of a rally car turning a hair-pin corner.

The second of the vision talks, "View synthesis and Creating Immersive Video Objects" was presented by Stephen Pollard (Hewlett-Packard Laboratories) dealt with image-based rendering of both static and dynamic scenes. In this work, image edges are used to automatically register disparate views of a scene, with texture added by blending colour information from each view. The technique was used to generate new views of the scene without resorting to a full 3D reconstruction, with examples of environments rendered of a variety of outdoor scenes. The technique was also demonstrated on trinocular video sequences; novel views can be generated of dynamic activity at respectable frame rates.

After a break for lunch, we returned to hear Richard Bowden (Brunel University) present his work "Toward Marker-less Based Motion Capture", where a model-based approach was taken to infer full 3D information about the posture of a human figure from a single 2D image. A non-linear approximation to a point distribution model was trained on a set of 2D (image) features derived from images of a person along with 3D information relating to that person's skeleton. After training the the model was fitted to previously unseen images using the 2D features

alone, from which the 3D pose of the skeleton is inferred.

In the next talk "Immersive Participatory Media, Projecting User Performances into Dynamic Media Events", Sharon Springel (University of Cambridge) brought us back to the problems of constructing convincing virtual experiences for users to interact within. It is anticipated that the media of the next century will break away from the traditional "one to many" model, which has prevailed since the advent of the printing press, to a more complex "many to many" model where users/actors interact across multi-directional networks. This requires a move away from a director who dictates the action toward a facilitator who "hosts" events. The creativity in this model is no longer solely in pre-production but also required at the "action" stage too.

In such systems, computer vision tools will be required to recognise and capture facial expression and gaze directions, identify use of gestures and other body language, allow the facilitator system to witness and take the first steps toward interpreting user actions and intentions, and to allow users to signal their intentions in a natural way without recourse to awkward interface technologies.

The final presentation of the day gave an indication of how such a 3D device may be constructed. In "3D Imaging for Metrology and Display" Neil Davies (DeMontford University) described the "integral photography" imaging technology. As opposed to stereo techniques, where the illusion of depth is achieved by fusion of disparity cues in the brain, integral imaging devices capture and reconstruct the rays of light from the original scene, creating a true 3D scene that the eye can focus on in the usual way. Although still suffering from some technical problems, the devices look promising; Richard Storey (the first speaker, from the BBC) believes this type of imaging device to be the only current 3D display technology likely to transfer into the home.

Overall, the meeting had a very balanced and enjoyable program. The first talk asked questions both technical and creative, to which some solutions were proposed in the subsequent presentations; this format proved to be very satisfying, leaving the audience with a set of well formed questions to be answered in their future research. I believe that another meeting with similar subject matter is already being proposed for a later date.

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Future BMVA Technical Meetings

10 May 99 *Motion Analysis and Estimation* (IEE/BMVA) to be held at the IEE, Savoy Place, London.

26 May 99 *Machine Vision in Photogrammetry* to be held at the BIR, London.

19-20 July 99 *Medical Image Understanding and Analysis 99* to be held at the Examination Schools, Oxford

13-16 Sept 99 *Tenth British Machine Vision Conference*, BMVC'99, to be held at Nottingham University.

The meetings programme for 1999/2000 is currently being finalised but as usual we are always on the lookout for possible subjects for future meetings. So if you feel there is a subject that the BMVA has neglected recently or would like to revisit a past subject please contact `richard.bowden@brunel.ac.uk` with your suggestions.

Future meetings currently being finalised are:

- Industrial Inspection

- Surveillance

- Augmented Reality

For up to date information on forthcoming BMVA meetings and events, subscribe to the BMVA mailing list at `www.mailbase.ac.uk/lists/bmva/` or check out the website at `www.bmva.ac.uk/meetings`

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> Vision and VR Group
> Dept M & ES
> Brunel University

IEE Events

IEE/BMVA Colloquium on Motion Analysis and Tracking

Monday 10 May 1999

IEE, Savoy Place, London

Developments in motion analysis and tracking features or objects over time in image sequences has been one of the key factors in the emergence of new applications for Computer Vision and Image Processing in recent years. Techniques for estimating motion, tracking objects and inferring 3-D structure from motion are finding increased use in areas ranging from multimedia and virtual reality to telemedicine, traffic monitoring and video compression. Much of the new research and industrial exploitation of this area is taking place within the UK.

The colloquium will begin with a keynote talk by Professor Andrew Blake of the Robotics Research Group at the University of Oxford and the programme will consist of contributions from the major UK research groups working in the area. The event will provide a broad summary of the current state-of-the-art and will be of interest to researchers and application developers from all sectors.

For details of the programme and information on attending the colloquium visit the web page at `http://www.iee.org.uk/Events/e10may99.htm` or contact

> Neil Sharp
> IEE
> Savoy Place
> London WC2R 0BL
> tel: +44 (0)171 344 5421
> email: `nsharp@iee.org.uk`

IPA 99

12-15 July 1999: Seventh International Conference on Image Processing and its Applications, at the University of Manchester.

IPA 99 aims to cover the whole range of topics of current interest in the image processing field, including in particular image communication, image interpretation, image analysis, architectures and applications. There is an impressive array of keynote speakers:

Dr. N. Lodge of the Independent Television Commission, UK will talk on "Being Part of the Fun: Immersive Broadcasting for the New Millennium".

Professor S. Mitra of the University of California, USA will talk on "Nonlinear Image Processing".

Professor A. Del Bimbo of the University of Firenze, Italy will talk on "Image and Video Databases: State of the Art and Perspectives".

Professor C. Taylor of the University of Manchester, UK will talk on "Understanding Images".

Professor V. Bruce of the University of Stirling, UK will talk on "Identification of Human Faces".

Professor G. Lorette of the University of Rennes, France will talk on "Image Perception and Interpretation Systems: A Case Study".

A Tutorial will be held on 12 July, prior to the main conference. Four eminent experts have been selected for this intensive integrated tutorial:

Dr. Steve Sangwine is a Lecturer at the University of Reading, and an expert on colour image processing. He will talk on "Colour in Image Processing".

Roy Davies is Professor of Machine Vision at Royal Holloway, University of London, and an expert on low-level vision. He will talk on "Low Level Vision Requirements".

Josef Kittler is Professor in Machine Intelligence at the University of Surrey, and an expert on theoretical aspects of Pattern Recognition and Computer Vision. He will talk on "Video Database Searching".

Dr. Nick Lodge leads major R&D programmes at the Independent Television Company (UK), and is an expert on communications and media technology. He will talk on "An Introduction to Advanced Methods for the Subjective Evaluation of Image Quality and the use of Visual Models".

The full programme is available from:

> IPA 99 Secretariat
> IEE Conference Services
> Savoy Place
> London WC2R 0BL
> tel: 0171 344 5472
> fax: 0171 240 8830
> email: `ipa99@iee.org.uk`
> www: `http://www.iee.org.uk/Conf/`

European Workshop on Distributed Imaging

Thursday 18 – Friday 19 November 1999, to be held at the IEE, Savoy Place, London

IEE Professional Group E4 (Image processing and vision)

Ransford Johnson (University of Bristol) and Paola Hobson (Motorola) are organising a two-day European Workshop on Distributed Image Processing. It is aimed to highlight advances in facets of Video Conferencing, World Wide Web, Image Databases, Intelligent Networks, distributed processing and Image Processing theory and practical applications.

The workshop will provide a venue for and bring together industrialists, academics, practitioners, tool developers and users from these various disciplines to compare and discuss various approaches to the use of images in a distributed environment. The topics for which papers are solicited include but are not limited to:

- Client/Server imaging applications
- Distributed image/video databases
- Image processing of remote data
- Image coding
- Hypermedia
- Editing and post production of distributed video archives
- Multimedia over IP, including techniques and applications
- Video in intelligent networking environment
- Mobile multimedia
- Advances in video conferencing
- Image processing aspects of WAP
- Standards use - CORBA, XML, OLE etc.

The deadline for submission of abstracts is 31 July 1999. For further details, please contact:

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> Paola Hobson
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IUE: Image Understanding Environment

In the past year there have been a number of improvements to the IUE which have made the environment more comprehensive and user friendly. The purpose of this article is to outline these changes and report the current status of the IUE.

In the original development environment for the IUE, users had to specify class interfaces using a specification language which was not C++. This language was implemented using LaTeX macros, and LaTeX was used to generate C++ code to which the user then added implementation code for the classes. The same generator produced documentation in LaTeX and HTML. The main advantages of using a code generator in this way was that wholesale changes to code structure could be easily provided, a uniform documentation style could be enforced, and desirable C++ programming practices could also be enforced because the code was generated and did not rely upon the experience of the programmer.

In practice, most users found that the environment was difficult to use and that it reduced productivity rather than enhanced it. The reasons included dislike of having to specify classes in anything other than C++, and the somewhat baroque nature of the file and development structure that supported the code generation. It took an unacceptably long time to learn how to use the environment. The HTML documentation generator was extremely difficult to set up to use so that links across library packages worked. A further disincentive was the fact that users could not easily develop applications that mixed IUE-style classes with their local, non-IUE code.

These difficulties were identified by many users in the USA and those working on the IUE project in the UK. The IUE environment has now been changed to eliminate these difficulties and to support the needs expressed by many users. The IUE now supports:

- mixing of standard C++ classes and IUE-style classes, standard C functions

- IUE class enhancements, such as Data Exchange (DEX), explicit template instantiation and run

- time typing, can be added independently to turn a standard C++class into an IUE style class

- documentation generation is based on the same C++ source that is presented to the compiler

- the development directory structure has been simplified and made compatible with the TargetJr development environment. The TargetJr class libraries are now included with the IUE distribution

- code sharing using CVS repositories

- support for more platforms, including WinNT

- debugging and production builds

Documentation Generation

HTML reference documentation is produced using PERCEPS. PERCEPS is a Perl tool that parses C++ source and produces user-defined output. The IUE uses PERCEPS to perform the generation of services such as DEX and to produce class documentation in HTML. Documentation can be produced from C++ source that has no comments added to it i.e. it contains only raw C++ code. You can add C++ comments with tags that produce appropriate text in the HTML pages e.g. descriptions of the class, member data and functions etc. The tool is capable of producing cross-linked documentation and an alphabetical index from source code contained in different packages.

Importing Your Own Code.

Once you have installed the IUE it is easy to import your own C++ class and C function libraries into the IUE working environment. The development model is one of creating packages which when built produce libraries. Applications are usually single file programs that are compiled and linked with the packages that they use. To import your code, you simply have to create new package directories, move the source into them as appropriate, and build each package. Applications reside in one or more application directories.

We have done this at Manchester for our RADIAL C++ class library. Users here can now write applications which use classes selected from RADIAL, IUE, TargetJr and STL (the Standard Template Library) as they need.

Development Using Repositories

The IUE and TargetJr developers use source code repositories to share code. Sharing source via a repository is an extremely efficient way of propagating new versions and bug fixes amongst a group of users. The IUE uses CVS (Concurrent Versioning System) to maintain and share source. CVS is available for Unix and NT platforms.

In the repository model, each user has a copy of the source code for a package in their own (private) development area. To use it they just build it. Any changes that you make to your local copy can easily be committed to the repository source. If someone else wants to benefit from these changes, it is a simple process to update their local copy of the package and rebuild it. We now use this method of working at Manchester and our experience is that it is an extremely good way of developing and sharing software.

CVS works even when the repository is remote. The IUE and TargetJr source code is now held in a publicly accessible repository. You can choose to download a released version of the IUE or to use CVS to update your local copy of the IUE and rebuild it.

Debugging and Production Builds

When you install the IUE, you can choose to build shared libraries, static archives or both. If you install both, then you can build your applications in two ways.

• using shared libraries, with debugging code. If you choose this (default) mode then if you make a change to a package and rebuild it, you don't have to re-link any applications. The updated packages are linked at run-time. This can reduce your compile-link-run cycle considerably. The code also contains the symbol tables so that you can use a debugger.

• using static libraries, with optimised code. Programs built this way have shorter start-up time when you run them, run faster and occupy much more disc space.

Platforms

The IUE is now available on these OS/compiler combinations:

Sun-Solaris 2.5 + (gcc2.7.2.x, egcs 1.1.1, Sun-Pro CC 4.2) Linux + (gcc2.7.2.x, egcs 1.1.1) WinNT + (VC 5.0)

A port to WinNT + VC 6.0 is in progress.

The Unix and WinNT Environments

The Unix environment uses the usual tools for development (make, Perl etc.) To build the IUE in WinNT you have to install CygWin, which provides these tools for the NT environment. Using CygWin, the build procedure is almost identical. It was done this way to simplify the port to NT.

NT provides a comprehensive C++ development environment called Developer Studio (DS) which differs from the IUE environment. You can develop applications in DS which use the IUE libraries. If you choose to develop packages using DS rather than the IUE Unix-style scheme, then it is not clear at the moment how source would be shared between NT and Unix developers. DS users tend to use Source-Safe as the repository mechanism rather than CVS because it is integrated into DS. CVS can be used on NT, but the directory structures used by IUE/Unix and DS are different which may make package sharing using source difficult. The policy of the IUE at the moment is to await user feedback on this issue.

A Final Word

The IUE development environment is productive, gives you access to many class libraries, and enables efficient sharing of code between developers. Even if you do not wish to use the classes, the development environment is good and worth having. If you are a Unix user, you will never have to write a makefile again. If you would like further information or wish to install it to try it out for yourself then please do not hesitate to contact me for assistance.

References:

IUE page:
www.aai.com/AAI/IUE/
UK IUE page:
s20c.smb.man.ac.uk/services/IUE/IUE_gate.html
Target at Oxford:
www.robots.ox.ac.uk/~tgtjr
PERCEPS page:
www.friga.mer.utexas.edu/mark/perl/perceps/

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